

LIGHTING REPORT
FOR
NEW PRODUCTION FACILITY
AT
SEFTER FARM, PAGHAM

Project N°: 3330
Revision: P3
Date: July 2016
Client: Barfoots of Botley

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REVISIONS

Revision	Pages Revised & Re-Issued	Date	Checked
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P2	Comments incorporated	05/07/2016	KH
P3	Further comments incorporated	05/07/2016	KH

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1.0 INTRODUCTION

Pope Consulting Ltd was originally appointed by Barfoots of Botley to assess the impact the lighting associated with the new Production facility (including the new office building, goods yard and extended car park) will have on the surrounding environment.

2.0 REQUIREMENTS FOR THE LIGHTING INSTALLATION

All proposed lighting arrangements should comply with the guidance set out in the Institution of Lighting Engineers 'Guidance Notes for the Reduction of Obtrusive Light'.

This lighting report will demonstrate how the light arising from the site will comply with Environmental Zone E2 in Table 1 of the above guidance note.

3.0 EXECUTIVE SUMMARY

This installation is compliant with the requirements of the Institution of Lighting Engineers 'Guidance Notes for the Reduction of Obtrusive Light', in particular with the limitations of Environmental Zone E2 in Table 1 Guidance Note.

The expected hours of illumination will be as follows:

Summer 20:30 – 22:00

Winter 06:00 – 22:00

Note that the external lighting will all be photocell and timeclock controlled such that the light will be held off if sufficient daylight is present and switched off beyond these operating hours.

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4.0 LIGHTING

The specifics of the installations have not yet been fully designed, but, in the absence of full, detailed lighting designs, the following have been assumed:

- The luminaires are to be from a British Manufacturer where replacements can be readily sourced to ease future maintenance.
- The luminaires are to be of a good quality with energy efficient designs but designed to a cost effective budget
- The installation is for offices attached to a production facility and therefore the installation should be simple and discreet
- The luminaires should all have an LED source to reduce energy bills, reduce ongoing maintenance costs and to promote energy conservation and efficiency.
- Car Park luminaires will be bollard type, assumed at 1m to top with a 360° area distribution.
- Roadway luminaires will be bollard type, assumed at 1m to top with a 180° lateral distribution.
- Yard luminaires will be column mounted, assumed at 8m to lantern (lanterns with asymmetric distribution) and also façade mounted wide area floodlights assumed at Eaves level on the production building

The interior luminaires have been modelled at standard intervals (1.8m, 2.4 or 3.0m spacings representing standard 600mm x 600mm modular ceiling grids) and using either recessed modular square luminaires with glare controlled output suitable for use in areas with computer screens or recessed circular downlights. The downlights have been used generally in circulation spaces and to mark notional corridors in open plan office areas, over stairs and in reception areas.

The rooms that do not have openings onto the external aspect have not been modelled.

The exterior luminaires have been modelled for the three different instances of use:

- Car Park
- Roadway
- Vehicle Yard

Car Park

It is not the intention that the installation is to provide adequate levels of car park illumination, but it is the intention that runs of low level bollards are used as wayfinding in the car park area only.

Roadway

It is not intended that the new roadway is to be lit to comply with apodted road lighting standards, but it is to be lit using a series of low level bollards to provide wayfinding lighting again. The roadway is not a pedestrian route and is to be used by vehicles with running lights.

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Vehicle Yard

The yard lighting has been designed to achieve an average of 30 lux – the equivalent of High Risk Lorry Parking as noted in the CIBSE [Chartered Institute of Building Services Engineers] Lighting Guides which is a suitable lighting level for lorries to navigate the yard and reverse up to the loading bay doors.

To achieve this, a series of wide area floodlights will be used at eaves level on the building and this will be supplemented by column mounted lanterns around the yard, ensuring there are no fixtures within the yard itself as these would be subject to damage/cause a nuisance to lorries

The column luminaires are envisaged as being 8000mm high with an asymmetric distribution

The fittings have been photometrically tested by the manufacturers and the photometric data provided and installed into the lighting design software.

For the purposes of this report, the external emergency lighting has not been considered.

Given the nature of the construction, it is inevitable that the artificial lighting will exit the structure at night.

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Modular Recessed lighting has been modelled using the following fitting:**Manufacturer: Dextra Group PLC****Dextra**
GROUP PLC**MODR O L55 recessed luminaire DEXTRA LIGHTING - MOD LED OFFICE (lay-in version)**

MODR O L55 - MODLED Office 5500 lumen, 600mm x 600mm recessed lay-in luminaire, white powder coated one piece steel body, LEDs mounted to rear of housing. Aluminium framed front panel formed from high transmission polycarbonate sheet with framed micro-prism centre diffuser. Fixed output driver mounted on rear of housing, mains connection via backflap accessible terminals or optional 4 pole panel mount or 6 pole fixed 'T' piece. Complies with BSEN 12464, 3000 candela per sq/m limit at 65 deg.

Optional extras:

E3 - Emergency control gear (710 lumens)

H High Frequency Dimming (Analogue 1-10v)

S Digital Dimming Switch Dim (ECO)

D Digital Dimming DSI (ECO)

A Digital Addressable Lighting Interface (DALI)

C Bi-Level Dimming (optional 1 minute or 30 minute total off function available; please contact our sales team for advice)

R2MA Minihead integral daylight and presence sensor (DALI variants only)

R2MD Minihead integral daylight and presence sensor (DSI variants only)

4PM - 4 Pole panel mount

6TBG - 6 Pole 'T' piece

Suitable for flush installation into exposed 'T' grid ceilings with a minimum void depth of 220mm.

If installing into a reduced void depth (void must greater than the recessed depth of the luminaire plus an allowance for the electrical connection), order the MODR luminaire along with the MOD L PUK (pull-up kit)*

If installing into solid ceilings such as plasterboard order the MODR luminaire along with the MOD L PBK66 (frame kit).

*Please note this installation method will cause the trim of the luminaire to sit 10mm below the suspended ceiling line.

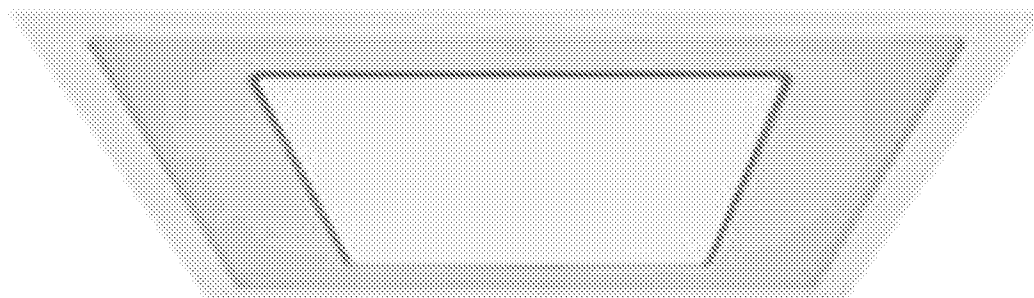
Luminaire data

Luminaire efficiency	: 66.4%
Luminaire efficacy	: 100.61 lm/W
Classification	: A40 ↓100.0% ↑0.0%
CIE Flux Codes	: 54 84 97 100 66
UGR 4H 8H	: 19.5 / 19.4
Control gear	: electronic ballast
Power	: 36.3 W
Luminous flux	: 3652 lm

Dimensions : 595 mm x 595 mm x 0.0 mm

Equipped with

Quantity	: 1
Designation	: Dextra
Colour	: nw/4000K
Luminous flux	: 5500 lm
Colour reproduction	: 1B



Recessed downlighting has been modelled using the following fitting:

Manufacturer: Dextra Group PLC

Dextra
GROUP PLC**PTEC D2000 HF C84 recessed luminaire DEXTRA LIGHTING - PROTEC LED**

PTEC D2000 HF C84 - ProTec LED DLM 2000 lumen recessed downlighter with ABS housing and bezel, zinc plated spring steel fixing clips, anodised aluminium reflectors, electronic driver. Optional switch dimming or DALI dimmable driver available.

