

ARC OXFORD – PLOT 4200

Lighting Assessment

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P03

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P03	31/01/2024	Updated Planning Submission

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Introduction

Project Overview

Project Name	ARC Oxford – Plot 4200
Applicant	Advanced Research Clusters GP Limited (ARC)
Application Type	Full Planning Application
LPA	Oxford City Council
Site Address	Plot 4200 John Smith Drive Oxford OX4 2RU
Site Area	1.3ha (12,952sqm)

ARC is Europe’s leading network of science and innovation clusters. At the cutting edge of major knowledge economies, it supports businesses in the science and technology sector by creating the best possible environments for innovation, allowing them to thrive and make a difference in the world. It currently operates from several locations in London and Oxfordshire – including ARC Uxbridge, ARC West London, the Harwell Campus and ARC Oxford.

ARC Oxford

Formerly known as Oxford Business Park, ARC Oxford is a well-established employment site comprising 88 acres in the Cowley area of Oxford. It is home to several businesses, including several focused-on science and innovation, set within a landscaped ‘Campus’ environment. In addition to employment space, other uses at ARC Oxford include Oxford Factory (café/restaurant), Oxford Works, a Premier Inn hotel and restaurant, a David Lloyd Racket & Health Centre, and a Bright Horizons Day nursery.

Plot 4200

Plot 4200 lies within the southern part of ARC Oxford to the west of John Smith Drive. It currently comprises of 7 individual office buildings organised around areas of car parking and intermittent tree planting. Residential development lies to the west and an existing private footpath runs alongside the southern side of the site.

The proposed development involves the demolition of all existing buildings on the site, making way for the redevelopment of a single laboratory-enabled office building. This will be provided alongside ancillary amenity spaces and other tenant support spaces.

The building has been designed to be a laboratory ready facility. The initial design is based on a shell and core with space planning to accommodate laboratory and administration facilities as a 60:40 split. Future laboratory fitout will be to Category CL2 (Containment Level 2).

The building brief for ARC Oxford Plot 4200 / 4400 combines laboratory enabled office space, tenant amenity, opportunity for commercial lettings, and other tenant support spaces.

The building has an external car-parking around the perimeter of the building.

Plot 4200 / 4400 has a requirement of being designed as a Laboratory ready facility. The initial design is to be based on a shell and core with space planning to accommodate laboratory and administration facilities as a 60:40 split.

Future laboratory fitout will be to Category CL2 (Containment Level 2).

All works will comply with legislative requirements current at the time the Building Contract is let and in accordance with the latest edition (including amendments) of the Building Regulations, British Standards, and approved Codes of Practice.

The building will obtain Building Regulations approval, which will also include acknowledgement of the Equality Act provisions and will conform to the Fire Prevention Act, Health and Safety at Work Act, Workplace regulations 1992, Environmental Health, Local Bye Laws, Town, and country Planning Acts and the CDM regulations 2015.

Purpose of this document

This report has been prepared to demonstrate that the proposed lighting scheme will comply with Local and National policy and guidelines in terms of light pollution and minimum levels of illumination required addressing security and amenity.

The intention of this document is to demonstrate the anticipated lux levels being provided by the external lighting scheme and to detail anticipated spill light to the adjacent areas of the plot. This report also details the internal lighting controls.

In accordance with CIE guidance 2003 & 2017 and the ILP Guidance Notes for the Reduction of Obtrusive Light (2021) and in relation to the assessment, the following definitions are used in describing obtrusive lighting effects:

- Direct sky glow: the direct upward spill of light into the sky, which can cause a glowing effect and is often seen above cities when viewed from a dark area.
- Upward reflected light: the reflected upward spill of light into the sky, from surfaces below the light sources. A contributor to sky glow.
- Light spill: the spilling of light beyond the boundary of the area being lit.
- Light intrusion: nuisance light, levels of light above defined values into residential properties.

Land Use

The new facility is to be located on Plot 4200 at ARC Oxford with existing buildings being demolished to make way for this new laboratory ready facility. The images below show the location of the development and its surroundings. The plot is neighboured by other employment uses to the north, south and west with residential development located to the west.



Objectives and Design Criteria

Objectives

Specific objectives of the proposed lighting scheme when fully designed include:

- Provide adequate illuminance to the roadway areas of this development.
- Provide adequate illuminance to walkways and entrances to improve the security of the users.
- To provide limited feature lighting to the garden space at the front of the building
- Mitigate light pollution and light trespass so far as is practicable.
- Limit impacts to site ecology.
- Minimise energy consumption through efficient luminaires and suitable lighting control strategy.

Relevant Standards & Guidance

Policy RE7 (Managing the impact of development) of the adopted Oxford Local Plan states planning permission will only be granted for new development that ensures the amenity of communities, occupiers and neighbours are protected from harmful impacts from pollutants - such as lighting.

Light, and people's perceptions of it, are a complex interaction and vary from person to person. There are therefore recognised standards that are based on current good practice.

