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External Lighting Design Jepco Norfolk House Farm Gedney Marsh Spalding PE 12 9PB, UK

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1. INTRODUCTION

This report has been prepared in support of a planning application for a new Argi tech development at Jepco Norfolk, specifically pertaining to the lighting installations and their effect on the surrounding Areas.

The proposed development is outlined in figure 1 below and it is intended to install the minimum artificial light to facilitate the safe operations in the hours of darkness and hence only the main approach road and service yards shall be lit. The glasshouse itself is fitted with a grow lamp system to facilitate year round growing however this area shall be completed with automatic blackout/light pollution controlling blinds interconnected with a Horticultural Management System [HMS].

These Light pollution screens will be a combination of horizontal and vertical screening, and will ensure minimal light emission rates of less than 0.1%, thus meeting regulatory obligations on light emission levels. The effects of the Glasshouse lighting have therefore been excluded from this report.



Figure 1 Site Layout



2 SITE LOCATION AND DESCRIPTION

The subject site of this particular planning permission is located to the east and adjoining the existing Norfolk Farm site and covers approximately 15 ha as per figure 1 above.

The site is currently in agricultural use and houses on its Western side one of a number of lagoons which are utilised as rainwater attenuation for storage in the growing processes.

The site is bounded on the North, East and West by additional Jepco holdings and on its South by the Main Road.

2.1 Proposed Development

The proposed development consists of the covering of 10 hectares of land to enable undercover growing within glasshouses and to support same with an integrated preparation, processing, storage and dispatch facility and the associated required infrastructure. The overall scope can therefore be sub divided into the following components:

- Main Glasshouse Area containing Hydroponic Growing System.
- Glasshouse Annex containing Seeding and Germination processes
- Main Pack Building.
- Administration and Welfare Building
- Main Plant Room
- External Roads & Hardstandings

3 DESIGN OVERVIEW

The external lighting will be designed in accordance with Chartered Institute of Building Services Engineers (CIBSE) code for external lighting (LG6), and will fulfil the categories of amenity, safety, and security. The lighting will be provided to enhance the security of the building with minimised impact on the surrounding environment and, wherever possible, the design will satisfy the minimum lighting level requirements, generally as follows: -

- 50 Lux average at floor level in Loading Bay
- 20 Lux average at floor level in car park
- 10 Lux average at floor level in perimeter & Walkways

The external lighting design will minimise, as far as practicable, light pollution into sensitive areas of to the natural environment in general.

ILE Guidance Notes for the Reduction of Obtrusive Light (2005) [1] has been considered and subject to Offaly County Council confirming the environmental zone classification for the exterior lighting, it is considered that category E2 is applicable, i.e., low district brightness areas such as rural, small village, or relatively dark urban locations.

Table 1 – Environmental Zones			
Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

The lighting design requirements will therefore have regard to the obtrusive light limitations for light trespass (into windows), source intensity (glare) and sky glow upward light ratio for an E2 Environmental Zone, in order to safeguard the sensitivities of the surrounding natural and built environment.