DIM - DALI or switch dimming

E3 - 3 Hour remote emergency pack (490 lumens)

ST3 - Self Test remote emergency pack

AT3 - Autotest remote emergency pack

Order the luminaire with trim accessory attachment:

PTEC DG R

Silver Bezel / OptiSpec Reflector (No Coloured Ring)

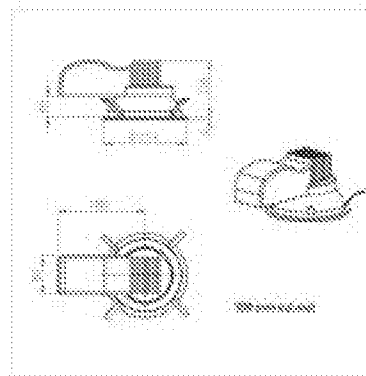
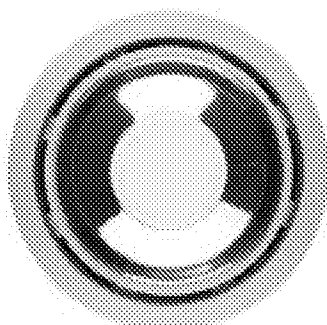
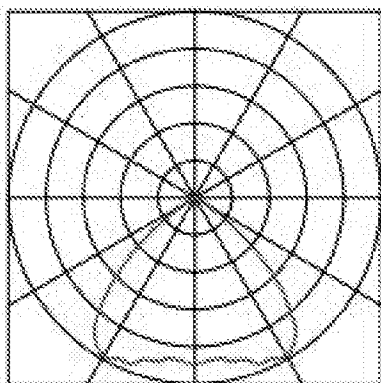
Luminaire data

Luminaire efficiency	: 100%
Luminaire efficacy	: 101.52 lm/W
Classification	: A50 ↓ 100.0% ↑ 0.0%
CIE Flux Codes	: 72 99 100 100 100
UGR 4H 8H	: 23.9 / 23.8
Control gear	: electronic ballast
Power	: 19.7 W
Luminous flux	: 2000 lm

Dimensions : Ø174 mm x 9.0 mm

Equipped with

Quantity	: 1
Designation	: Dextra
Colour	: mw/4000K
Luminous flux	: 2000 lm
Colour reproduction	: 1B



Building mounted floodlighting has been modelled using the following fittings:

Manufacturer: Dextra Group PLC

Dextra
GROUP PLC

OPU2XL L288 C84 projector DEXTRA LIGHTING - OPUS LED FLOODLIGHT

OPU2XL L288 C84 - Opus extra large sized LED floodlight, symmetric light distribution with 28800 lumen LED, high quality diecast construction, matt grey powder coat finish, high grade aluminium reflector, fully gasketed IP65 ingress protection, toughened glass cover, adjustable saddle mounting bracket with angle set feature allen key fixings.

Optional extra

PH - Photocell (on/off switching only)

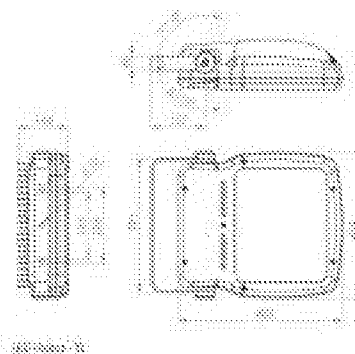
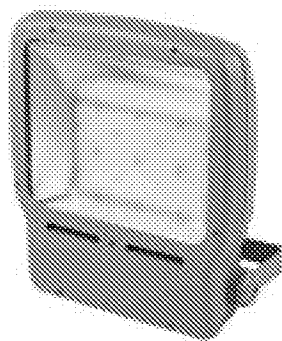
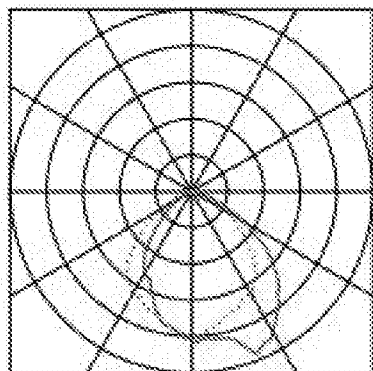
Luminaire data

Luminaire efficiency	: 89.7%
Luminaire efficacy	: 97.12 lm/W
Classification	: A50 ↓ 100.0% ↑ 0.0%
CIE Flux Codes	: 58 90 99 100 90
UGR 4H 8H	: 31.7 / 28.8
Control gear	: electronic ballast
Power	: 286 W
Luminous flux	: 25833.8 lm

Equipped with

Quantity	: 1
Designation	: Dextra
Colour	: nwr/4000K
Luminous flux	: 28800 lm
Colour reproduction	: 1B

Dimensions : 483 mm x 424 mm x 146 mm



Pole mounted floodlighting has been modelled using the following fitting:

Manufacturer: Thorlux Lighting



STG16355 Floodlight (Floodlighting) Starguard LED
LED Zero upward light area floodlight

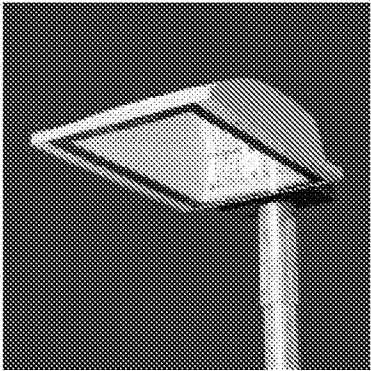
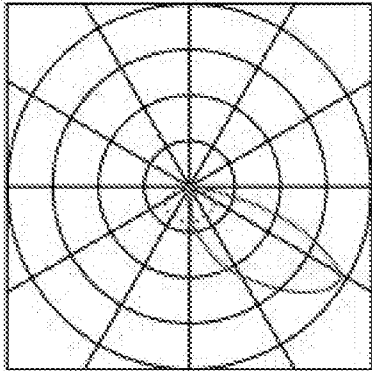
Luminaire data

Luminaire efficiency	: 100%
Luminaire efficacy	: 98.3 lm/W
Classification	: A30 ↓ 99.8% ↑ 0.2%
CIE Flux Codes	: 32 72 97 100 100
UGR 4H 5H	: 36.7 / 27.5
Power	: 150 W
Luminous flux	: 14745 lm