The proposed developments lighting shall be designed in accordance with the following regulations, standards, and guidance:

- SLL Code of Lighting
- Society of Light & Lighting Handbook
- CIE Technical Report, CIE 150 – Guide to the Limitation of the Effects of Obtrusive Light from Outdoor Installations
- CIBSE Lighting Guide 6 – The Outdoor Environment
- BS 5489-1:2020 Design of Road Lighting. Part 1: Lighting of Roads and Public Amenity Areas - Code of Practice
- BS EN 13201-2:2015 Road Lighting. Part 2: Performance Requirements
- BS EN 12464-2 Lighting of workplaces. Part 2: Outdoor workplaces

Additional guidance on light pollution and limiting impacts on ecology:

- Guidance Notes for the Reduction of Obtrusive Light – ILP
- Guidance Note 08/18: Bats and Artificial Lighting in the UK (If applicable)
- Health & Safety at Work Act
- Health & Safety Commission, Approved Code of Practice Regulation 8 Lighting Performance Criteria

Quality of Light

Lamps and Luminaires:

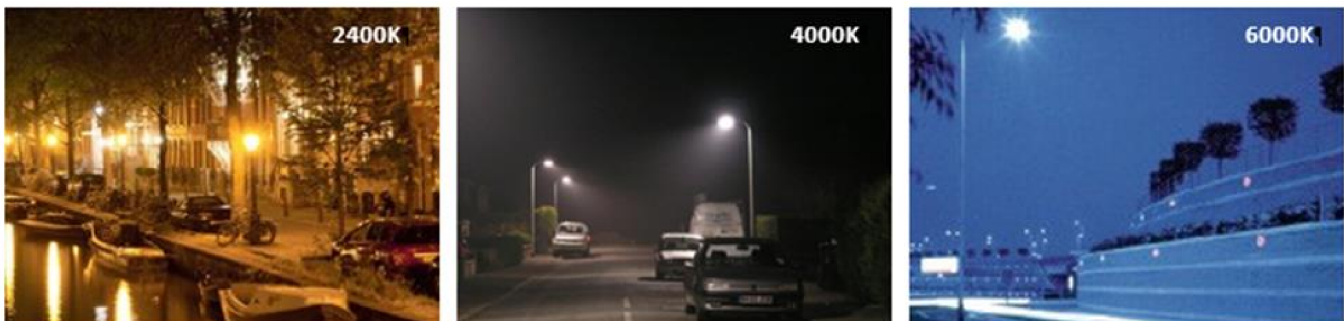
Lamp types will be selected for their efficacy, colour rendition and longevity to provide an efficient lighting solution with a predictable maintenance regime. Where possible luminaires will be sourced from readily available standard product ranges. Luminaires will be selected for their construction, design, fabrication, and ingress protection and will be sited in accessible locations. Particular attention will be paid to selecting luminaires with good optical control to help ensure that light pollution is kept to a minimum.

Colour Temperature:

The colour temperature of a light source is conventionally stated in the unit of absolute temperature, Kelvin, having the unit symbol K. Temperatures above 4000K are cool in colour, with bluish white light, while colour temperatures around 4000K are more neutral white in tone, providing a modern feel. Colour temperatures in the 2400K-3000K range have a warmer effect, creating a traditional atmosphere.

Guidance from the ILP states that luminaires with a warm white spectrum are preferential as bats are more affected by the blue light component, therefore luminaires with a colour temperature of 3000K will be used if bats are present or suspected to be present.

A colour temperature of 3000K has been selected.



Obtrusive Light

Light pollution, or obtrusive light, has the potential to cause physiological and ecological issues. It takes various forms:

- Sky glow: the brightening of the night sky above our towns and cities.
- Glare: the uncomfortable brightness of a light source in contrast to the background.
- Light Trespass: the spilling of light beyond the boundary of the property on which the light source is located.
- Light Ingress: the passage of light into buildings from an external source(s).

Obtrusive light is a nuisance to both humans and wildlife, it is a waste of energy and contributes to greenhouse gas emissions. The problems of unnecessary, obtrusive light can and should be reduced or eliminated at the design stage. When specifying the luminaires, careful consideration has been given to minimising upward light and the use of optical units with precise light intensity distribution: thus, ensuring that spill and glare are minimised.

The road lighting luminaires which have a higher lumen package selected for this development will have no upward light component and will all be LED with optics designed for precise projection of light.

During the design of the external lighting installation, the following measures have been considered to reduce the occurrence of obtrusive light:

Over-lighting: This is avoided by conducting thorough calculations and carefully selecting the most appropriate lighting equipment and lamp types. Luminaires with high output have been provided with back light shields to reduce spill light at the rear of the luminaires.

Lighting Control: To ensure luminaires are only switched on, when necessary, a lighting control performance specification is to be produced with the zones and times detailed within this report.

Assessment Criteria

For the purposes of demonstrating a robust assessment, the following standard industry precautionary measures are applied to the assessment calculation:

- It has been assumed that all relevant external lighting is operational simultaneously for the relevant pre or post curfew operational condition (i.e., a maximum adverse scenario).
- Where applicable, small feature lighting, such as LED strips have been excluded from the assessment. The low output and orientation limit their impact.
- The lighting design has been based on Maintenance Factor of 0.8 to reflect likely cleaning intervals and lumen depreciation. This will deliver the design-lighting levels in use and result in higher than design-lighting levels when new.
- As per standard industry practice existing and proposed planting / trees have not been included within the assessment calculations, however the location of all luminaires detailed have been coordinated with the Landscape Architects plans.
- Ground surface reflectance has been taken as 22% based on data from CIBSE LG11: Surface Reflectance and Colour. This is an Area Weighted Reflectance based on typical sports surfaces & natural landscaping.

BS EN 12464-2:2014 provides the following design guidance for the external lighting scheme:

Table 2.2 Excerpt from BS EN 12464-2:2014 (reproduced by permission of BSI)

Ref. no.	Type of area, task or activity	\bar{E}_m (lux)	U_o (-)	R_{GL} (-)	R_a (-)	Remarks
5.1.1	Walkways exclusively for pedestrians	5	0.25	50	20	
5.1.2	Traffic areas for slowly moving vehicles (max. 10 km/h), e.g. bicycles, trucks and excavators	10	0.40	50	20	
5.1.3	Regular vehicle traffic (max. 40 km/h)	20	0.40	45	20	At shipyards and in docks, R_{GL} may be 50
5.1.4	Pedestrian passage, vehicle turning, loading and unloading points	50	0.40	50	20	

Utilising the guidance above, the following average levels of illuminance will be applied to the external lighting design:

- Access Roads – 10 Lux - 0.25 Uniformity
- Car Park – 10 Lux – 0.25 Uniformity
- Pathways – 5 Lux - 0.25 Uniformity

Pole mounted luminaires (4M Columns) will be utilised to illuminate the access roadway from John Smith Drive to the building, walkways & carparks. Limiting the column height to 4M was to reduce light spill onto adjacent properties.

