



DCO Submission

Environmental Statement

**Chapter 8:** Lighting  
**Appendix 8.1:** Outline Lighting Strategy

Document 6.8A

On behalf of  
**Oxfordshire Railfreight Limited**

Prepared by DFL-UK Ltd  
**February 2026**



· LIGHTING DESIGN · ELECTRICAL · SMART CITIES ·  
ENERGY REDUCTION · LIGHTING IMPACT

# CHAPTER 8 APPENDIX 8.1

## OUTLINE LIGHTING STRATEGY

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Designs for Lighting (DFL) is a business built on successfully collaborating with our clients. We have over 20 years proven experience in our industry, listening to the challenges our clients face, developing the best solutions and being innovators in our specialism. Our role is to find the most effective and sustainable outcome to enhance and support your projects. We proudly work with recognised industry bodies to promote and shape the future of the industry and ensure our staff are trained to exceed the required competency levels of our industries. Above all, we ensure each project delivers against our values.



Quality



Knowledgeable



Dependable



Clear Advice

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## 1. INTRODUCTION

### 1.1. Executive Summary

- 1.1.1. This Lighting Strategy has been written by DFL (Designs for Lighting Ltd<sup>1</sup>), a lighting design consultancy specialising in Lighting Impact Assessments, obtrusive light mitigation, and detailed lighting design.
- 1.1.2. The Lighting Strategy proposes good practice and outlines a suitable approach for the proposed lighting for the purpose of safety, security, wayfinding and amenity. The Lighting Strategy is intended to set out a minimally obtrusive approach to the lighting, whilst ensuring it is necessary and considers the sensitivity of nearby human, environmental and ecological receptors.
- 1.1.3. This Lighting Strategy forms an Appendix to **Chapter 8** of the Environmental Statement and must be read in conjunction with this document.
- 1.1.4. Lighting associated with the Proposed Development (see ES **Chapter 2** for details) will comply with relevant British Standards and Institution of Lighting Professionals (ILP) guidance to ensure obtrusive light is minimised in accordance with best practice.
- 1.1.5. This report outlines the following:
- > The relevant British Standards, Guidance and adoption specifications,
  - > Why the Proposed Development requires artificial lighting,
  - > Details as to how lighting will be implemented for the Proposed Development, and;
  - > The mitigation embedded into the Lighting Strategy.

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<sup>1</sup> [https://\[REDACTED\]about/](https://[REDACTED]about/)

## 2. BRITISH STANDARDS

### 2.1. BS 5489-1:2020 - Lighting of Roads and Public Amenity Areas - Code of practice

2.1.1. This standard gives recommendations on the general principles of road lighting, its aesthetics and technical aspects and provides guidance on operational maintenance. It also provides guidance on means of minimising energy consumption and limiting the impacts on the environment and adjacent properties.

### 2.2. BS EN 13201-2:2015 - Road lighting. Performance requirements

2.2.1. This British and European standard defines the performance requirements specified as lighting classes for road lighting aiming at the visual needs of the road users, as well as the consideration of the environmental aspects of the road lighting to be applied.

### 2.3. BS EN 12464-2:2024 - Light and Lighting – Lighting of workplaces

2.3.1. This British and European standard specifies lighting requirements for outdoor workplaces which meet the needs for visual and task performance. All visual tasks are considered with the exclusion of emergency lighting.

## 3. GUIDANCE

### 3.1. Guidance Notes for the Reduction of Obtrusive Light (Institution of Lighting Professionals GN01:2021)

3.1.1. The Lighting Strategy is informed by industry guidance notes which aim to reduce the potential for obtrusive light to occur, which is typically caused by poorly designed and installed exterior artificial lighting.

3.1.2. GN01:2021 provides guidance on best practice and suitable mitigation methods to be used when designing lighting for the exterior environment.

### 3.2. Bats and Artificial Lighting at Night (Institution of Lighting Professionals and Bat Conservation Trust GN08:2023)

3.2.1. The Lighting Strategy is informed by industry guidance notes which aim to reduce the effect that artificial lighting has on areas that are used by bat.

3.2.2. GN08:2023 provides guidance on best practice and suitable mitigation methods to be used when designing developments and lighting when bats have been identified using areas within or surrounding development sites.

### 3.3. PLG23:2020 Lighting for Cycle Infrastructure – Institution of Lighting Professionals

3.3.1. Lighting for cycle infrastructure will be informed by guidance detailed in ILP PLG23:2020.

3.3.2. The lighting class for the cycle route will be selected based on its type. This being Unsegregated or Segregated and one of the following: Strategic, Major, Local, Rural (**Figure 1**). This is then used to confirm the lighting class as detailed within BS 5489-1:2020.

	Strategic	Major	Local	Rural
<b>Route type</b>	Core routes linking main settlements and areas of high employment or education	Core leisure routes and routes linking the strategic network to secondary destinations	Feeder routes within urban areas	Rural feeder routes
<b>Common characteristics</b>	Largely segregated network of cycle routes with separation from pedestrians where width allows	Predominantly off-road routes, although some linking sections might be on road	Mix of on road routes often with cycle lanes / symbols and off-road shared use links	Predominantly quiet on road routes without cycle lanes, with some off-road paths
<b>Surface</b>	Sealed surface	Sealed surface	Generally surfaced routes	Generally surfaced, but some routes may be unsurfaced
<b>Lighting</b>	Lit within urban areas	Lit within urban areas	On road routes usually lit	Not generally lit

Figure 1: Typical Cycle Route Hierarchy from PLG23:2020 Page 13

3.3.3. The placement of lighting columns within cycle infrastructure is important for achieving a safe and useful cycle route. **Figure 2** contains an extract from PLG23:2020 discussing this.

**Obstacle Avoidance**

**For simplicity, the dynamic width (actual width plus deviation) of a cyclist on the road may be taken as 1m.**

**Lighting columns, should not be installed within 1m of a cycle track.**

**Where signs are erected above footways and cycle tracks, adequate clearance is required for pedestrians and cyclists. A minimum height of 2300mm for pedestrians and 2400mm for cyclists is recommended.**

**Sign posts should be placed at least 0.5m from the carriageway and cycle track edge, but no more than 1m from the route to ensure that they are visible to users.**

**Where any equipment is installed less than 1m from any cycle infrastructure, it is recommended that a retro-reflective band of contrasting colour is installed around each of them, at a suitable height to increase conspicuity.**

Figure 2: Obstacle Avoidance Guidance from PLG23:2020 Page 15

### 3.4. PLG02:2013 The Application of Conflict Areas on the Highway - Institution of Lighting Professionals

- 3.4.1. There are several roundabouts and junctions within the Proposed Development.
- 3.4.2. This document provides guidance on the best practice for lighting these locations.