Equipped with

Quantity	: 1
Designation	: LED
Power	: 140 W
Colour	: 5700
Luminous flux	: 14745 lm

Dimensions : 420 mm x 610 mm x 150 mm



Bollard mounted car park lighting has been modelled using the following fitting:

TLSBP-1400NW-XC49

Talos Pollare Bollard

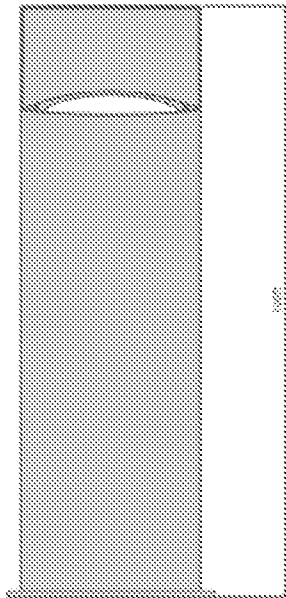
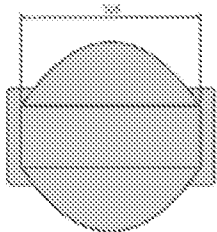
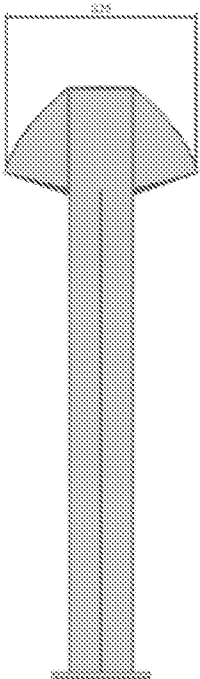
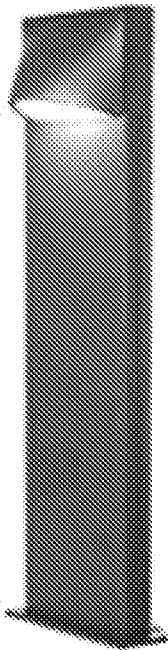
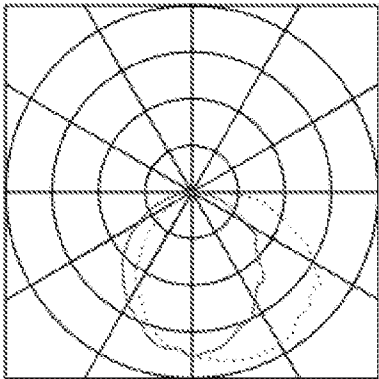
Luminaire data

Luminaire efficiency : 100%
Luminaire efficacy : 85.79 lm/W
Classification : A40 ↓99.8% ↑0.2%
CIE Flux Codes : 46 76 93 100 101
UGR 4H 8H : 25.6 / 16.2
Power : 14 W
Luminous flux : 1201 lm

Equipped with

Quantity : 1
Designation :
Colour :
Luminous flux : 1201 lm

Dimensions : 300 mm x 200 mm x 150 mm



Bollard mounted roadway lighting has been modelled using the following fitting:

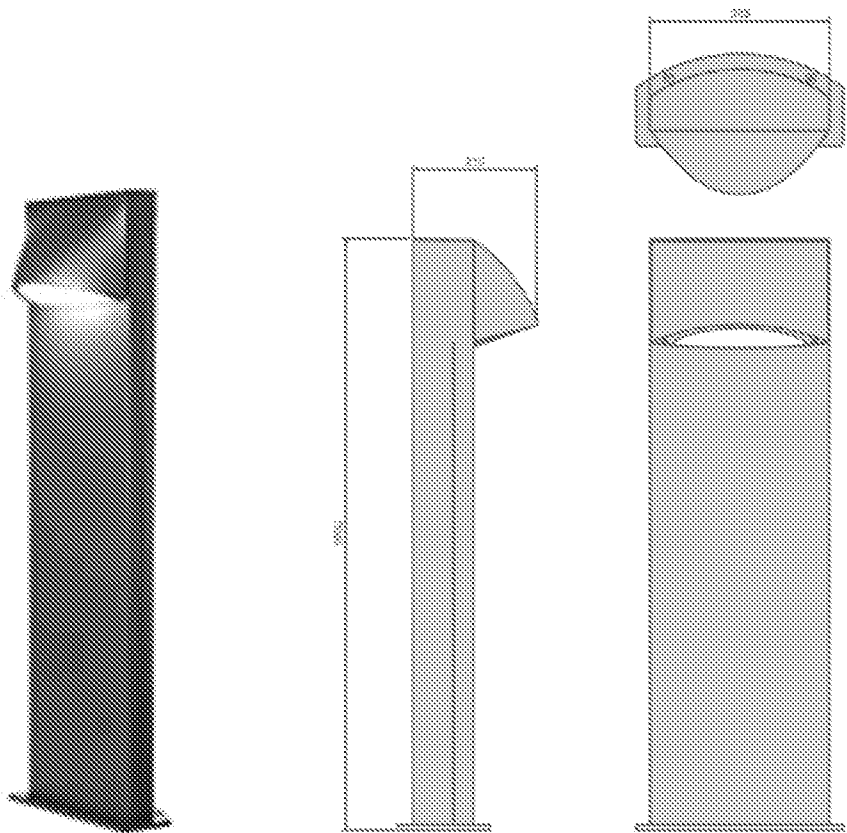
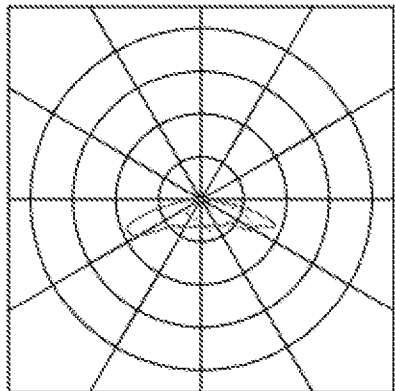
Luminaire data

Luminaire efficiency	: 100%
Luminaire efficacy	: 96.7 lm/W
Classification	: A10 ↓99.8% ↑0.2%
CIE Flux Codes	: 21 44 80 100 101
UGR 4H 8H	: 37.6 / 21.0
Power	: 10 W
Luminous flux	: 967 lm

Equipped with

Quantity	: 1
Designation	: LED
Colour	: 4000K
Luminous flux	: 967 lm

Dimensions : 200 mm x 200 mm x 200 mm



5.0 CALCULATIONS

A 3D model was generated in Relux Lighting Design Software <http://relux.biz/>

The most current version of the programme was used, version 2016.1.1.0

The model incorporated solid external walls, solid internal walls and the external glazing openings for both windows and doors (modelled with standard double glazing material). Reflectances were assumed to be a standard 50% internally.

The double glazing material was selected as having a transmittance of 81.0%

All luminaires were modelled as being 'on' with an output of 100%. This is a false worst case scenario as the lighting internally will be complete with automatic controls (anticipated as being absence detection as a minimum) and there will be blinds etc. for glare control.

Internally, the furniture and fittings are not modelled as, again, the types and locations are not known and these are not fixed items so they could be moved which would artificially affect the calculation results.