All columns adjacent residential areas are to be provided with back light shields to significantly reduce light pollution further.

The central pathways at the front and rear of the building will be illuminated utilising multi-head columns with the design intent to utilise timber columns.

LED downlights will be installed to the underside of the building canopies. LED Strip will be installed to the underside of the timber benches as depicted on the layout drawing. 1M high lighting bollard will be utilised to illuminate pathways.

Additional external lighting would be provided to the external roof terrace at the front of the building. This will be restricted to lighting for safe access and egress to the space. Moreover, external lighting will be required for the roof plant spaces. The use of these luminaires will be intermittent only whilst plant maintenance is carried out during the hours of darkness. The design and location of these aspects are yet to be determined and it is proposed that their detail would be secured by condition. However, subject to the design intent above, this would not be considered to lead to unacceptable impacts.

Calculation Results

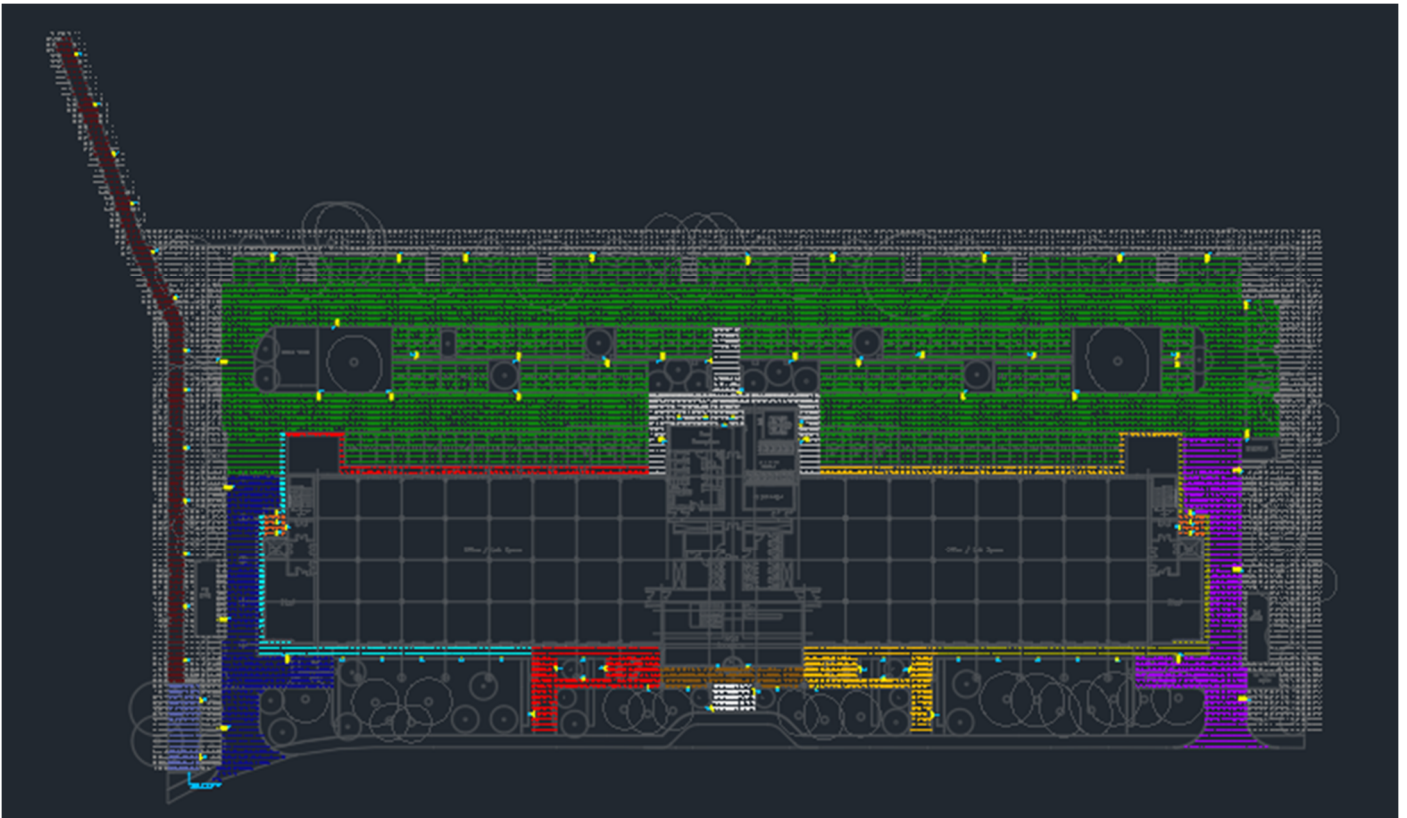
A lighting model was prepared utilising lighting design software (Relux) to check the compliance of the design with the aforementioned criteria, ensuring adequate illumination of the access road, paths and entrances to the building, as well as examining the obtrusive light to minimise the ecological impact of the design.

The model reflected the submitted architectural and landscape layouts. Lighting design software was used to give a realistic indication of the development when constructed. The parameters considered in the model are as follows:

Roadway column mounted luminaires will be mounted at 4000mm.

Pathway bollards will be mounted at 1000mm.

LED strip lighting to the underside of the timber benches are excluded from the calculations.