### 3.5. TR12:2007 Lighting of Pedestrian Crossings - Institution of Lighting Professionals

- 3.5.1. Where pedestrian crossing areas are included on main access roads and they take the form of Zebra, Toucan, Pelican, etc, and are not signal controlled, they may require lighting as outlined within TR12:2007 (**Figure 3** and **Figure 4**).

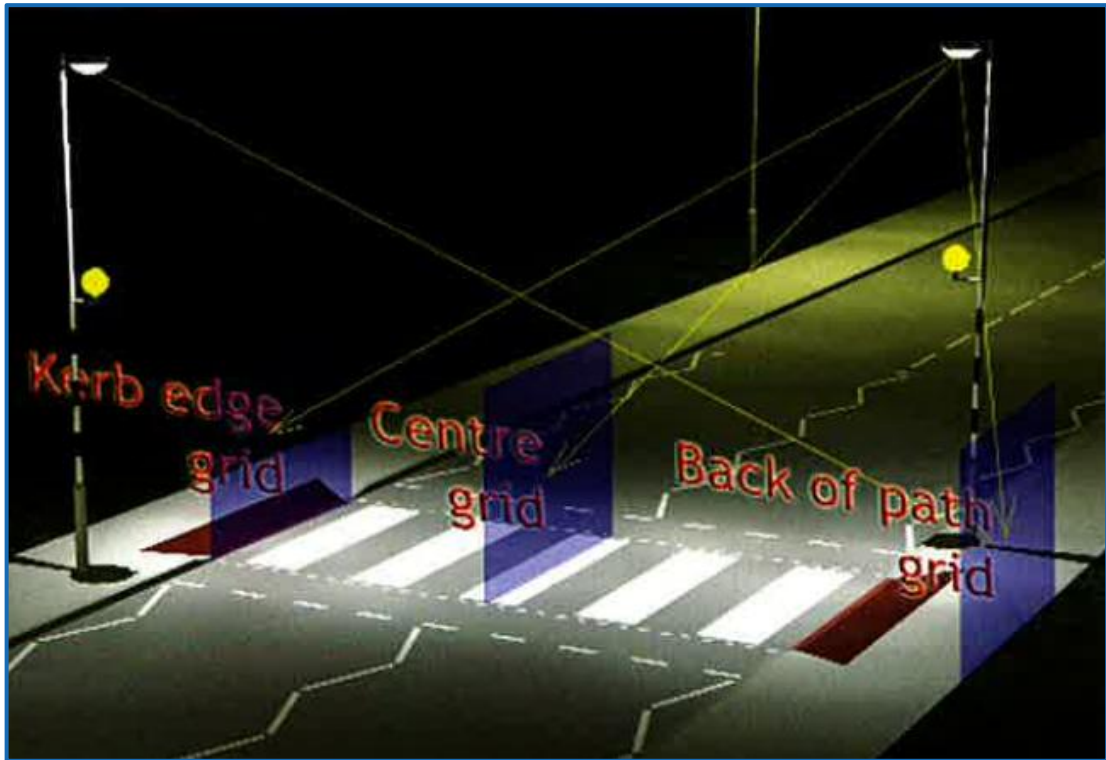


Figure 3: TR12:2007 Crossing Example

## Design values

Minimum average horizontal illuminance ( $\bar{E}$ ) on the carpet:

Carpet  $\bar{E} = 3.5 \times$  average horizontal road illuminance with  $U_o > 0.6$

Minimum vertical illuminance at a point  $E_v$ :

Grid 1 (centre of crossing) = 2 x nominal average horizontal road illuminance

Grid 2 (kerb edge) = 2 x nominal average horizontal road illuminance

Grid 3 (rear of waiting area) = 1.5 x nominal average horizontal road illuminance.

Note: the value of the average road horizontal illuminance to be used is that designed within the standard installation in the vicinity of the crossing – and this average should be the actual design value in the particular installation and not the nominal value for the lighting class selected.

*Figure 4: TR12:2007 Lighting Levels*

3.5.2. Where these crossings are adjacent to conflict areas (roundabout), and a risk assessment has been conducted, they may be included within the conflict area lighting to avoiding the need for specific lighting.

3.5.3. Where pedestrian crossings are located on roads that are not lit or not proposed to be lit, a risk assessment will be undertaken and lighting may be provided for these areas. Lighting in these locations would comply with BS 5489-1:2020 and BS EN 13201-2:2015. And will include:

- > The approach to the crossing,
- > The crossing surface
- > The entrance to the crossing for pedestrians as defined within TR12:2007.

## 3.6. CAST Aerodrome Safeguarding Advice Note 2 – Lighting Near Aerodromes April 2024

3.6.1. This advice note, published by the Civil Aviation Authority (CAA), considers the location, height, brightness, type, and pattern of lights around the aerodrome, with an overall caveat that no light should be directed or pointed towards any aircraft.

3.6.2. It further states that:

*“Various types of lighting have the potential to cause issues for example:*

- *Temporary lighting, e.g. construction lighting, light shows, temporary installations*
- *Advertisements*
- *Lighting of buildings and other structures*
- *Street and car park lighting*
- *Flood lighting at sporting venues or similar including special events in temporary locations*

*No lighting should be displayed which could distract pilots or confuse them by being mistaken for aeronautical ground lights."*

- 3.6.3. The advice also references use of Road Lighting Standards BS 5489-1:202024 and BS EN 13201-2:201515, which inform this Lighting Strategy.

## 4. ADOPTING AUTHORITY SPECIFICATIONS


### 4.1. National Highways

4.1.1. All highways proposed will be lit as outlined within the National Highways design guidance<sup>2</sup> and specification documents. The relevant National Highways area that adopts and controls the lighting for highways with and near the Proposed Development is Area 3.

### 4.2. Oxfordshire County Council

4.2.1. Where applicable the lighting specification of Oxfordshire County Council (OCC) will be used.

4.2.2. The preferred luminaires by OCC are detailed in **Table 1**.

Manufacture and Model	Example Image
<p><b>Holophane Factor LED Lantern range</b></p>	

<sup>2</sup> DMRB TD501 Road Lighting Design

Manufacture and Model	Example Image
<p><b>ASD Diamond range</b></p>	
<p><b>DW Windsor Kirium Pro range</b></p>	

*Table 1: OCC Lantern Types with Uses*

## 5. LIGHTING STRATEGY

### 5.1. Introduction

- 5.1.1. The Proposed Development will require lighting for safety and amenity during the hours of darkness. Lighting will be fit for purpose and sensitive to nearby human and ecological receptors.
- 5.1.2. Lighting will be of an appropriate specification and designed in accordance with British Standards.
- 5.1.3. The following criteria seeks to ensure that the lighting is not outside of the obtrusive light limits for the Environmental Zone in which the Proposed Development is located, is sensitive to the area, and provides a recognised standard level of lighting for all adoptable areas requiring illumination.
- 5.1.4. Luminaires will distribute light downwards only, to reduce the potential for light spill onto the boundaries surrounding the buildings and upwards towards the sky.