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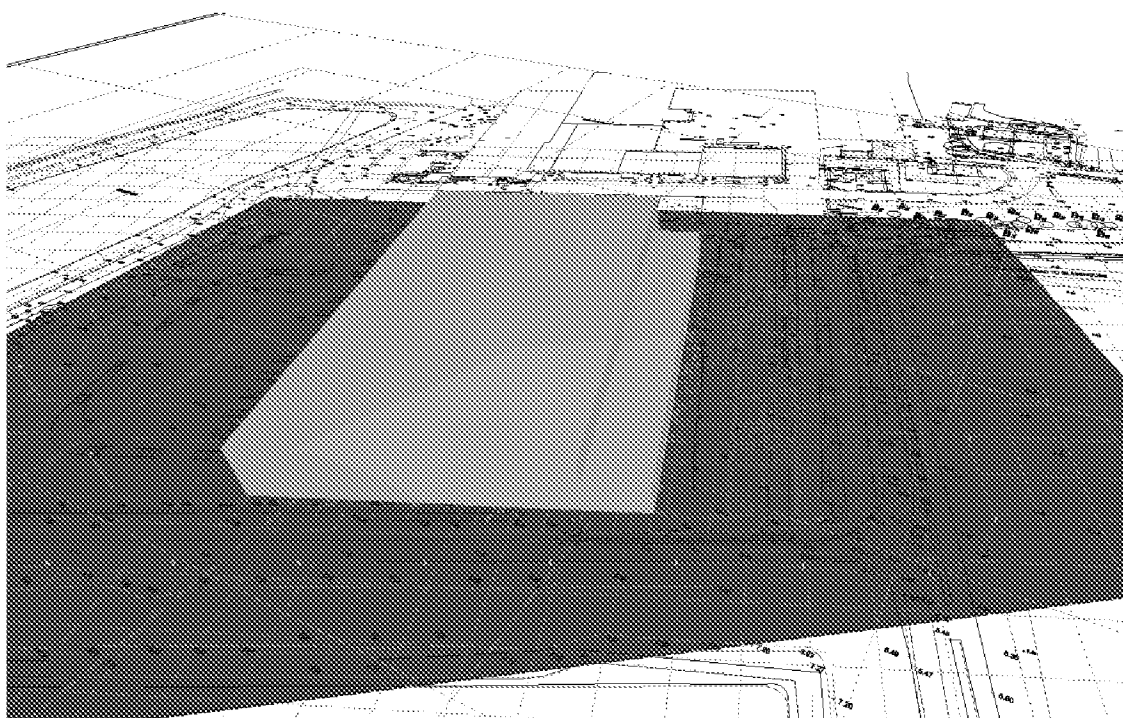
The 3D model in Relux.

The new production facility with associated office can be seen in the image below.

The view is looking up the site plan (Appendix A) from bottom to top with the new road and extended car park to the right hand side and the yard to the left.

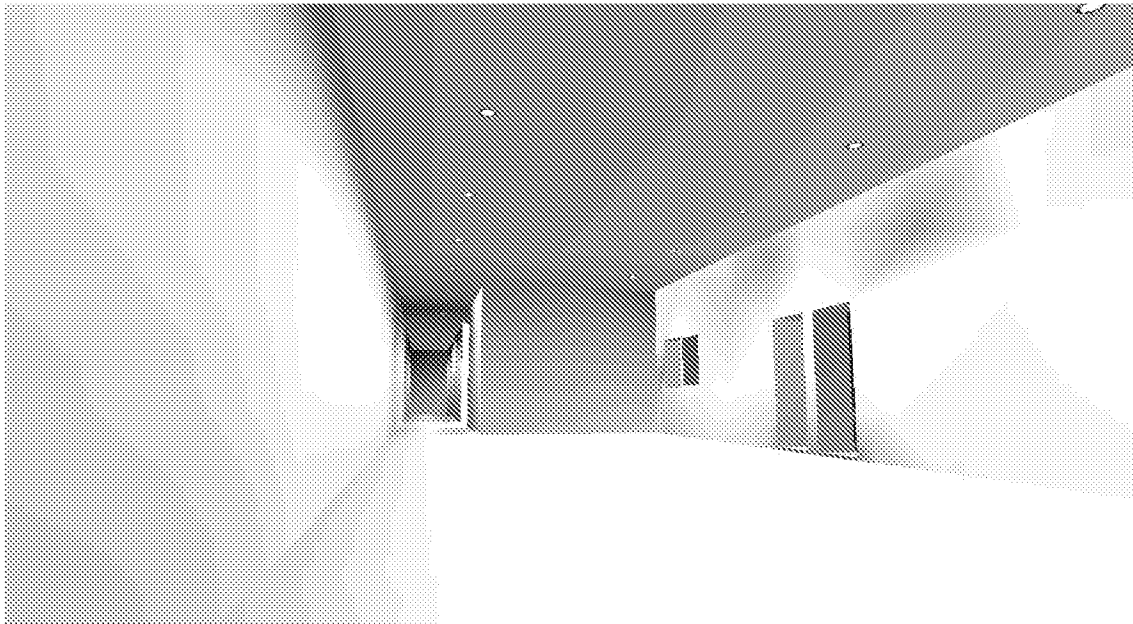
For scale, the lighting lanterns that can be seen are on top of 8m tall columns.

The general measuring areas are represented by the red polygonal shapes (Yard, Car Park and Road) and the darker purple area is the extent of the model in the software. The site layout drawing can be seen in the background of the image.



Inside the building model

The image below is from within the 3D model and shows the reception space on the ground floor leading to a corridor with the front of the building facing the car park to the right (hence the windows and doors). As previously stated, the internal reflectances have been taken as 50% and are represented by the grey colour.

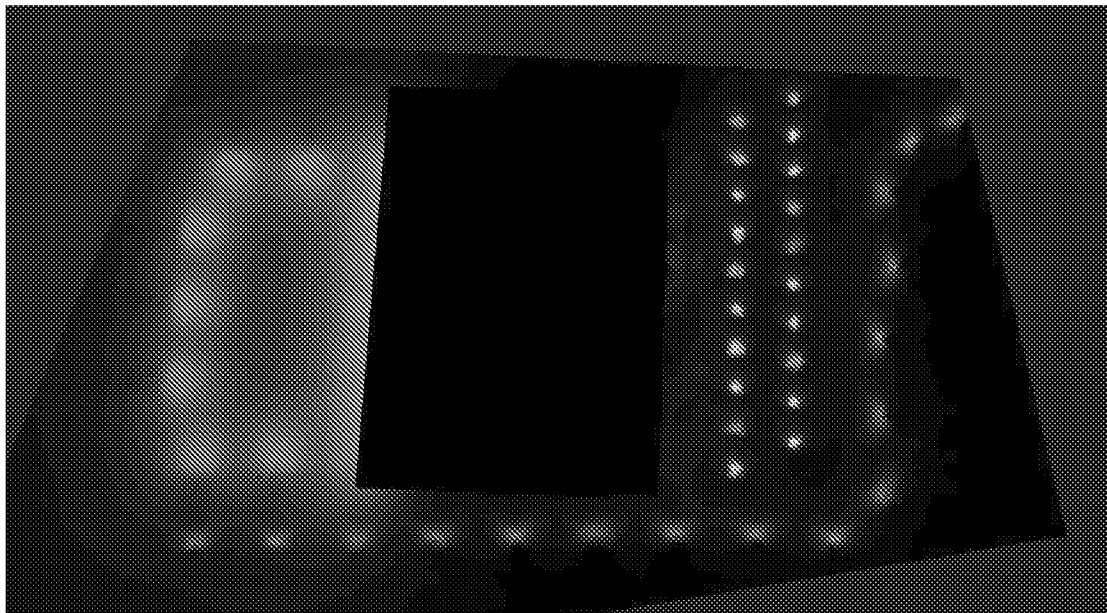


The software utilises a standard radiosity algorithm in undertaking the calculation, however, in this instance, both a radiosity calculation and a radiance ray tracing calculation had to be undertaken in order to accurately model the path of the light through the glazing.