Refer to drawing P4200 / 4400-DAL-XX-00-DR-E-6350

Summary of Calculation Results

Description	Average Illuminance	Uniformity
Front Car Park Left	31.5 Lux	0.29
Front Car Park Right	33.9 Lux	0.29
Rear Car Park	24.1 Lux	0.28
Rear Walkway Central	30.5 Lux	0.42
Rear Walkway Left	10 Lux	0.55
Rear Walkway Right	8.7 Lux	0.61
Front Area Central	62.8 Lux	0.53
Front Walkway Left	35.8 Lux	0.39
Front Walkway Right	36.6 Lux	0.39
Left Side Walkway	30.2 Lux	0.29
Right Side Walkway	29.6 Lux	0.27
Loading Bay Left	63.4 Lux	0.85
Loading Bay Right	62.6 Lux	0.76
Front Walkway	22.3 Lux	0.25
Pathway	18.7 Lux	0.29
Pathway Seating Area	37.8 Lux	0.42
Spill Light Rear	0.57 Lux	N/A

The above lighting calculation results are based on a maintenance factor of 0.8. to reflect likely cleaning intervals and lumen depreciation. This will deliver the design-lighting levels in use and result in higher than design-lighting levels when new.

Luminaire Schedule

Reference EX1

Column mounted luminaire complete with back light shield. Single-piece die-cast aluminium housing conforming to EN1706 AC-46500, with integral heat sink fins to optimise thermal management. LED light engine modules are IP66 with individual PMMA lenses. Housing sealed to IP65 via hinged access door (two captive fixing screws). Installation via mounting feature for quick and easy installation. International Dark-Sky Association Approved (colour temperatures 3000K or warmer are approved under the IDA).

- LED light engine producing 5,815lm with a nominal 3000°K colour temperature.
- Forward light distribution
- Smooth Grey (RAL7035)
- Back Light Shield

Complete with 1 x tubular base compartment column. 4 metre, single head, For light & medium area wind zones (compliant to EN40).

- Bracket galvanised
- direct embedment
- 4M Column



Reference EX2

Twin column mounted luminaire. Single-piece die-cast aluminium housing conforming to EN1706 AC-46500, with integral heat sink fins to optimise thermal management. LED light engine modules are IP66 with individual PMMA lenses. Housing sealed to IP65 via hinged access door (two captive fixing screws). Installation via mounting feature for quick and easy installation. International Dark-Sky Association Approved (colour temperatures 3000K or warmer are approved under the IDA).

- LED light engine producing 4,672lm with a nominal 3000°K colour temperature.
- Twin Head Luminaire
- Forward light distribution
- Smooth Grey (RAL7035)

Complete with 1 x tubular base compartment column. 4 metre, single head, For light & medium area wind zones (compliant to EN40).

- Bracket galvanised
- direct embedment
- 4M Column

○



Reference EX3

Column mounted luminaire. Single-piece die-cast aluminium housing conforming to EN1706 AC-46500, with integral heat sink fins to optimise thermal management. LED light engine modules are IP66 with individual PMMA lenses. Housing sealed to IP65 via hinged access door (two captive fixing screws). Installation via mounting feature for quick and easy installation. International Dark-Sky Association Approved (colour temperatures 3000K or warmer are approved under the IDA).

- LED light engine producing 4,672lm with a nominal 3000°K colour temperature.
- Long and Narrow Distribution
- Smooth Grey (RAL7035)

Complete with 1 x tubular base compartment column. 4 metre, single head, For light & medium area wind zones (compliant to EN40).

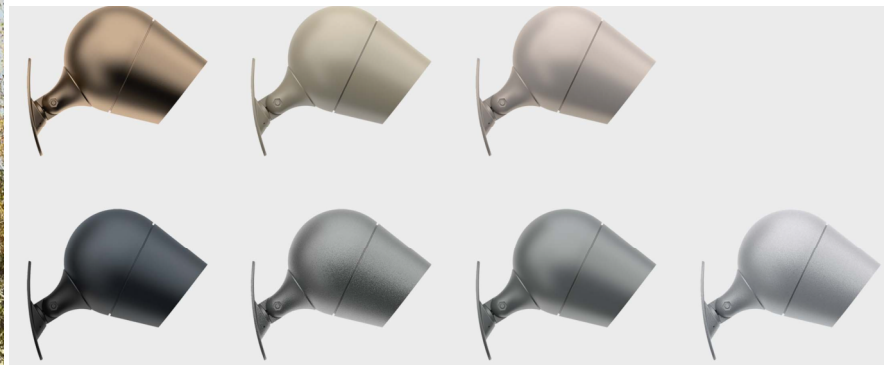
- Bracket galvanised
- direct embedment
- 4M Column



Reference EX4

For Wood poles we use premium-quality, robust pine wood from sustainable forests. The correct choice of wood is key to attaining optimal technical characteristics. As well as being a sustainable raw material, wood is also durable, moisture-regulating, lightweight and robust at the same time – ideal as a construction material for all types of architecture. A special weather-proof glaze provides long-term protection for the natural beauty of the material. Six different shades of wood mean Olivio Wood can be coordinated to all architectural contexts – three graduated brown shades for a particularly warm and natural effect and three shades of grey for a neutral look in urban spaces.

- Single Spotlight
- 3000K
- 4M Timber Column
- 1500 Lumens



Reference EX5

For Wood poles we use premium-quality, robust pine wood from sustainable forests. The correct choice of wood is key to attaining optimal technical characteristics. As well as being a sustainable raw material, wood is also durable, moisture-regulating, lightweight and robust at the same time – ideal as a construction material for all types of architecture. A special weather-proof glaze provides long-term protection for the natural beauty of the material. Six different shades of wood mean Olivio Wood can be coordinated to all architectural contexts – three graduated brown shades for a particularly warm and natural effect and three shades of grey for a neutral look in urban spaces.