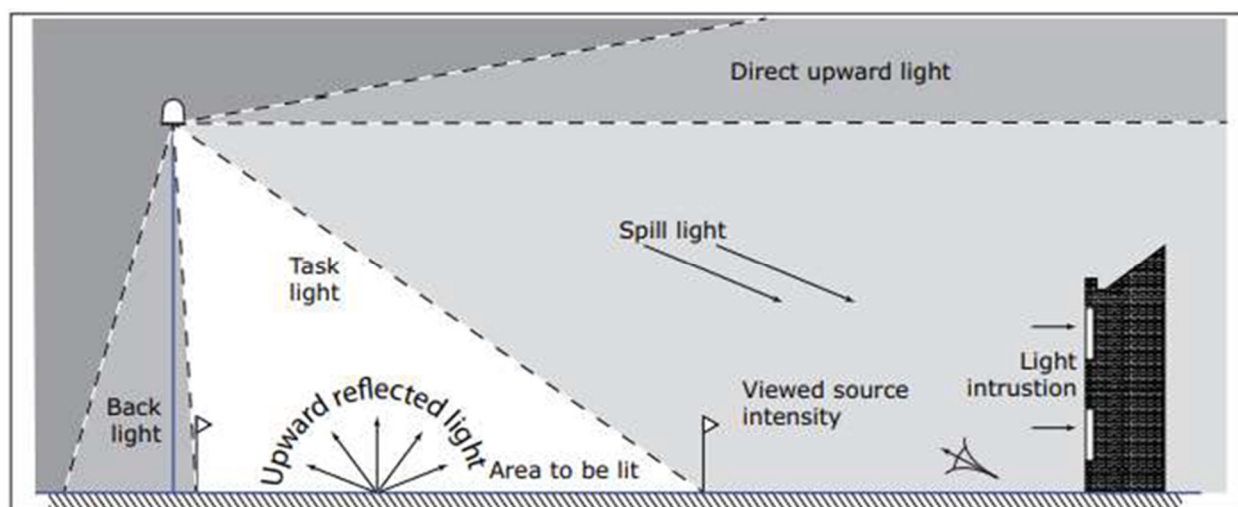


Figure 2 Types of intrusive light



This is to minimise the effects of installed lighting on neighbouring residential properties, ecological receptors and on the night-time setting and landscape.

Recommended illuminance levels will be achieved by selection of particular luminaire, lamp source and optical control.

All external lighting, excluding emergency luminaires, will be photo-electric cell and time switch controlled, with manual override from within the Packaging Building.

Following light are used for the external lights for design development.

1. Pole Mounted Street Light
 - a. AONIXLED/3 Street luminaire FLOODLIGHTING - Onix LED Street Light
 - b. AONIXLED/2 Street luminaire FLOODLIGHTING - Onix LED Street Light
2. Flood Light
 - a. AAZLEDIO0/ASY Rectangular projector FLOODLIGHTING - Aztec LED Asymmetric Floodlight

Calculations were performed using Lighting Reality Software. The software calculations are in conformance to EN13201:2015 Road lighting. Performance requirements.

4. GENERAL

The specifics of the installations have not yet been fully designed, but the following will form basis of final design.

- The luminaires are to be of good quality and high efficiency.
- The luminaires are to be complete with an LED source to promote energy conservation and efficiency.
- The luminaires will be complete with an LED source to eliminate the production of UV frequencies in adherence to the guidelines made within the Bat Conservancy Trust's Designing for Biodiversity .
- Car Park luminaires will be column or wall mounted, assumed at 8m to lantern. It can be demonstrably quantified that the use of lighting equipment mounted closer to the ground will be detrimental to the overall scheme because more lighting units will be required, the overall quantity of emitted light will be increased, and the lighting units will need to be angled up from horizontal to achieve the light distribution - all of which are contra-indicated in the Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations.
- External Light sources will be 30QQQK rather than the more normal 40QQQK in adherence to the guidelines made within the Bat Conservancy Trust ' s Designing for Biodiversity.
- Intelligent controls will be utilised

The exterior luminaires have been modelled to provide an adequate level of car park illumination to assist pedestrians to safely walk around and to/from the car park area only.

Lighting to loading bays and other items of main plant (Water storage tanks and loading bays for example) that have lighting adjacent have not been considered as this lighting will be used for maintenance or specific functions only and not left on for extended periods of time.

All the fittings considered have been photometrically tested and the photometric data provided and installed into lighting design software (as detailed below).

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

Signage Suitable directional luminaires fitted with appropriate accessories to avoid light spillage will be used to highlight the building mounted signs. Where possible, road lighting will be planned to light any signage as well as the road.

Localised lighting will only be used when the road lighting is deemed inadequate for the purpose.

Enhanced accent lighting will be provided at the main entrance area.

Any floodlighting will use asymmetric beam floodlights (as opposed to symmetric) orientated so that the glass is parallel to the ground will ensure that the light is cast in a downward direction and avoids horizontal spill.