#### Construction

- 5.1.5. Construction activities typically take place during daylight hours because this is the safest time to complete such tasks.
- 5.1.6. There may be some exceptions to this:
  - > Construction activities on the Highway
  - > Under exceptional circumstances on the Main Site with prior approval
- 5.1.7. Working at night on the highway is common practice as this reduces the impact works have on the existing function of the Strategic Road Network, and because of the reduced traffic flow it is safer for the workers.
- 5.1.8. With prior approval, work may take place on the Main Site during the night for limited periods. This will only be in exceptional circumstance and will have clear justification.
- 5.1.9. Security lighting will be used to ensure the construction site follows best practice for safe construction. This is only be used in limited locations throughout the construction site, and the whole site will not be lit at night.
- 5.1.10. The use of lighting during construction is outlined within the Construction Environmental Management Plan (CEMP) accompanying the application.

#### Highways Works

- 5.1.11. Where proposed highways are to be lit, they will be lit as outlined in the National Highways guidance and specification document (Design Manual for Roads and Bridges (DMRB)).

- 5.1.12. Not all highways are required to be lit, and those proposed to contain lighting are detailed in the relevant drawings and documentation.
- 5.1.13. As these highways will be lit as outlined within National Highways guidance and specification documents the specific illuminance requirements are not detailed in this Lighting Strategy.
- 5.1.14. Where pedestrian crossings are proposed on the highway, the lighting for these locations will follow guidance from ILP TR12:2007 and be compliant with BS 5489-1:2020 and BS EN 13201-2:2015.
- 5.1.15. Where active travel routes are proposed and these are separate from highways the lighting in these locations will be provided by Solar Road Studs. These luminaires produce very low light levels, and are a modern replacement of Cat's-Eyes provided path and road demarcation rather than spread of illuminance over a surface.
- 5.1.16. The highways lighting strategy can be seen in **ES Figure 8.1**.

### **Main Site**

- 5.1.17. The follow areas will require task lighting to facilitate the safe undertaking of operational tasks:
- 5.1.18. Lighting to an adoptable specification will be required in the following areas:
- > Section 278 Areas for Access
- 5.1.19. Lighting to a private specification will be required in the following task areas:
- > Site Roads, Accesses and Adoptable Highways within the Order Limits;
  - > Car Parking Areas;
  - > Loading and Unloading Bays;
  - > Amenity Lighting to Site buildings;
  - > Yard Areas;
  - > Rail Freight Loading / Unloading Areas; and
  - > Central Hub (Zone E) Amenity Lighting.

## 5.2. Construction

- 5.2.1. All construction lighting will be subject to the CEMP, which will be secured by a DCO agreement. The CEMP sets out the overarching systems and controls that will be adopted during the construction of the Oxfordshire Strategic Rail Freight Interchange scheme to minimise any adverse environmental impacts in accordance with the conclusions of the Environmental Statement and construction good practice. It is intended that separate Construction Environmental Management Plans will be provided for particular components of the development.
- 5.2.2. No works within the Main Site are planned to be undertaken in periods of darkness and therefore it is unlikely that task lighting will be required. However, unplanned events can occur for which task lighting may be required for short periods; in this event each P-CEMP shall set out the maximum height of lighting lanterns and the average lux levels.
- 5.2.3. The P-CEMP for any component of the highway works shall provide details of requirements for night working and any associated proposals for lighting.
- 5.2.4. Temporary lighting will be provided in the contractor’s compound for security and safety reasons. Details shall be set out in the P-CEMP including the average lux level.
- 5.2.5. Construction lighting will be provided in compliance with the guidance within BS EN 12464-2: 2024 (an example of the lighting levels is shown in **Figure 5**), which defines appropriate lighting levels for outdoor work tasks. The levels required will vary depending upon the task being undertaken and will be risk assessed on a task-by-task basis. Construction lighting will not significantly exceed the relevant lighting standard for the task being undertaken in order to limit the visibility of construction lighting within the landscape.

Ref. no.	Type of area, task or activity	$\bar{E}_m$ lx		$U_o$	$R_{GL}$	$R_a$	Specific requirements
		required <sup>a</sup>	modified <sup>b</sup>				
13.1	Clearance, excavation and loading	20	30	0,25	55	70	
13.2	Construction areas, drain pipes mounting, transport, auxiliary and storage tasks	50	75	0,40	50	70	
13.3	Framework element mounting, light reinforcement work, wooden mould and framework mounting, electric piping and cabling	100	150	0,40	45	70	
13.4	Element jointing, demanding electrical, machine and pipe mountings	200	300	0,50	45	70	Can be met with use of local mobile lighting.

<sup>a</sup> Required: minimum value.  
<sup>b</sup> Modified: considers common context modifiers in 5.3.3.

Figure 5: BS EN 12464-2: 2024 Table 13 Building Sites

- 5.2.6. Task lighting shall ensure that there is no upward light. This will be achieved by restricting luminaire tilt angles and by specifying luminaires with good optical control.
- 5.2.7. Lighting will be switched off when not required for safety or security.
- 5.2.8. Security lighting to the construction compounds will be provided by luminaires fixed to site infrastructure, such as cabins or scaffolding poles, will be oriented downwards only and will be aimed into the site only to reduce the levels of light spill leaving the site.
- 5.2.9. Several different luminaire form factors are likely to be used during construction, this may include:
- > Tower lighting
  - > Bulkhead luminaire
  - > Small floodlights, and
  - > Festoon for wayfinding
- 5.2.10. Some examples of these luminaires are shown in **Figure 6 - Figure 9**.



Figure 6: Example of Construction Tower Lighting produced by Prolectric



*Figure 7: Example of Bulkhead Lighting*



*Figure 8: Example of Small Construction Floodlights*



*Figure 9: Example of Construction Festoon for Wayfinding*

- 5.2.11. Working at night, will primarily take place on the Highway Network, as during these times traffic flow is at its lowest and therefore it is safer to complete tasks at this time.
- 5.2.12. Where construction lighting is to be used on the Strategic Road Network it will be ensured that it conforms to DMRB guidance including that the lighting does not cause distraction or glare to surrounding road users.