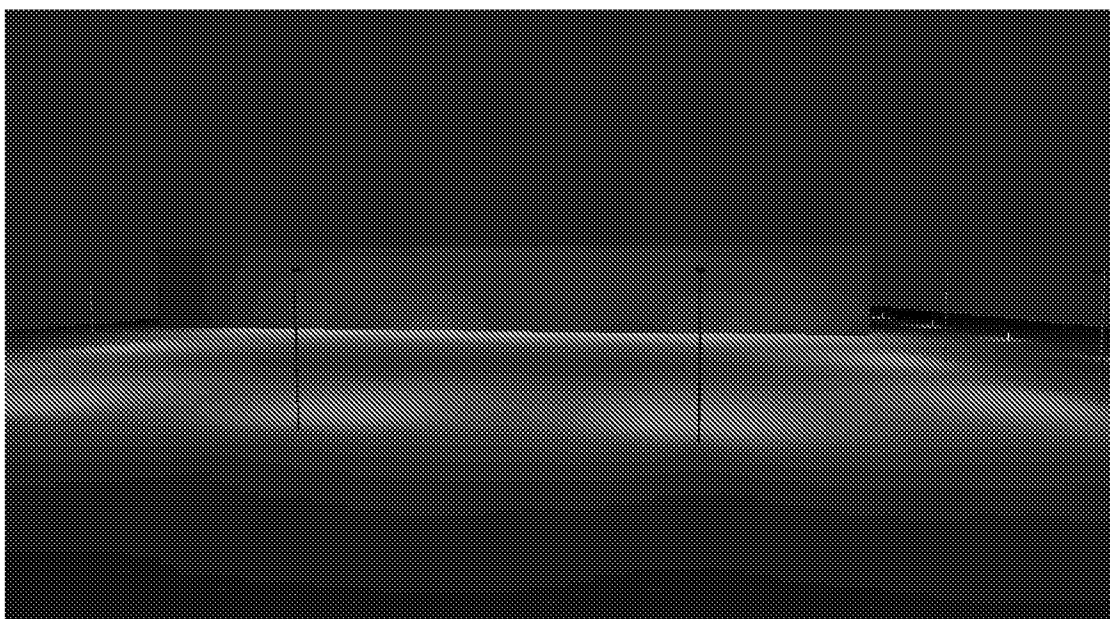
The radiosity algorithm provides the external lux level calculations from the car park lighting reproduced below and the radiance ray tracing calculation produces the lux level calculations from the internal lighting, also reproduced below.

Calculation Results – Car Park and roadway lighting Energised

Ray traced renderings of the office building showing the car park lighting energised.



View from above with Yard to the left and office/car park to the right

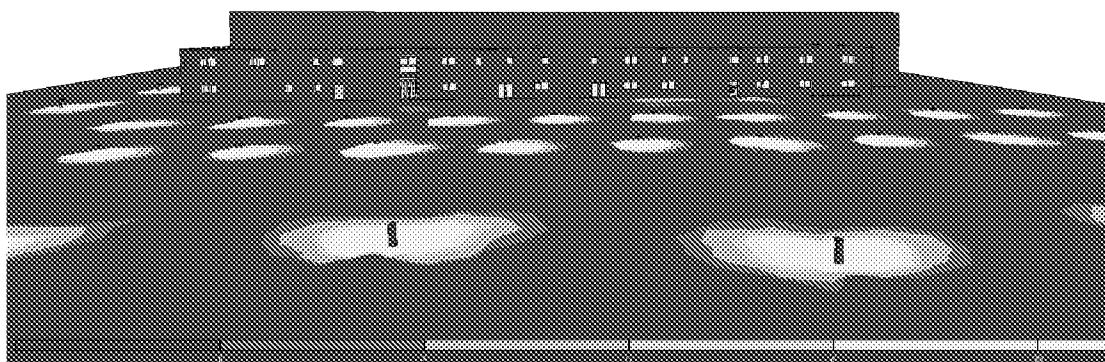


View of the Yard looking back onto the loading bay



View of the offices looking across the car park

The image below is the same calculation image as above, but with different colours representing the light intensity (illuminance) represented in lux. The colour scale is also reproduced for reference. The lighter the colour, the more light is present



View of the offices looking across the car park

The rendering below is a closer view more accurately calculated to show the light spillage onto the façade and out of the building.



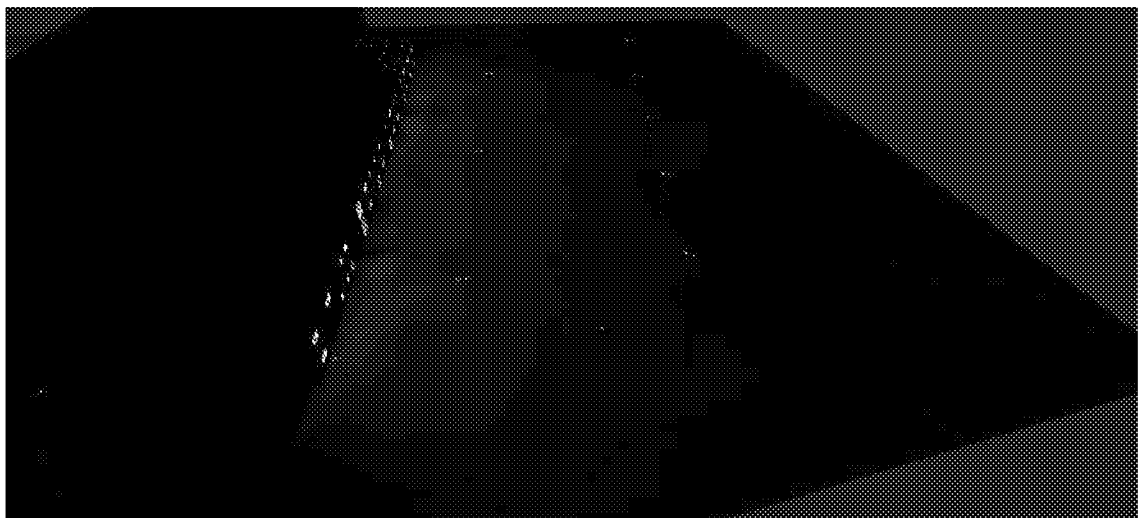
Calculation Results – Car Park Lighting De-Energised

The image below represents the ray traced rendering of the internal lighting spilling out externally with the car park lighting turned off.