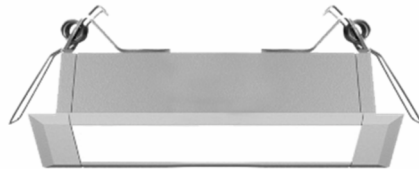
- Twin Spotlight
- 3000K
- 4M Timber Column
- 1500 Lumens x 2



Reference EX6

Extruded aluminium alloy body. A4 Stainless steel screws.

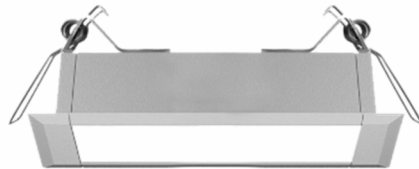
- 415 Lumens
- 3000K
- Diffused Distribution
- IP65



Reference EX7

Extruded aluminium alloy body. A4 Stainless steel screws.

- 825 Lumens
- 3000K
- Diffused Distribution
- IP65



Reference EX8

Bollard luminaire. Extruded marine grade aluminium body with die-cast aluminium top and base secured by stainless steel nuts and sealed to IP65. The optical arrangement consists of individual optical modules with a patented transition zone to minimise glare. Suitable for flange base mounting (bolts available as an accessory).

- LED light engine producing 414 lm with a nominal 3000°K colour temperature
- Single sided
- Long and Narrow light distribution
- 1 metre high
- Smooth Grey (RAL7035)
- 6W

Root Mounting Spike to fit Bollard. Includes set of 4 Bolts M10 x 40mm



Reference EX9

Surface IP65 Emergency LED bulkhead complete with polycarbonate TP(a) fresnal lens for safe egress from the building exits. 3hr non maintained.

- IP65
- Non-Maintained
- 3 Hour Battery Back Up
- LED
- 150 Lumens

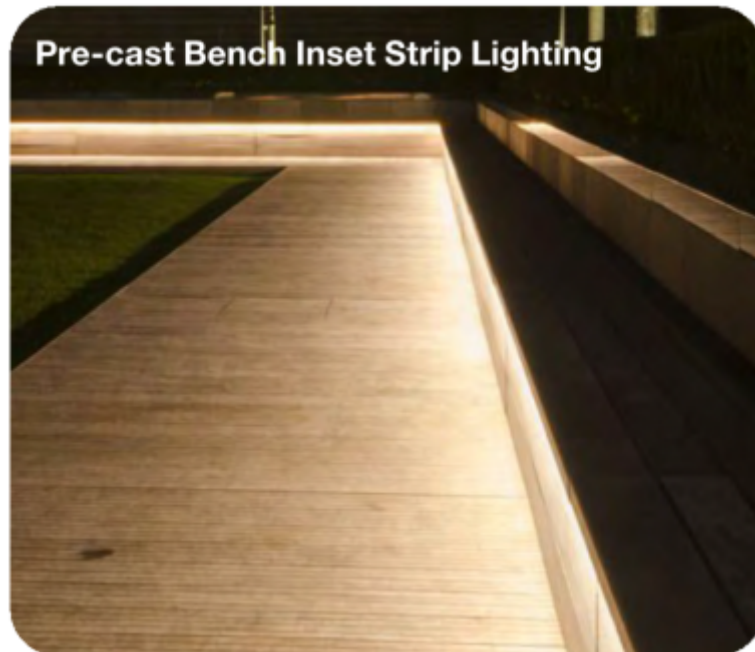


Reference EX10

LED lighting to underside of Timber benches

LED tape

- 425 lumens per Metre
- 4.8W per Metre
- 3000K
- IP65
- To be housed in metal strip with diffuser for additional protection.



Controls

The external lighting installation will be automatic with user intervention where required. Lighting will be controlled via centralised photocell and programmable time clock lighting control system, located adjacent to external lighting distribution boards. Override / isolation switches will be provided alongside the boards to allow for routine maintenance and testing.

The lighting installation will be zoned to allow different areas to be controlled independently.

- Control Zone 1: Central Front Areas & Walkways
- Control Zone 2: Left Side Car Park & Walkways
- Control Zone 3: Right Side Car Park & Walkways
- Control Zone 4: Rear Car Park
- Control Zone 5: Pathway Adjacent to Plot
- Control Zone 6: Bench Feature Lighting

The external lighting will be switched on at dusk via the centralised photocell and switch off as detailed below.

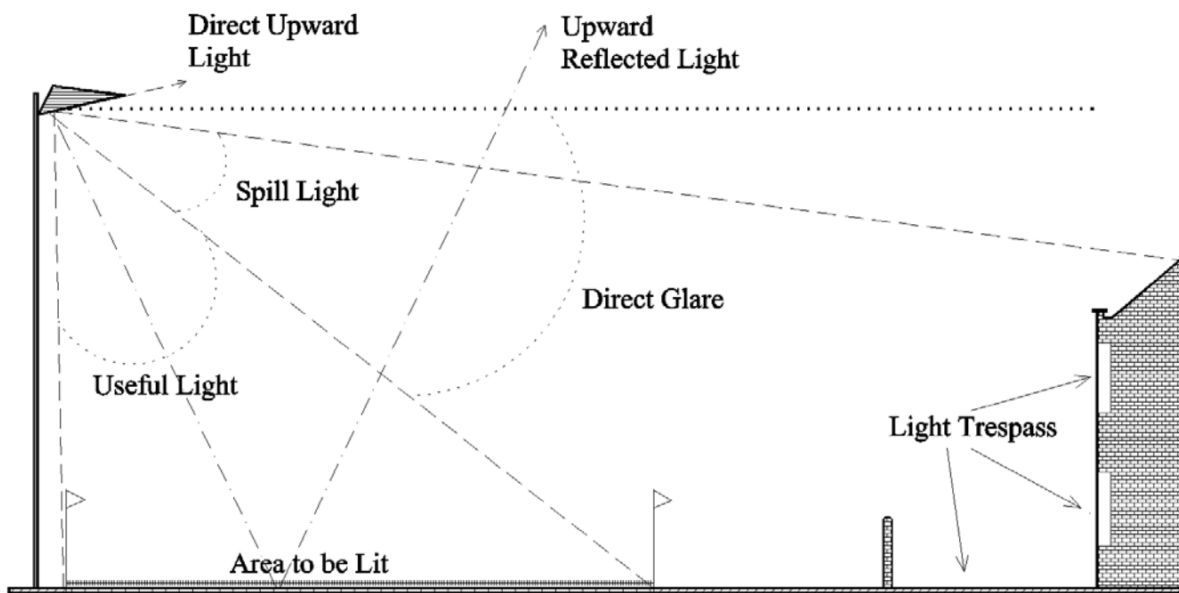
Please note that these times could be changed within the external lighting system to meet the Client's requirements.