### 5.3. Main Site

#### Site Roads, Accesses and Adoptable Highways within the Order Limits

- 5.3.1. The Site Roads, Accesses and Adoptable Highways within the Order Limits will require lighting in accordance with BS 5489-1:2020, BS EN 13201-2:2015 and BS EN 12464-2:2024. Light spill onto boundary features from the road lighting will be restricted by focusing light into the site.
- 5.3.2. Luminaires are to emit a warm white colour temperature light (3000 Kelvin or less, unless otherwise specified by the adopting authority, where any of the infrastructure is to be adopted by the local highway authority) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 5.3.3. Where applicable the adoptable lighting specification of the follow authorities will be followed:
- > Oxfordshire County Council, and;
  - > National Highways (Highways England).
- 5.3.4. Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.
- 5.3.5. Luminaire performance parameters for the Site roads and accesses are outlined in **Table 2**.

Equipment Specification	Description
<b>Location</b>	Site Roads and Accesses
<b>Light Source</b>	LED [Light Emitting Diode]
<b>Luminaire Type</b>	Urbis Ampera (or similar approved)
<b>CCT of Light Source (Kelvin)</b>	3000K (maximum) 2700K (where applicable and installed adjacent to Ecology Receptors)
<b>Luminous Intensity Class</b>	G3 (minimum)
<b>Luminaire Tilt</b>	0 degrees from horizontal
<b>Dimming and switching requirements</b>	Luminaires are to be controlled by Central Management System, and timeclock to the following specification: Dusk – Midnight: 100% Output Midnight – 04:00am: 50% Output 04:00am to Dawn: 100% Output
<b>Design Guidance</b>	
<b>Lighting Standard</b>	<b>BS EN 12464-2:2024</b> <b>BS EN 13201-2:2015</b>

<b>Lighting Class</b>	BS EN 12464-2:2024 – 7.3 – Regular Vehicle Traffic (20 lux average, 0.2 0 uniformity) (Site Roads and Accesses) BS EN 13201-2:2015 – Table 1 (M lighting classes), Table 2 (C lighting classes) and Table 3 (P lighting classes). Lighting classes to be assessed by a competent designer as part of the detailed design process.
<b>Mounting Arrangement</b>	Post Top
<b>Restrictions</b>	<p>The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees.</p> <p>8.0 metre maximum column height</p> <p>Where possible columns to be setback at the rear of the carriageway at a distance no less than as stated in BS 5489-1:2020.</p> <p>Where applicable back light shields are to be installed on luminaires identified as causing levels of light spill likely to cause Light Intrusion or effects on ecology.</p>

**Table 2: Site Roads, Accesses and Adoptable Highways - Luminaire Performance Requirements**

5.3.6. Details of the locations where highways lighting is proposed and the lighting classes can be seen in **ES Figure 8.1**.

### Car Parking Areas

5.3.7. Site car parks will require lighting in accordance with BS 5489-1:2020. Light spill onto boundary features from car park lighting will be restricted by focusing light into the site.

5.3.8. Luminaires are to emit a warm white colour temperature light (3000 Kelvin or less) to reduce the potential for adverse effects onto potentially sensitive receptors.

5.3.9. Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.

5.3.10. Luminaire performance parameters for the Car Parking Areas are outlined in **Table 3**.

Equipment Specification	Description
<b>Location</b>	Car Parking Areas
<b>Light Source</b>	LED [Light Emitting Diode]
<b>CCT of Light Source (Kelvin)</b>	3000K (maximum) 2700K (where installed adjacent to Ecology Receptors)
<b>Luminous Intensity Class</b>	G3 (minimum)
<b>Luminaire Tilt</b>	0 degrees from horizontal
<b>Dimming and switching requirements</b>	Luminaires are to be controlled by Central Management System, and timeclock to the following specification: Dusk – Midnight: 100% Output

	Midnight – 04:00am: 50% Output 04:00am to Dawn: 100% Output
Design Guidance	
<b>Lighting Standard</b>	<b>BS 5489-1:2020</b>
<b>Lighting Class</b>	Maintained lighting levels for outdoor car parks, Medium traffic (10 lux average, 0.25 uniformity)
<b>Mounting Arrangement</b>	Post Top
<b>Restrictions</b>	<p>The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees.</p> <p>8.0 metre maximum column height</p> <p>Where possible columns to be setback at the rear of the path or area being lit at a distance no less than as stated in BS 5489-1:2020.</p> <p>Where applicable back light shields are to be installed on luminaires identified as causing levels of light spill likely to cause Light Intrusion or effects on ecology.</p>

**Table 3: Car Parking - Luminaire Performance Requirements**

### Loading and Unloading Bays

- 5.3.11. Loading and unloading bays will require lighting in accordance with BS EN 12464-2:2024 to enable safe use during the hours of darkness. Light spill onto boundary features from loading bay lighting will be restricted by focusing light into the site and controlling the hours of operation.
- 5.3.12. Luminaires are to emit a warm white colour temperature light (3000 Kelvin or less) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 5.3.13. Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.
- 5.3.14. Where level access loading / unloading takes place, lorry parking bays shall be lit in accordance with the lighting levels for the associated service yard.
- 5.3.15. Luminaire performance parameters for the Loading and Unloading bays are outlined in

**Table 4.**

Equipment Specification	Description
<b>Location</b>	Loading and Unloading Bays
<b>Light Source</b>	LED [Light Emitting Diode]
<b>CCT of Light Source (Kelvin)</b>	3000K (maximum) 2700K (where installed adjacent to Ecology Receptors)
<b>Luminous Intensity Class</b>	G3 (minimum)

<b>Luminaire Tilt</b>	0 degrees from horizontal
<b>Dimming and switching requirements</b>	Luminaires are to be controlled via Central Management System,, dimming luminaires to their 'off' state when not in use.
<b>Design Guidance</b>	
<b>Lighting Standard</b>	<b>BS EN 12464-2:2024</b>
<b>Lighting Class</b>	17.1 – 20 lux average, 0.25 uniformity
<b>Mounting Arrangement</b>	Wall Mounted
<b>Restrictions</b>	<p>The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees.</p> <p>8.0 metre maximum mounting height</p> <p>Where applicable back light shields are to be installed on luminaires identified as causing levels of light spill likely to cause Light Intrusion or effects on ecology.</p> <p>When the area is non-occupied average lux required will be reduced to 5 lx, as detailed within BS EN 12464-2:2024</p>

**Table 4: Loading Bays - Luminaire Performance Requirements**

### Amenity Lighting to Site Buildings

- 5.3.16. Wall mounted amenity lighting will be required to site buildings for the purposes of wayfinding, safety and amenity during the hours of darkness. Light spill onto boundary features from wall mounted amenity lighting will be restricted by focussing light into the site, maintaining light at a relatively low level, and ensuring that the output of the proposed luminaires is suitable for the application.
- 5.3.17. Luminaires are to emit a warm white colour temperature light (3000 Kelvin) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 5.3.18. Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.
- 5.3.19. Luminaire performance parameters for the Amenity Lighting to Site Buildings are outlined in **Table 5**.