As can be seen, the light does not spill very far from the footprint of the building.



View of the offices looking across the car park



View of the offices from above and in front showing the light spillage from the glazed openings

The rendering below is a closer view more accurately calculated to show the light spillage onto the façade and out of the building.

As can be seen, there is negligible lighting on the façade.

When the rendering is interrogated, it can be seen that:

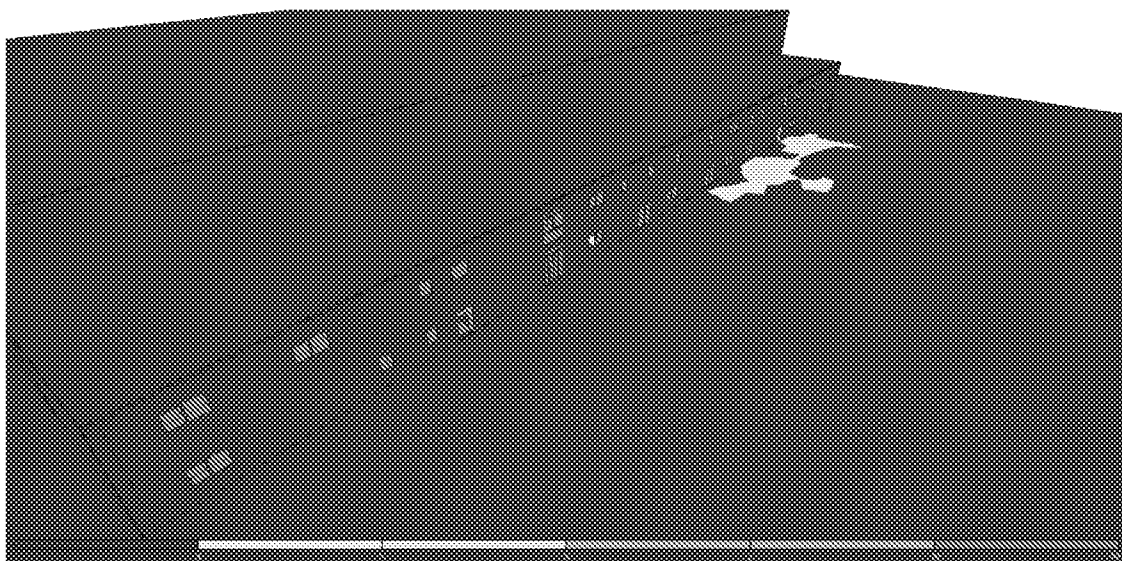
- the façade varies with a low of 1 and a high of 0.26 candelas/m²
- the floor in front of the building varies with a low of zero and a peak of 4.94 cd/m² immediately in front of the reception door

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- the windows are the visually brightest elements, with a peak of 29.5cd/m²



The image below is a similar calculation image to that above, but with different colours representing the light intensity (illuminance) represented in lux again. The colour scale is also reproduced for reference. As can be seen, the light spillage from the building is generally a few 5lux within a few metres of the building proper.



Calculation Results

Yard

- Average lux level 35.5lux
- Minimum lux level 9.0lux
- Uniformity 0.25

Car Park

- Average lux level 3lux
- Minimum lux level 0lux
- Uniformity 0.01

Roadway

- Average lux level 6.1lux
- Minimum lux level 0.1lux
- Uniformity 0.02

6.0 ANALYSIS OF RESULTS

The design shown can be seen to meet the desired targets as stated previously.

From the results provided by the software it can be seen that the light spillage onto the ground outside the building with the car park lighting not energised, is very low.

Within a few metres of the building, the values drop significantly.

Of main concern, is the visual impact of the structure itself in terms of how visually bright the structure appears at night. As can be seen from the visualisation, the amount of direct light on the façade is non-existent due to the distribution of the bollard type luminaires

With the car park lighting de-energised, the windows and glazed doors are visually the brightest areas, with values in excess of 0.5cd/m², as seen above. The software indicates values of up to 39.5 cd/m² at points over these glazing elements. The software also shows that the building façade itself is generally lit to less than 0.26cd/m² with a few bright points near where the windows and glazed doors are.

The requirements for this installation must fall within the limits set by Category E2 in table 1 of the Institute of Lighting Engineer's guidance Notes for the Reduction of Obtrusive Light, as reproduced in the Appendices below. The pertinent information is also shown here:

SkyGlow	ULR 2.5% (maximum)
Light trespass into Windows	Not applicable here
Source Intensity	Pre-Curfew 7.5kcd (maximum) Post-Curfew 0.5kcd (maximum)
Building Luminance (average)	Pre-Curfew 5cd/m ² (maximum)

Upward Light Ratio is the maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky. In this case, all the luminaires selected have a ULOR that is negligible

The Light Trespass into Windows is not applicable here as there is no living accommodation in the immediate vicinity.

Source Intensity applies to the light source in the potentially obtrusive direction, outside of the area being lit. Again, this is not applicable here, as the luminaires are parallel to the floor.

Building Luminance refers to building being directly illuminated and, although there is no direct illumination, this element relates to the proposed installation here as the envelope will be seen to be lit to a degree due to the glazing elements.

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From the results, it can be seen that the point luminance peaks at approximately 29.5cd/m^2 so if we assume this worst case for all the glazing, we know that the building façade facing the car park is 90.71m long x 6.54m high (average) which gives an area of 593.24m^2

The glazing on this façade totals 76.53m^2

If we assume a worst case of the building fabric being illuminated to 0.26cd/m^2

Then the average building luminance (with worst case assumptions) could be said to be

$$\begin{aligned} &(((593.24 - 76.53) \times 0.26) + (76.53 \times 29.5))/593.24 \\ &= (573.34 + 2257.64)/593.24 \\ &= 2830.98/593.24 \\ &= 4.77\text{cd/m}^2 \end{aligned}$$

Which is less than the maximum allowed for in the table in the Appendices.

7.0 CONCLUSIONS

With reference to the Institution of Lighting Engineers 'Guidance Notes for the Reduction of Obtrusive Light', it can be seen that this installation is compliant.

It is worth noting that the Guidance Note is written more for installations with exposed floodlighting, building lighting and area lighting.

It can be seen that there are no luminaires that will cause obtrusive light and glare as all fittings are within the building, barring those bulkheads above the emergency exits (which are for emergency use only so not considered in the context of this report as they would not normally be illuminated).

It can also be seen from above, that the proposed installation will comply with the limitations of Environmental Zone E2 in Table 1 of the Institution of Lighting Engineers 'Guidance Notes for the Reduction of Obtrusive Light'.

The expected hours of illumination, given that this is an office building will be as follows:

Summer 20:30 – 22:00

Winter 06:00 – 22:00

Note that the external lighting will all be photocell and timeclock controlled such that the light will be held off if sufficient daylight is present and switched off beyond these operating hours.

It should be reiterated that the lighting design has not yet been fully detailed and the fittings indicated in this report are representative of the intention for the building installation at this stage.