- Control Zone 1: Central Front Areas & Walkways – Dusk to 11pm, 06:00 to daylight
- Control Zone 2: Left Side Car Park & Walkways – Dusk to 11pm, 06:00 to daylight
- Control Zone 3: Right Side Car Park & Walkways – Dusk to 11pm, 06:00 to daylight
- Control Zone 4: Rear Car Park – Dusk to 11pm, 06:00 to daylight
- Control Zone 5: Pathway Adjacent to Plot – Dusk to Dawn
- Control Zone 6: Bench Feature Lighting – Dusk to 11pm, 06:00 to daylight

Impact on Surrounding Areas

The external lighting has been designed to minimise light pollution and light trespass onto the adjacent plots. Careful consideration has been given to the selection and location of luminaires to minimise obtrusive light.

The luminaires selected and their positioning maximise the illumination to the areas requiring to be lit whilst limiting direct upward light and light trespass.



The luminaires with the highest lumen output are the access roads and car park column mounted luminaires. The column mounted luminaires have been selected and have unique optics placed below each LED to ensure light is delivered where required, providing a uniform night-time friendly environment with minimal light pollution.

No Tree uplighters have been detailed within the design to limit light pollution and any effect on wildlife within the trees.

Drawing P4200-DAL-XX-00-DR-E-6350 provides detailed lux plots of the external lighting scheme. However, it details that spill light from the lighting scheme at the boundary is around 1 Lux average. The calculation does not take into consideration any trees or hedges that are either existing or planned as part of the external landscaping strategy that will prevent light spill into the adjacent plots, though submitted landscaping plans demonstrate enhancements to planting on all sides that is likely to aid reducing light spill.

BS EN 12464-2: 2014 provides the following guidance for obtrusive light. Using environmental zone category E3, the upward light ratio permitted is 15%.

4.5 Obtrusive light

To safeguard and enhance the night time environment it is necessary to control obtrusive light (also known as light pollution), which can present physiological and ecological problems to surroundings and people.

The limits of obtrusive light for exterior lighting installations, to minimize problems for people, flora and fauna, are given in Table 2 and for road users in Table 3.

Table 2 — Maximum obtrusive light permitted for exterior lighting installations

Environmental zone	Light on properties		Luminaire intensity		Upward light ratio	Luminance	
	E_v lx		I cd			R_{UL} %	L_b cd-m ⁻²
	Pre-curfew ^a	Post-curfew	Pre-curfew	Post-curfew	Building facade		Signs
E1	2	0	2 500	0	0	0	50
E2	5	1	7 500	500	5	5	400
E3	10	2	10 000	1 000	15	10	800
E4	25	5	25 000	2 500	25	25	1 000

where

E1 represents intrinsically dark areas, such as national parks or protected sites;
E2 represents low district brightness areas, such as industrial or residential rural areas;
E3 represents medium district brightness areas, such as industrial or residential suburbs;
E4 represents high district brightness areas, such as town centres and commercial areas;

E_v is the maximum value of vertical illuminance on properties in lx;
 I is the light intensity of each source in the potentially obtrusive direction in cd;
 R_{UL} is the proportion of the flux of the luminaire(s) that is emitted above the horizontal, when the luminaire(s) is (are) mounted in its (their) installed position and attitude, and given in %;
 L_b is the maximum average luminance of the facade of a building in cd-m⁻²;
 L_s is the maximum average luminance of signs in cd-m⁻².

^a In case no curfew regulations are available, the higher values shall not be exceeded and the lower values should be taken as preferable limits.

The following table details the upward light output ratio of each luminaire. Ref EX9 LED emergency bulkhead is excluded from the calculation as is EX10 as it is mounted below seating.

Ref	Quantity	Lumens	Power (W)	LL/CW	Total Lumens	ULR %	Total Upward Lumens
EX1	20	5815	64	125	116,300	0%	0
EX2	1 (2no)	4672	37	135	9,344	0%	0
EX3	16	4672	37	135	74,752	0%	0
EX4	2	1500	19	79	3,000	0%	0
EX5	12	1500	19	79	18,000	0%	0
EX6	3	415	6	69	1,245	0%	0
EX7	6	825	10	83	4,950	0%	0
EX8	29	414	6	110	12,006	3.2%	384.2
Total					239,597		384.2

Installation Upward Light Ratio = 0.16% of total external lighting scheme

As can be seen from the above table, there is no upward light output from the roadway lighting, the luminaires mounted around the front of the building, the car park lighting, or the pathway luminaires. Upward light is limited to the pathway bollards to pedestrian walkways.

CIE 150:2017 Guide on the limitation of the effects of obtrusive light provides guidance on obtrusive light onto adjacent properties. Using environmental zone E3 in the tables below, a pre-curfew lighting level of 10 lux and a post-curfew lighting level of 2 lux is permitted.