Equipment Specification	Description
<b>Location</b>	Amenity Lighting to site buildings
<b>Light Source</b>	LED [Light Emitting Diode]
<b>CCT of Light Source (Kelvin)</b>	3000K (maximum) 2700K (where installed adjacent to Ecology Receptors)
<b>Luminous Intensity Class</b>	G3 (minimum)
<b>Luminaire Tilt</b>	0 degrees from horizontal

<b>Dimming and switching requirements</b>	Luminaires are to be controlled by Central Management System, and timeclock to the following specification: Dusk – Midnight: 100% Output Midnight – 04:00am: 20% Output 04:00am to Dawn: 100% Output
<b>Design Guidance</b>	
<b>Lighting Standard</b>	<b>BS 5489-1:2020</b>
<b>Lighting Class</b>	P4 – (5 lux average, 1 lux minimum)
<b>Mounting Arrangement</b>	Wall Mounted
<b>Restrictions</b>	The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees. 3.0 metre maximum mounting height

*Table 5: Building Amenity Lighting - Luminaire Performance Requirements*

## Yard Areas

- 5.3.20. The yard areas will require lighting in accordance with BS EN 12464-2:2024. Light spill onto boundary features from the yard lighting will be restricted by focusing light into the site.
- 5.3.21. Luminaires are to emit a warm white colour temperature light (3000 Kelvin or less) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 5.3.22. Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.
- 5.3.23. Luminaire performance parameters for the yard areas are outlined in **Table 6**.

Equipment Specification	Description
<b>Location</b>	Yard Areas
<b>Light Source</b>	LED [Light Emitting Diode]
<b>CCT of Light Source (Kelvin)</b>	3000K (maximum) 2700K (where installed adjacent to Ecology Receptors)
<b>Luminous Intensity Class</b>	G3 (minimum)
<b>Luminaire Tilt</b>	0 degrees from horizontal
<b>Dimming and switching requirements</b>	Luminaires are to be controlled by photocell and Central Management System, to the following specification: Dusk – Midnight: 100% Output Midnight – 04:00am: 50% Output 04:00am to Dawn: 100% Output

Design Guidance	
<b>Lighting Standard</b>	<b>BS EN 12464-2:2024</b>
<b>Lighting Class</b>	7.3 – Regular Vehicle Traffic (20 lux average, 0.20 uniformity) (Site Road)
<b>Mounting Arrangement</b>	Post Top
<b>Restrictions</b>	<p>The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees.</p> <p>8.0 metre maximum column height</p> <p>Where possible columns to be setback at the rear of the carriageway at a distance no less than as stated in BS 5489-1:2020.</p> <p>Where applicable back light shields are to be installed on luminaires identified as causing levels of light spill likely to cause Light Intrusion or effects on ecology.</p>

**Table 6: Yard Areas - Luminaire Performance Requirements**

### Rail Freight Loading / Unloading Areas

- 5.3.24. Loading and unloading areas associated with the rail freight terminal to the north of the Application Site will require lighting in accordance with BS EN 12464-2:2024 to enable safe use during the hours of darkness. Light spill onto boundary features from rail freight lighting will be restricted by focusing light into the site and controlling the hours of operation.
- 5.3.25. Luminaires are to emit a warm white colour temperature light (3000 Kelvin or less) to reduce the potential for adverse effects onto potentially sensitive receptors.
- 5.3.26. Luminaires are to be mounted at a tilt angle of 0 degrees, and are to emit light downwards only, in accordance with guidance set out in GN01:2021.
- 5.3.27. Luminaire performance parameters for the Rail freight loading / unloading areas are outlined in **Table 7**.

Equipment Specification	Description
<b>Location</b>	Rail freight loading / unloading areas
<b>Light Source</b>	LED [Light Emitting Diode]
<b>CCT of Light Source (Kelvin)</b>	3000K (maximum) 2700K (where installed adjacent to Ecology Receptors)
<b>Luminous Intensity Class</b>	G3 (minimum)
<b>Luminaire Tilt</b>	0 degrees from horizontal
<b>Dimming and switching requirements</b>	Luminaires are to be controlled via Central Management System, dimming luminaires when not in use.

Design Guidance	
<b>Lighting Standard</b>	<b>BS EN 12464-2:2024</b>
<b>Lighting Class</b>	22.22 - Railway yards handling areas (30 lux average, 0.40 uniformity)
<b>Mounting Arrangement</b>	Column Mounted / Affixed to Loading Cranes
<b>Restrictions</b>	The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees.  18.0 metre maximum mounting height  Where applicable back light shields are to be installed on luminaires identified as causing levels of light spill likely to cause Light Intrusion or effects on ecology.

*Table 7: Rail Freight Loading / Unloading Areas - Luminaire Performance Requirements*

### Central Hub (Zone E) Amenity Lighting

- 5.3.28. The Central Hub, Zone E on the Parameters Plan, is proposed to provided areas for relaxation and amenity for staff and visitors to the Main Site.
- 5.3.29. This location is comprised of several listed buildings with high sensitivity in terms of their heritage importance. As such, all lighting in this location must be mindful of this context therefore being installed sensitively, with appropriately warm colour temperatures and light levels.
- 5.3.30. As this area will be exclusively for pedestrian use during the hours of darkness the area will be lit in accordance with BS 5489-1:2020. As traffic flow is expected to be medium – high and the Application Site is assessed as E2 a P5 lighting class will be used.
- 5.3.31. This class is only to be applied to the main access and congregation areas, with the remaining areas being lit for wayfinding only.
- 5.3.32. This location may also be used for events at different times of year meaning temporary event lighting may also be required. This is not included within the Lighting Strategy, but as this lighting will be temporary and designed to be appropriate to the location and event scale it will not result in significant levels of obtrusive light.
- 5.3.33. The permanent lighting for this location is outlined in **Table 8**.