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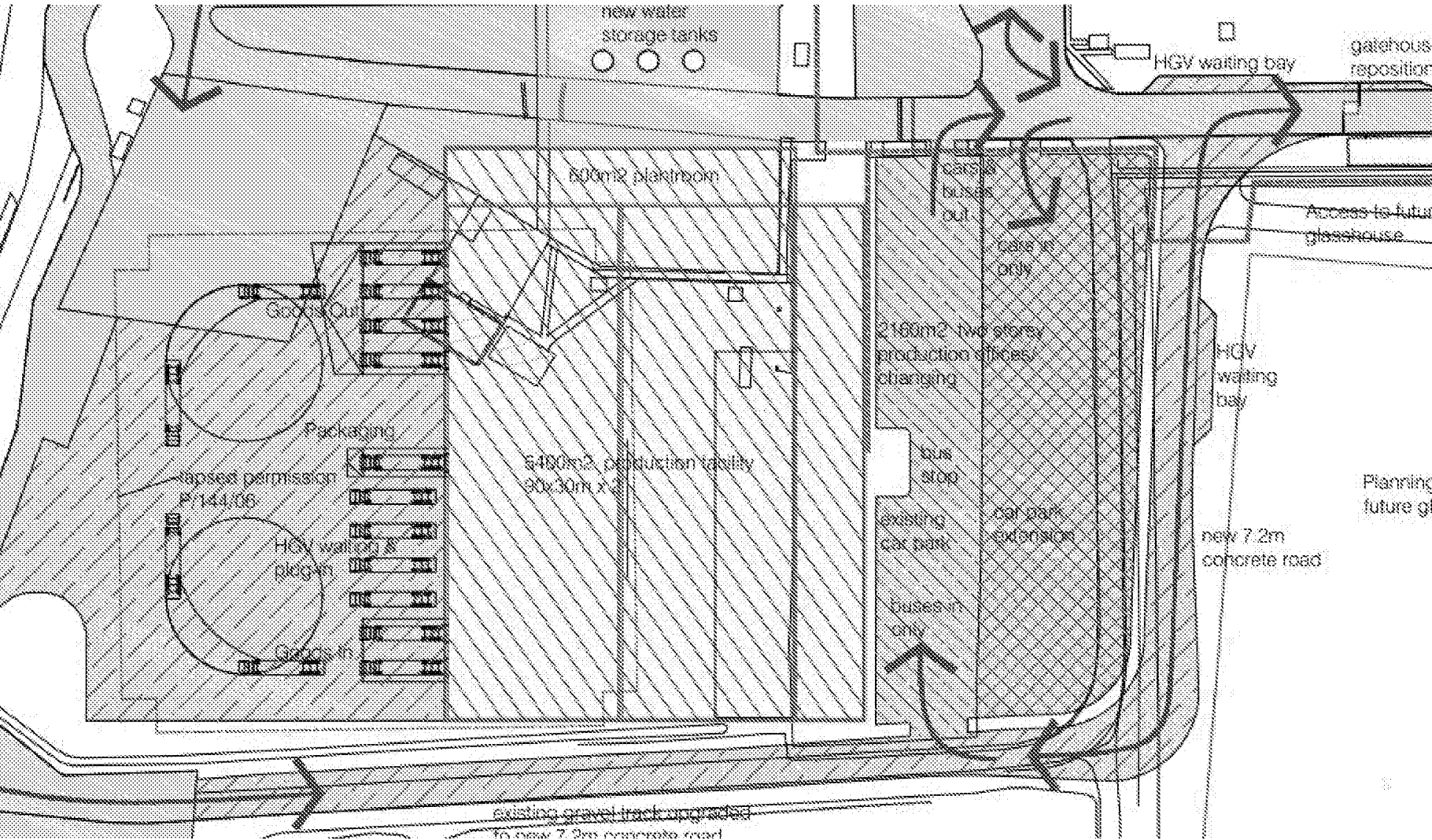
8.0 APPENDICES

Appendix A – Location Plan

Appendix B – Layout Drawings

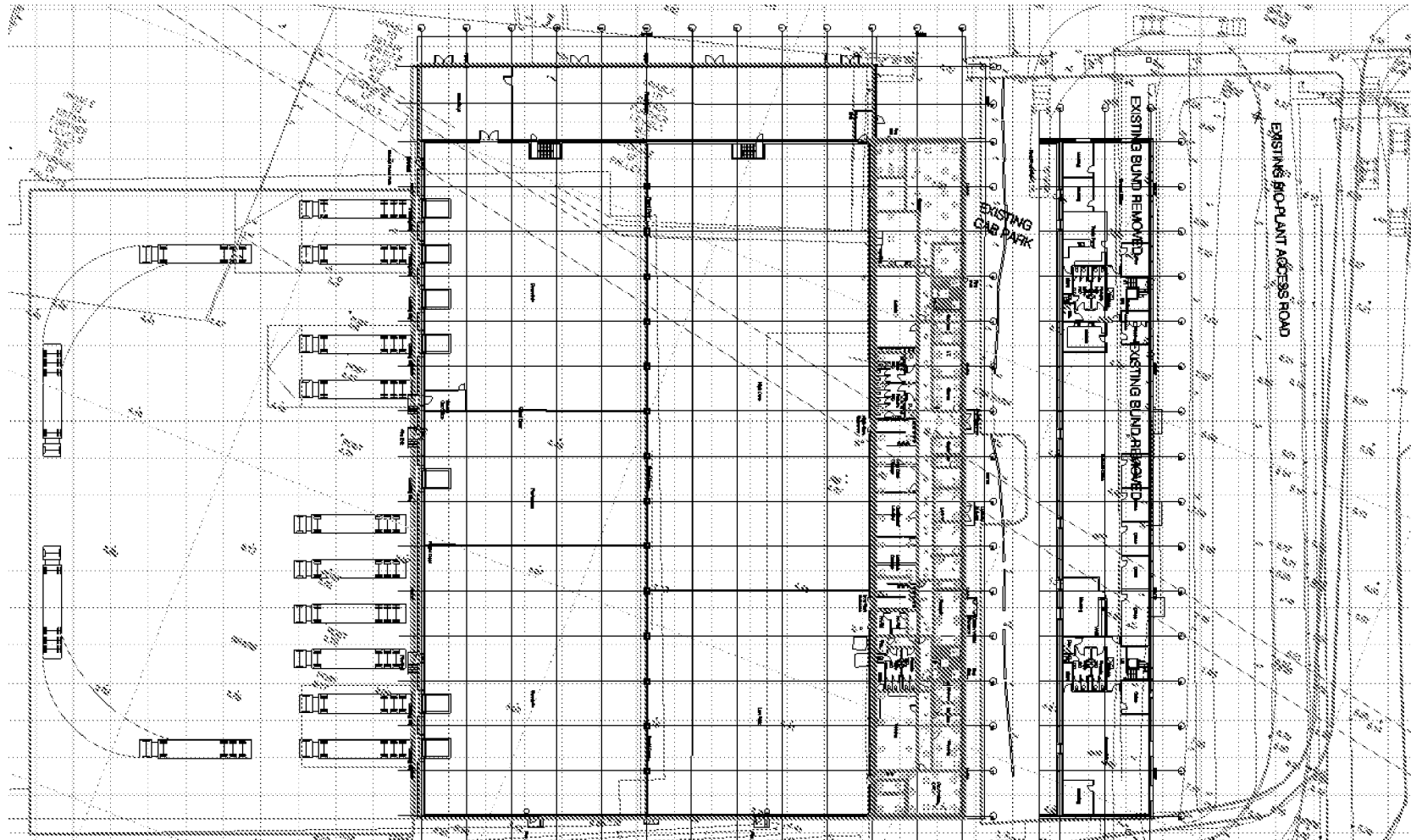
Appendix C – Institution of Lighting Engineers Guidance

Appendix A – Location Plan



Appendix B – Layout Drawing

The layout drawing below is from the Relux software and is a view through the top of the model through to the floor and, as such, represents both floors of lighting at the same time. The First Floor of the office building can be seen to the side of the offices and was used in order to lay out the first floor neatly before the two floors were combined in the model. Due to the scale, it is very difficult to see in detail where specific luminaires are located, but each one is shown.