Table 1 – Environmental lighting zones

Zone	Lighting Environment	Examples
E0	Intrinsically dark	UNESCO Starlight Reserves, IDA Dark Sky Parks, Major optical observatories
E1	Dark	Relatively uninhabited rural areas
E2	Low district brightness	Sparsely inhabited rural areas
E3	Medium district brightness	Well inhabited rural and urban settlements
E4	High district brightness	Town and city centres and other commercial areas

NOTE Regardless of the level of urban development, the recommendations for Environmental Zone 1 or 0, should be followed for all locations within 100 km of a major optical astronomy observatory. Regardless of the level of urban development, the recommendations for Environmental Zone 2 (or better) should be followed for locations within 30 km of an operating urban optical astronomy observatory, and for locations between 100 km and 300 km from a major optical astronomy observatory.

3.6.5.1 Limitation of illumination on surrounding properties (light intrusion)

Table 2 shows maximum values of vertical illuminance on properties. Limits apply to nearby dwellings, or potential dwellings, more specifically to their relevant surfaces or parts of surfaces, especially where windows are. The values consider the summation of all lighting installations.

Table 2 – Maximum values of vertical illuminance on properties

Light Technical Parameter	Application Conditions	Environmental Zones				
		E0	E1	E2	E3	E4
Illuminance in vertical plane (E_v)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	< 0,1 lx*	1 lx	2 lx	5 lx

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

Internal Lighting Controls

General

Lighting will be controlled via a combination of manual and automatic controls designed to maximise flexibility and minimise energy use. The lighting control system will be a standalone system (non-PC based system), control locally via LCM's, PIR and wall switches.

The following areas will be provided with presence detection only:

- Cleaners' stores
- General stores
- WC's – To control cold water solenoid feed as required by BREEAM
- Circulation
- Stairways
- Risers

The following areas will be provided with absence detection and scene setting controller operation. LCM's in open plan areas to be intelligent and are to communicate with each other:

Open Plan Offices / Laboratories

The following areas will be provided with manual switching but with PIR's mounted over room entrances with off delay set at a minimum of 4 hours:

- Plant rooms
- Comms rooms (If applicable)
- Switch rooms

The following area will be provided with scene setting switching:

- Main Reception
- Meeting rooms + Absence Detection

Luminaires will be derived from local lighting control modules located above the ceiling. In areas where ceilings aren't present, hard-wired modules will be utilised.

The lighting control system will be provided as a Honeywell Ex-Or system or equal and accepted.

Lighting Control Modules

Lighting control modules will be provided to suit the installation method based on the individual space and lighting scheme.

In the open plan offices, networked intelligent lighting control modules are to be utilised.

To ensure that the lighting control system is setup to satisfy the requirements of the client, this section provides details of the proposal for the commissioning of the lighting control system to be agreed / amended with the client / their representatives.

The following matrix details how the lighting control system should be designed at the next stage. All dimmable luminaires to be DALI protocol:

Area	LCM Type	Detection	Day Light Dimming	Manual Dimming	Off Delay
Cleaners Stores	Non-Intelligent	Passive	No	No	15 Minutes
General Stores	Non-Intelligent	Passive	No	No	15 Minutes
Toilets including CWS solenoid valves	Non-Intelligent	Passive	No	No	30 Minutes
Circulation	Non-Intelligent	Passive	No	No	15 Minutes
Stairs	Single Connection Points	Passive	No	No	15 Minutes
Risers	Single Connection Points	Passive	No	No	15 Minutes
Open Plan Offices and Laboratories	Intelligent Networked	Absence (Manual On / Auto Off)	Yes if rooms adjacent windows	Yes scene setting controllers	120 Minutes
Meeting Rooms	Non-Intelligent in small rooms	Absence (Manual On / Auto Off)	Yes if rooms adjacent windows	Yes scene setting controllers	60 Minutes
Reception	Intelligent Networked	Absence (Manual On / Auto Off)	Yes	Yes scene setting controllers	4 Hours
Plant Rooms	Single Connection Points	Absence (Manual On / Auto Off)	No	No	4 Hours

Area	LCM Type	Detection	Day Light Dimming	Manual Dimming	Off Delay
IT Rooms	Single Connection Points	Absence (Manual On / Auto Off)	No	No	4 Hours
Switch Rooms	Single Connection Points	Absence (Manual On / Auto Off)	No	No	4 Hours

Internal Lighting Performance

The complete lighting installation to the building will comply with the requirements set out in BS12464-1, the Code for Interior Lighting published by the Chartered Institution of Building Services Engineers (CIBSE) and relevant CIBSE Technical Memoranda. The installation will also be designed in and installed in accordance with Part L and all other relevant Building Regulations.

The lighting scheme will be of a high quality to create the right impression and atmosphere for staff and visitors. The systems will include a mixture of suspended, surface and recessed luminaires to suit the environment and space being lit. The luminaires and control devices will be selected to provide maximum efficiency and to meet the building requirements.

Luminaires will be coordinated with the type of ceiling (typically recessed) and agreed with the Design Team and users. All luminaires will be finally located as indicated on the Architect’s reflected ceiling plan drawings. All luminaires will be suitable for the environment where they are to be installed, and complete with specialist fixings, bracketry or supports to suit the ceiling type in which they are installed. A secondary fixing is to be provided to each luminaire to support the luminaires should the ceiling installation fail.

All lighting connection points will be installed such that they are easily accessible for the replacement of luminaires, the final connection for each luminaire will generally be directly wired into the luminaires via lighting connection modules or where suitable plug-in ceiling roses can be used on pendant drops etc. All internal luminaires to be provided with a plugin connection to enable disconnection of a luminaire for maintenance or testing and inspection of a circuit. Positions of light fittings and switches will anticipate door swings and be agreed with the Architect. Additional support to ceilings will be provided where required to support the new luminaires mounted in or fixed to them.