Equipment Specification	Description
<b>Location</b>	Central Hub (Zone E) Amenity Lighting
<b>Light Source</b>	LED [Light Emitting Diode]
<b>CCT of Light Source (Kelvin)</b>	2700K (maximum)
<b>Luminous Intensity Class</b>	G3 (minimum)
<b>Luminaire Tilt</b>	0 degrees from horizontal
<b>Dimming and switching requirements</b>	Luminaires are to be controlled via Central Management System,, dimming luminaires when not in use.
Design Guidance	
<b>Lighting Standard</b>	<b>BS 5489-1:2020</b>
<b>Lighting Class</b>	E1 – E4, Pedestrian and Cyclists, Medium – Busy Traffic Flow: P5 (3 Lux Average, 0.6 Lux Minimum)
<b>Mounting Arrangement</b>	Column Mounted Bollard Wall Mounted
<b>Restrictions</b>	<p>The peak beam angle of all lights directed towards any potential observer is not to be more than 70 degrees when the luminaire is installed with a tilt angle of 0 degrees.</p> <p>4.0 metre maximum mounting height for columns 2.0 metre maximum mounting height for wall mounted luminaires 1.0 metre maximum height for bollards</p> <p>No luminaires are to be installed on listed buildings.</p> <p>Where applicable back light shields are to be installed on luminaires identified as causing levels of light spill likely to cause Light Intrusion or effects on ecology.</p>

**Table 8: Central Hub (Zone E) Amenity Lighting - Luminaire Performance Requirements**

## 5.4. Mitigation

5.4.1. **Table 9** details the mitigation that will be embedded into the lighting designs for the Proposed Development.

Mitigation Name	Description of Mitigation	Installation Location
<b>Restricting the Upward Light Output Ratio</b>	All luminaires will have an Upward Light Output Ratio of 0%.	Whole Proposed Development
<b>Restricting Luminaire Tilt</b>	All luminaires will be installed with a tilt of 0° as standard. An allowance to tilt luminaires to 5° may be made, where it is demonstrated that: <ol style="list-style-type: none"> <li>1. This is required to achieve a standard lighting level on the task or area, and</li> <li>2. This will not result in any significant effects on the surrounding receptors.</li> </ol>	Whole Proposed Development
<b>Installation of Back Light Shielding</b>	Manufacturers often provide “back light optics” where back light mitigation is integrated on the lenses of the luminaires. This is the preferred option as it provides the greatest degree of controlled ( <b>Figure 10</b> ).  Where this is not available, traditional back light shields can be used ( <b>Figure 11</b> ).	Whole Proposed Development: Where luminaires are installed on the boundary of an area facing into the site.
<b>Using the lowest possible Correlated Colour Temperature</b>	Throughout the Proposed Development the standard Correlated Colour Temperature used will be ≤ 3000K.  Where there are areas of specific ecological sensitivity the lighting near this area will be dropped to ≤ 2700K.  In locations where there are specific safety concerns, for example in the substations or freight handling areas, the Correlated Colour Temperature may be increase to ≤ 4000K. However, a risk assessment needs to be undertaken to justify this increase if this does not form part of a local authority adoptable specification, National Highways guidance or Network Rail guidance.	Whole Proposed Development
<b>Using the lowest applicable lighting levels for tasks and areas</b>	All areas and task will be lit using the lowest applicable lighting levels as defined in the relevant British Standard ( <b>Section 2 and Section 5</b> ).  This will ensure a standard and recognised level of light is provided for all areas of the Proposed Development, while ensure no area is over lit.	Whole Proposed Development

Mitigation Name	Description of Mitigation	Installation Location
	During the detailed lighting design, a risk assessment must be undertaken to help defined the specific lighting class for any area.	
<b>Centralised Lighting Controls</b>	<p>Throughout the Proposed Development a centralised lighting control system/s will be used.</p> <p>This will ensure lighting is only active as require during the hours of darkness, will allow dimming based on traffic flow, and switching to take place based on the hours of use.</p> <p>For example:</p> <ol style="list-style-type: none"> <li>1. When a car park is experiencing low use over night the lighting can be dimmed,</li> <li>2. If a unit is closed overnight, then all associated lighting can be switched off.</li> </ol> <p>This will not only reduce the effects of lighting, but will save money and energy for the owner of the lighting system.</p>	Whole Proposed Development
<b>Using the minimum practical mounting height</b>	<p>All luminaires will be mounted at the minimum practical mounting height for the area or task.</p> <p>This will reduce the visibility of the luminaires in the landscape, by allowing surrounding trees and buildings to act as blocking features to direct views of luminaires.</p> <p>This will also help ensure there is minimum need to tilt luminaires, by providing enough height for the light to travel forward into the task area.</p>	Whole Proposed Development
<b>Using appropriate optics for the areas being illuminated</b>	<p>The luminaire optic used will be specific to the area being lit (<b>Figure 12</b>).</p> <p>This will ensure the task and area is lit to a standard level of light, while also allowing the lux contours to be shaped to the specific areas.</p> <p>This will help reduce light spill out of areas and the either over lighting or under lighting of areas.</p>	Whole Proposed Development
<b>Only using Luminaires where Photometry is Available from the Manufacturer</b>	<p>Luminaires will be used with integral LEDs and only where the luminaire photometry is available from the manufacturer (<b>Figure 12</b>). This is to ensure the photometric footprint of the luminaires can be modelled to ensure the potential effects of light spill are reported and minimised or mitigated.</p>	Whole Proposed Development

**Table 9: Embedded Mitigation Table**



Figure 10: Example of Integrated Light Spill Control Options – Kingfisher Lighting




Figure 11: Example of a Traditional Back Light Shield



Figure 12: Example of Two Different Luminaire Optics


## 6. OPERATIONAL EQUIPMENT SPECIFICATION

### 6.1. Luminaire and control specification Tables

Equipment Specification	
<b>Application Area</b>	National Highways
<b>Correlated Colour Temperature (Kelvin)</b>	≤3000K
<b>Luminaire Manufacturer</b>	Philips (Or Similar Approved)
<b>Luminaire Model</b>	Luma Gen 2 (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	≤15m
<b>Mounting Arrangement</b>	Post Top or Side Entry
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	
<b>Controls<sup>3</sup></b>	Lighting shall be CMS controlled. Road lighting lanterns, illuminated signs and bollards require CMS control with a node fitted to each lantern. Individual PECU control shall not be used.