Any security lighting will use a lamp of greater than 2000 lumens (150 W) and movement sensors will be aimed carefully to reduce the amount of time a light is on each night. This will be achieved in a system where the light unit and the movement sensor are able to be separately aimed. Any security lighting will be aimed to illuminate only the immediate area required by using as sharp a downward angle as possible. This will assist in avoiding any unnecessary light spill onto adjacent unlit areas and habitat utilised by foraging and bat species

In environmentally sensitive areas, such as areas known to have roosting bats (if any), lighting will be positioned to avoid unnecessary light spill, glare and the upward loss of light towards such sensitive areas.

5. GLASSHOUSE LIGHTING & LIGHT POLLUTION

The Glasshouse is to be complete with automatic blackout/light pollution controlling blinds interconnected with a Horticultural Management System [HMS] which will restrict the light that would otherwise have spilled out from the glasshouse.

Light pollution screens will be used in a combination of horizontal and vertical screening, as our client will be growing crops using supplementary lighting. Real Leaf Farms will be meeting regulatory obligations on light emission by installation light pollution screens ensure minimal light emission and depending on the type of screen cloth, emission rates of less than 0.5% are achievable.

Through the use of light pollution screens, the light intensity of the supplementary lighting can be retained within the greenhouse. Furthermore, the light pollutions screens open structure, in combination with good ventilation, helps control moisture and warmth."

The below blind is to be installed on both the horizontal and vertical planes of the glass house this would offer the following benefits:



OBSCURA 10070 FR WB+BW

Product information

Application	Inside
System	Hanging, Sliding
Feature	Light deprivation / blackout, Energy saving
Flame retardant	Yes
Material	Polyolefin 66%, Polyester 34%
Pattern	Full plastic
Warranty	Warranty five (5) years under all types of greenhouse covering. See Svensson's limited warranty for all terms, conditions and exclusions in writing.

Properties	Value	Unit	Test Methods
Shading level in diffused light PAR**	99.9	%	Svensson method
Shading level in direct light PAR**	99.9	%	Svensson method
Energy saving	70	%	Svensson method
Width of strips	4	mm	
Weight	198	g/m ²	

Figure 3 Ref: OBSCURA 10070 FR WB+BW

- Reduced energy requirements
- Ultra-low light pollution emission rates of less than 0.5%

Growing lights and/or other lights designed to provide anything other than emergency lighting shall not be operated within the glasshouses in darkness hours except at times when blackout blinds are fully employed . This will be ensured by the use of the Horticultural Management System and therefore the glasshouse lighting has not been considered as part of this report as it will comply with the requirements of the environmental zone restrictions.

6. LIGHTING CONTROLS

A system of intelligent lighting controls will be utilised to provide not only timeclock/photocell based activation of the lighting, but also movement based activation. The lighting will therefore be set out as below:

- A photocell will be provided for luminaires, either within a NEMA socket (or similar) on the lanterns or wall mounted for any building mounted luminaires. This will detect the natural light levels and prohibit the lights from being energised when there is sufficient natural light.
- The circuits will be connected through a timeclock that will further restrict the hours of operation to pre-set times only.
- When the lights are energised, they will turn on to a pre-set dimmed level, 20% of maximum output. This is the normal state of operation of the lighting and will be the state it is set to unless movement is detected.
- If movement is detected, for example, a car arrives in the car park or someone exits the main entrance of the building, the local lighting will ramp up the output to its maximum value of 100%. As more and more luminaires detect movement, then the corresponding fittings will also increase their outputs.
- The movement detection will trigger an internal clock that counts down to 0, at which point the luminaire reverts to the standard 20% output. At any point in the countdown process any further movement detection will trigger the internal clock to reset to maximum and countdown again.
- The internal clock can be adjusted, but it is suggested it is set to 10 minutes initially.

7. LIGHT SOURCES

All of the luminaires selected for this project use LED light sources, which have excellent colour rendering, efficacy and survival characteristics.

Where LED light sources are specified, we take great care to ensure that not only the LEDs, but their drivers and associated controls are all made to a high standard by reputable, recognized manufacturers.

The minimum standards we accept for LED light sources are L70 rating at 50,000 hrs (at least 70% output after 50,000 hours of operation) , and a colour rendering performance of at least Ra 80. We will specify colour temperatures of light sources, to try to ensure that the various types of lamp used in any area match each other and suit the appearance and function of the area.