Luminaire connection points to be provided near the luminaire, flexes are not to be run from adjacent rooms. All luminaires will be suitable for operation on a 230 (+10% and -6%) Volt, 50 Hz supply.

All luminaires will be provided with 4000K colour temperature LED’s unless otherwise detailed in the luminaire specification sheets.

Internal			
Entrance space	200	22	Escape Route 1 Lux
Reception Area	200 general 300 over reception desk	22	Escape Route 1 Lux 5 Lux above life safety control panels
Toilets	100 general 200 over basins	25	0.5 Lux
Disabled Toilets	200	25	1 Lux

Internal			
Stairwells	100 (on all treads, lit from two directions)	25	Escape Route 1 Lux 5 Lux above life safety control equipment and refuge points
Lift lobbies	200	22	Escape Route 1 Lux
Corridor	100	25	Escape Route 1 Lux
Open Plan Offices	300	19	0.5 Lux
Laboratories	500	19	0.5 Lux Subject to activity – High Risk areas to be minimum of 15 Lux
Deep-plan areas (more than 6M from window wall)	500	19	0.5 Lux
Cellular Offices & Meeting Rooms	300	19	0.5 Lux
Tea points	200	22	5 Lux
Stores	100	25	0.5 Lux
Security Control Rooms	200	22	0.5 Lux
Cleaners Cupboard	200	25	0.5 Lux
Plantrooms	200 general & 200 vertically on front of control panels, valve sets and instruments	25	5 Lux – High Risk areas to be minimum of 15 Lux
Electrical Switch rooms	200 general & 200 vertically on equipment	25	5 Lux
External			
Building Perimeter	10 (Subject to lighting report). Uniformity to be above 0.25		Escape Route 1 Lux at exits
Pathways	10 (Subject to lighting report). Uniformity to be above 0.25		N/A
External signage	100-150		N/A
Roadways	10 - Uniformity to be above 0.25		N/A
External plant areas	50		5 Lux on equipment panel faces

Target Energy Parameters

Selection of luminaires is to be based on the requirements detailed above and efficacy (lumen per circuit watt) of each luminaire:

Area	Luminaire Type	Efficacy
Circulation (Corridors / Lobbies)	Down Lights	100 Lumens per Circuit Watt
Toilets	Down Lights	100 Lumens per Circuit Watt
Stairwells	Wall Mounted or Suspended	100 Lumens per Circuit Watt
Offices	600 x 600 Modular Luminaires	130 Lumens per Circuit Watt
Future Laboratories	600 x 600 Modular Luminaires	130 Lumens per Circuit Watt
Plant Rooms	Linear LED	130 Lumens per Circuit Watt

The above target energy performance is to be reviewed with the requirements of the BRUKL documentation. The stage 3 design is to aspire to exceed the lumens per circuit watt detailed above.

Summary

This Lighting Assessment, accompanied by an External Lighting Drawing (plan ref: P4200-DAL-XX-00-DR-E-6350), has been prepared by Dalkia and submitted with the planning application.

Taking account of the site and the Proposed Development's requirements, the external lighting has been designed to meet the following objectives:

- Provide adequate illuminance to the roadway areas.
- Provide adequate illuminance to walkways, entrances, and adjacent footpaths in the interests of the security of users.
- Mitigate light pollution and light trespass so far as is practicable.
- Limit impacts to site ecology.
- Minimise energy consumption through efficient luminaires and a suitable lighting control strategy.

Externally, the proposed lighting design will utilise 36 x column mounted luminaires (upon 4m columns) (Refs: EX1 and EX3) to illuminate the main roadway from John Smith Drive to the building, car park and side walkways, 1 x Multi head columns (EX2) with 14 x luminaires to illuminate the central front and rear walkways (EX4 & EX5), 9 x downlights (Ref: EX6 and EX7) installed to the underside of the building canopies, and 29 x Pathway bollards (1m high) (Ref: EX8) to illuminate the pathways around the building and adjacent to the plot.

A colour temperature of 3000K has been selected for the external lighting scheme. This colour temperature has been selected to give a warmer feel to the external lighting scheme following feedback from the architect and the landscape architect and will provide a less harsh environment should bats start habiting near the plot.

All external lighting will be controlled centrally via a programmable time block lighting control system which will be zoned to allow different areas to be controlled independently.

The Report confirms that average illuminance and Uniformity requirements as detailed within British Standard EN 12464-2: 2014 has been achieved by the design. Obtrusive light has been kept to a minimum, with the external lighting scheme cumulatively resulting in a 0.16% Upward Light Ratio – below the 15% maximum permitted by standards in a comparable environmental zone. Moreover, spill light at the boundary onto adjacent plots has been kept to a minimum, averaging around 1 lux at the boundary. This is comparable to moonlight and considered to result in negligible impact beyond the site boundaries and in line with the CIE 150:2017 guidance.

The internal lighting scheme is controlled by a lighting control system throughout the installation. The internal lighting will only operate when an area is occupied, and the lighting will switch off automatically once presence has not been detected as per the durations detailed in the off-delay column. Luminaires with high efficacy will be selected to meet the requirements of the BRUKL document.

ABOUT DALKIA

We deliver technical and energy services to a wide range of clients in private and public sector all across the UK.

Backed by EDF, Britain's biggest generator of low carbon electricity, we leverage the strength of our Group, without losing the personability of a smaller business. We're a people-first culture. In fact, our customers tell us that we build the best people and client relationships in the business.

Our strength lies in the diversity and expertise of our people. We prioritise safety in everything we do, taking a proactive approach that ensures the health, safety and wellbeing of everyone we interact with.

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