Appendix C – Institution of Lighting Engineers Guidance

Institution of Lighting Engineers

Guidance Notes for the Reduction of Obtrusive Light GN01

ENVIRONMENTAL ZONES:

It is recommended that Local Planning Authorities specify the following environmental zones for exterior lighting control within their Development Plans.

Category	Examples
E1:	Intrinsically dark landscapes National Parks, Areas of Outstanding Natural Beauty, etc
E2:	Low district brightness areas Rural, small village, or relatively dark urban locations
E3:	Medium district brightness areas Small town centres or urban locations
E4:	High district brightness areas Town/city centres with high levels of night-time activity

Where an area to be lit lies on the boundary of two zones the obtrusive light limitation values used should be those applicable to the most rigorous zone.

DESIGN GUIDANCE

The following limitations may be supplemented or replaced by a LPA's own planning guidance for exterior lighting installations. As lighting design is not as simple as it may seem, you are advised to consult and/or work with a professional lighting designer before installing any exterior lighting.

Table 1 – Obtrusive Light Limitations for Exterior Lighting Installations						
Environmental Zone	Sky Glow ULR [Max %] ⁽¹⁾	Light Trespass (into Windows) Ev [Lux] ⁽²⁾		Source Intensity I [kcd] ⁽³⁾		Building Luminance Pre-curfew ⁽⁴⁾
		Pre-curfew	Post-curfew	Pre-curfew	Post-curfew	Average, L _(cd/m²)
E1	0	2	1*	2.5	0	0
E2	2.5	5	1	7.5	0.5	5
E3	5.0	10	2	10	1.0	10
E4	15.0	25	5	25	2.5	25

ULR = Upward Light Ratio of the Installation is the maximum permitted percentage of luminaire flux for the total installation that goes directly into the sky.

Ev = Vertical Illuminance in Lux and is measured flat on the glazing at the centre of the window

I = Light Intensity in Cd

L = Luminance in Cd/m²

Curfew = The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by the local planning authority. If not otherwise stated – 23.00hrs is suggested.

* = From Public road lighting installations only

- (1) **Upward Light Ratio** – Some lighting schemes will require the deliberate and careful use of upward light – e.g. ground recessed luminaires, ground mounted floodlights, festive lighting – to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.
- (2) **Light Trespass (into Windows)** – These values are suggested maxima and need to take account of existing light trespass at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complaint has been received, the Highway Authority should endeavour to reduce the light trespass into the window down to the after curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.
- (3) **Source Intensity** – This applies to each source in the potentially obtrusive direction, outside of the area being lit. The figures given are for general guidance only and for some sports lighting applications with limited mounting heights, may be difficult to achieve.
- (4) **Building Luminance** – This should be limited to avoid over lighting, and related to the general district brightness. In this reference building luminance is applicable to buildings directly illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent luminaires or luminaires fixed to the building but used to light an adjacent area.

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Table 2 – Maximum Values of Threshold Increment from Non-Road Lighting Installations

Light Technical Parameter	Road Classification ⁽⁶⁾			
	No road lighting	ME5	ME4/ ME3	ME2 / ME1
TI	15% based on adaptation luminance of 0.1cd/m ²	15% based on adaptation luminance of 1cd/m ²	15% based on adaptation luminance of 2 cd/m ²	15% based on adaptation luminance of 5 cd/m ²

TI = Threshold Increment is a measure of the loss of visibility caused by the disability glare from the obtrusive light installation.

- (6) Road Classifications as given in BS EN 13201 - 2: 2003 Road lighting Performance requirements. Limits apply where users of transport systems are subject to a reduction in the ability to see essential information. Values given are for relevant positions and for viewing directions in path of travel. See CIE Publication 150:2003, Section 5.4 for methods of determination. For a more detailed description and methods for calculating and measuring the above parameters see CIE Publication 150:2003.

RELEVANT PUBLICATIONS AND STANDARDS:

British Standards: www.bsi.org.uk	BS 5489-1: 2003 Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas BS EN 13201-2:2003 Road lighting – Part 2: Performance requirements BS EN 13201-3:2003 Road lighting – Part 3: Calculation of performance BS EN 13201-4:2003 Road lighting – Part 4: Methods of measuring lighting performance. BS EN 12193: 2003 Light and lighting – Sports lighting
Countryside Commission/DOE www.odpm.gov.uk	Lighting in the Countryside: Towards good practice (1997) (Out of Print)
CIBSE/SLL Publications: www.cibse.org	Col. Code for Lighting (2002) LG1 The Industrial Environment (1989) LG4 Sports (1990+Addendum 2000) LG6 The Exterior Environment (1992) FF7 Environmental Considerations for Exterior Lighting (2003)
CIE Publications: www.cie.co.at	01 Guide lines for minimizing Urban Sky Glow near Astronomical Observatories (1980) 83 Guide for the lighting of sports events for colour television and film systems (1989) 92 Guide for floodlighting (1992) 115 Recommendations for the lighting of roads for motor and pedestrian traffic (1995) 126 Guidelines for minimizing Sky glow (1997) 129 Guide for lighting exterior work areas (1998) 136 Guide to the lighting of urban areas (2000) 150 Guide on the limitations of the effect of obtrusive light from outdoor lighting installations (2003) 154 The Maintenance of outdoor lighting systems (2003)
Department of Transport www.defra.gov.uk	Road Lighting and the Environment (1993) (Out of Print)
ILE Publications: www.ile.org	TR 5 Brightness of Illuminated Advertisements (2001) TR24 A Practical Guide to the Development of a Public Lighting Policy for Local Authorities (1999) GN02 Domestic Security Lighting, Friend or Foe
ILE/CIBSE Joint Publications ILE/CSS Joint Publications	Lighting the Environment – A guide to good urban lighting (1995) Seasonal Decorations – Code of Practice (2005)
Campaign for Dark Skies (CfDS) www.dark-skies.org	

NB: These notes are intended as guidance only and the application of the values given in Tables 1 & 2 should be given due consideration along with all other factors in the lighting design. Lighting is a complex subject with both objective and subjective criteria to be considered. The notes are therefore no substitute for professionally assessed and designed lighting, where the various and maybe conflicting visual requirements need to be balanced.

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