*Table 10: Luminaire performance requirements For Highways (National Highways)*

<sup>3</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
<b>Application Area</b>	Active Travel Routes Separate from Highways
<b>Correlated Colour Temperature (Kelvin)</b>	Colour coded for path demarcation as per design
<b>Luminaire Manufacturer</b>	SolarLite-Studs (Or Similar Approved)
<b>Luminaire Model</b>	SolarLite-Path (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	In Ground
<b>Mounting Arrangement</b>	Ground Recessed
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	
<b>Controls<sup>4</sup></b>	Solar Powered Photocell – Dusk Until Dawn

**Table 11: Luminaire performance requirements For Active Travel Routes Separate from Highways**

<sup>4</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
<b>Application Area</b>	OCC Adoptable Areas
<b>Correlated Colour Temperature (Kelvin)</b>	≤3000K
<b>Luminaire Manufacturer</b>	DW Windsor (Or Similar Approved)
<b>Luminaire Model</b>	Kirium Pro Range (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	≤8m
<b>Mounting Arrangement</b>	Post Top
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	
<b>Controls<sup>5</sup></b>	As per Oxfordshire County Council Adoptable Specification


**Table 12: Oxfordshire County Council Adoptable Luminaire Option 1**

<sup>5</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
<b>Application Area</b>	OCC Adoptable Areas
<b>Correlated Colour Temperature (Kelvin)</b>	≤3000K
<b>Luminaire Manufacturer</b>	ASD (Or Similar Approved)
<b>Luminaire Model</b>	Diamond Range (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	≤8m
<b>Mounting Arrangement</b>	Post Top
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	
<b>Controls<sup>6</sup></b>	As per Oxfordshire County Council Adoptable Specification


*Table 13: Oxfordshire County Council Adoptable Luminaire Option 2*

<sup>6</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
<b>Application Area</b>	OCC Adoptable Areas
<b>Correlated Colour Temperature (Kelvin)</b>	≤3000K
<b>Luminaire Manufacturer</b>	Holophane (Or Similar Approved)
<b>Luminaire Model</b>	Factor LED Range (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	≤8m
<b>Mounting Arrangement</b>	Post Top
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	
<b>Controls<sup>7</sup></b>	As per Oxfordshire County Council Adoptable Specification


*Table 14: Oxfordshire County Council Adoptable Luminaire Option 3*

<sup>7</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
<b>Application Area</b>	Private Roads, Roundabouts, Car Parks and Yard/Commercial Unit Perimeters
<b>Correlated Colour Temperature (Kelvin)</b>	≤3000K
<b>Luminaire Manufacturer</b>	Urbis Schreder (Or Similar Approved)
<b>Luminaire Model</b>	Axia 3 (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	≤8m
<b>Mounting Arrangement</b>	Post Top
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	
<b>Controls<sup>8</sup></b>	Wirefield Eye-Wi (or equivalent approved) Wirefield Eye-Wi Zhaga node- Dusk to Dawn (35 lux switch on/18 lux switch off) (or equivalent approved)


**Table 15: Luminaire performance requirements Private Roads, Roundabouts, Car Parks and Yard/Commercial Unit Perimeters**

<sup>8</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
<b>Application Area</b>	Central Areas in Car Parks
<b>Correlated Colour Temperature (Kelvin)</b>	≤3000K
<b>Luminaire Manufacturer</b>	DW Windsor (Or Similar Approved)
<b>Luminaire Model</b>	Milano Classic (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	≤8m
<b>Mounting Arrangement</b>	Post Top
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	
<b>Controls<sup>9</sup></b>	Wirefield Eye-Wi (or equivalent approved) Wirefield Eye-Wi Zhaga node- Dusk to Dawn (35 lux switch on/18 lux switch off) (or equivalent approved)



**Table 16: Luminaire performance requirements Central Areas in Car Parks**

<sup>9</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
<b>Application Area</b>	Yards
<b>Correlated Colour Temperature (Kelvin)</b>	≤3000K
<b>Luminaire Manufacturer</b>	DW Windsor (Or Similar Approved)
<b>Luminaire Model</b>	Sabre (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	≤8m
<b>Mounting Arrangement</b>	Post Top and Wall Mounted on Brackets
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	
<b>Controls<sup>10</sup></b>	Wirefield Eye-Wi (or equivalent approved) Wirefield Eye-Wi Zhaga node- Dusk to Dawn (35 lux switch on/18 lux switch off) (or equivalent approved)


**Table 17: Luminaire performance requirements Yards**

<sup>10</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
<b>Application Area</b>	General Amenity and Wayfinding
<b>Correlated Colour Temperature (Kelvin)</b>	≤3000K
<b>Luminaire Manufacturer</b>	DW Windsor (Or Similar Approved)
<b>Luminaire Model</b>	Kirium Wall (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	≤3m
<b>Mounting Arrangement</b>	Wall Surface Mounted
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	 
<b>Controls<sup>11</sup></b>	Wirefield Eye-Wi (or equivalent approved) Wirefield Eye-Wi Zhaga node- Dusk to Dawn (35 lux switch on/18 lux switch off) (or equivalent approved)


**Table 18: Luminaire performance requirements General Amenity and Wayfinding**

<sup>11</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
<b>Application Area</b>	Central Hub (Zone E) Amenity Lighting
<b>Correlated Colour Temperature (Kelvin)</b>	≤2700K
<b>Luminaire Manufacturer</b>	DW Windsor (Or Similar Approved)
<b>Luminaire Model</b>	Pharola Dark Skies (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	≤1m
<b>Mounting Arrangement</b>	Root Mounted
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	
<b>Controls<sup>12</sup></b>	Wirefield Eye-Wi (or equivalent approved) Wirefield Eye-Wi Zhaga node- Dusk to Dawn (35 lux switch on/18 lux switch off) (or equivalent approved)


**Table 19: Luminaire performance requirements Central Hub (Zone E) Amenity Lighting - Bollard**

<sup>12</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
<b>Application Area</b>	Central Hub (Zone E) Amenity Lighting
<b>Correlated Colour Temperature (Kelvin)</b>	≤2700K
<b>Luminaire Manufacturer</b>	Ligman (Or Similar Approved)
<b>Luminaire Model</b>	Jet 31 (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	≤2m
<b>Mounting Arrangement</b>	Wall Mounted
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	
<b>Controls<sup>13</sup></b>	Wirefield Eye-Wi (or equivalent approved) Wirefield Eye-Wi Zhaga node- Dusk to Dawn (35 lux switch on/18 lux switch off) (or equivalent approved)

**Table 20: Luminaire performance requirements Central Hub (Zone E) Amenity Lighting - Downlight**

<sup>13</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

Equipment Specification	
<b>Application Area</b>	Central Hub (Zone E) Amenity Lighting
<b>Correlated Colour Temperature (Kelvin)</b>	≤2700K
<b>Luminaire Manufacturer</b>	DW Windsor (Or Similar Approved)
<b>Luminaire Model</b>	Windsor DS (Or Similar Approved)
<b>Light Source</b>	LED
<b>Height</b>	≤4m
<b>Mounting Arrangement</b>	Wall Mounted
<b>Luminaire Tilt</b>	0°
<b>Upward Light Output Ratio E2 &lt; 2.5%</b>	0%
<b>Example Luminaire Image</b>	
<b>Controls<sup>14</sup></b>	Wirefield Eye-Wi (or equivalent approved) Wirefield Eye-Wi Zhaga node- Dusk to Dawn (35 lux switch on/18 lux switch off) (or equivalent approved)

**Table 21: Luminaire performance requirements Central Hub (Zone E) Amenity Lighting – Heritage Luminaire**

<sup>14</sup> Dimming: when dimming is applied it is announced as a percentage still in use of the total percentage output (dimmed too, not dimmed by).

## TECHNICAL DESCRIPTIONS, DEFINITIONS & ABBREVIATIONS

**PHAR:** is an abbreviation for a potential human amenity receptor, a location where an observer could have the potential to be affected by the proposed lighting to be installed [Abbreviation used by DFL LI&P.](#)

**PSER:** is an abbreviation for an area identified as or treated as a location that may host a potentially sensitive ecological receptor. This is generally used where light sensitive bats have the potential to live, forage or use as a flight path, other ecologically sensitive receptors such as (but not limited to) the Great Crested Newt may also be identified by this term. [Abbreviation used by DFL LI&P.](#)

**PSR:** is an abbreviation for an area where an individual maybe susceptible to light brightness (Light intensity) which may have the potential to cause a hazardous situation. [Abbreviation used by DFL LI&P.](#)

**Obtrusive Light:** refers to excessive or bothersome artificial light that goes where it shouldn't, causing discomfort and disruption. *Spill light which because of quantitative, directional or spectral attributes in a given context gives rise to annoyance, discomfort, distraction or reduction in the ability to see essential information.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

**Sky glow:** When lights are directed upwards or light is scattered by particles in the air, like dust or water droplets, it creates a glow that makes it hard to see stars. *The increase in diffuse illuminance of the night sky above that produced by natural sources such as the moon and visible star.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

**Vertical Illuminance:** is how much light lands on upright surfaces like walls. It's measured in lux or footcandles and matters for places where the view from a vertical angle is important. *Lighting of vertical surfaces such as walls, windows, statues, sculptures and people's faces.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

**Correlated colour temperature (CCT):** the appearance of light emitted by a light source measured in Kelvin (K), Lower CCT values such as 2700K represent warmer, more yellowish light, *similar to the light from older incandescent lamps. (T<sub>cp</sub>)The temperature of the Planckian radiator whose perceived colour most closely resembles that of a given stimulus at the same brightness and under specified viewing conditions, measured in absolute temperature on the kelvin (K) scale.* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

**Lux:** measures the brightness of light as perceived by the human eye at a specific point on a surface. *The SI derived unit of illuminance, measuring luminous flux per unit area (1 lux =1 lumen/m<sup>2</sup>).* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

**Lumens:** measure how bright a light appears to our eyes. *The SI derived unit of luminous flux; a measure of the total quantity of visible light emitted by a source or received by a surface (unit: lumen).* [CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.](#)

**Glare:** refers to an excess of bright light that makes you uncomfortable or hinders your vision. It happens when there's a big difference between a bright light and the rest of the surroundings. *Glare: condition of vision in which there is discomfort or a reduction in the ability to see details or objects, caused by an unsuitable distribution or range of luminance, or by extreme contrasts.* [BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.1.8](#)

**Luminous intensity:** is light brightness or how intense the light source is. Light intensity is how intense a light source is emitted or received in a particular direction, this is measured in candelas and is termed as luminous intensity  $I_v$  <of a source, in a given direction> quotient of the luminous flux,  $d\Phi_v$ , leaving the source and propagated in the element of solid angle  $d\Omega$  containing the given direction, by the element of solid angle (unit:  $cd = lm \cdot sr^{-1}$ ). BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.2.

**Candela:** is a measurement for the brightness of a light source, taking into account the direction in which the light is emitted. Base unit of luminous intensity in the International System of Units (SI); the luminous power per unit solid angle emitted by a point light source in a particular direction. CIBSE LG21 Lighting Guide 21: Protecting the night-time environment.

**Uniformity (U<sub>0</sub>):** is an explanation for the even distribution of light across an area or surface. The overall uniformity shall be calculated as the ratio of the lowest luminance, occurring at any grid point in the field of calculation, to the average luminance. BS EN 13201-3-2015, Calculation of Performance Section 8.3.

**Luminance:** is how bright a surface appears to our eyes. It considers the light coming from or reflected by an object.  $L_v$  <in a given direction, at a given point of a real or imaginary surface> quantity defined by the formula (unit:  $cd \cdot m^{-2} = lm \cdot m^{-2} \cdot sr^{-1}$ ) BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.3.

**Illuminance** is how much light lands on a surface per square meter. It's measured in lux. More lux means a brighter area.  $E_v$  (unit:  $lx = lm \cdot m^{-2}$ ) 1. <at a point of a surface> quotient of the luminous flux  $d\Phi_v$  incident on an element of the surface containing the point, by the area  $dA$  of that element 2. <at a point of a surface> equivalent definition: integral, taken over the hemisphere visible from the given point, of the expression. BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.2.10.

**Luminaire:** a light fixture, this is also sometimes referred to as a lantern or a light fitting, is a product that produces artificial light. apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except the lamps themselves, all the parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.3.3

**ULOR:** upward light output ratio or ULOR refers to the amount of light the light fixture will produce upwards as a percentage of its total light output.  $RULO$  <of a luminaire> ratio of the upward luminous flux of the luminaire, measured under specified practical conditions with its own lamp(s) and equipment, to the sum of the individual luminous fluxes of the same lamp(s) when operated outside the luminaire with the same equipment, under specified conditions BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.3.12.

**Maintenance factor (MF):** is an allowance for how well the lights keep working overtime. It considers things like dirt on the light fittings and "wear and tear". ~~DEPRECATED: light loss factor ratio of illuminance produced by the lighting installation after a certain period to the illuminance produced by the installation when new~~ Note 1 to entry: The term depreciation factor has been formerly used to designate the reciprocal of the above ratio. Note 2 to entry: The maintenance factor takes into account light losses caused by dirt accumulation on luminaires and room surfaces (in interiors) or other relevant surfaces (in exteriors, where appropriate), and the decrease of the luminous flux of lamps. BS EN 12665-2018, Light and lighting - Basic terms and criteria for specifying lighting requirements, Section 3.5.18.

**Tilt:** is how much the luminaire is lifted based on the fitting facing flat to the ground.

**Outreach:** how far away the fitting is from the column/wall its mounted on to the light source.

# THE POWER TO MAKE LIGHT WORK



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