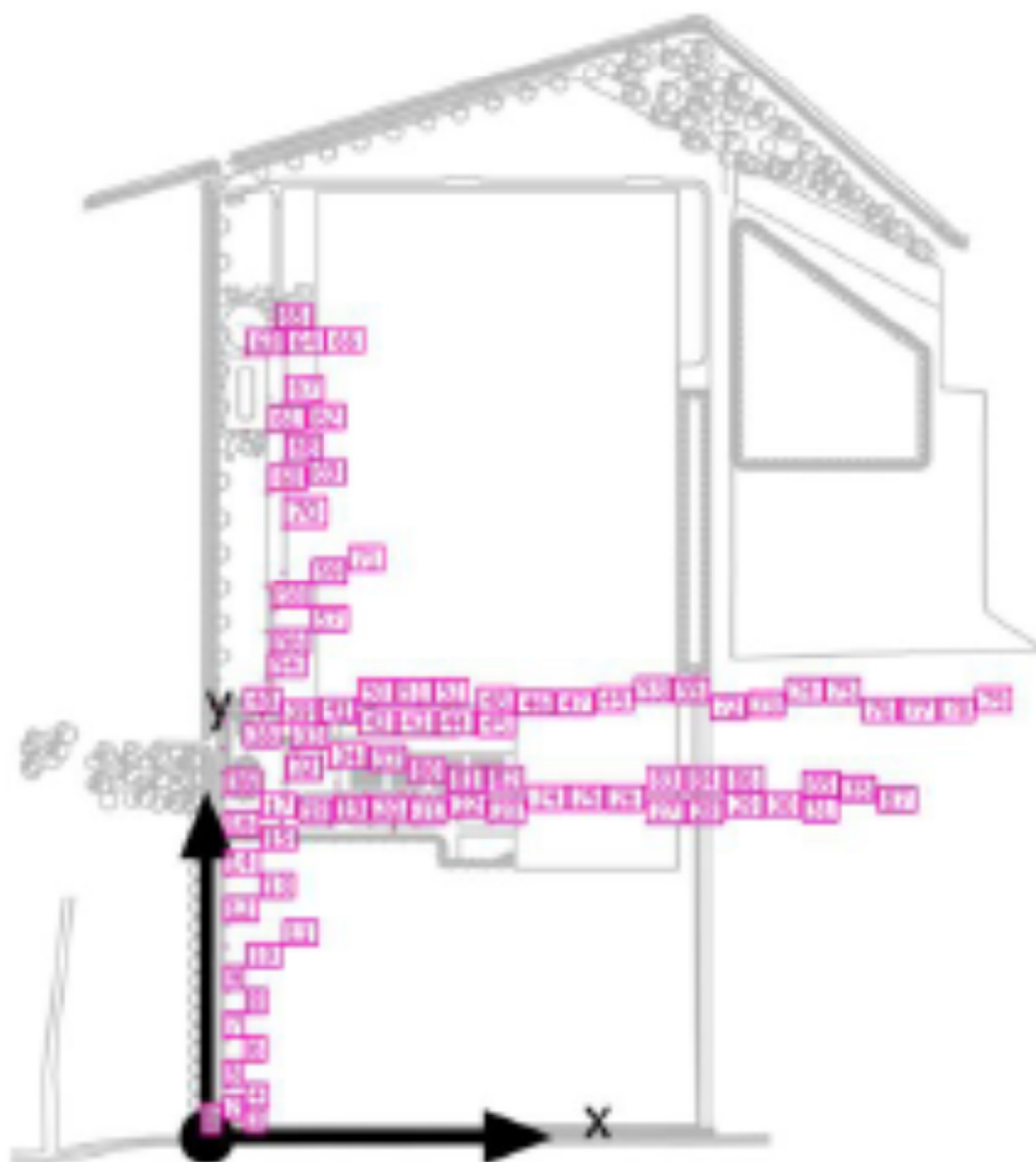


Figure 4 Luminaire Locations

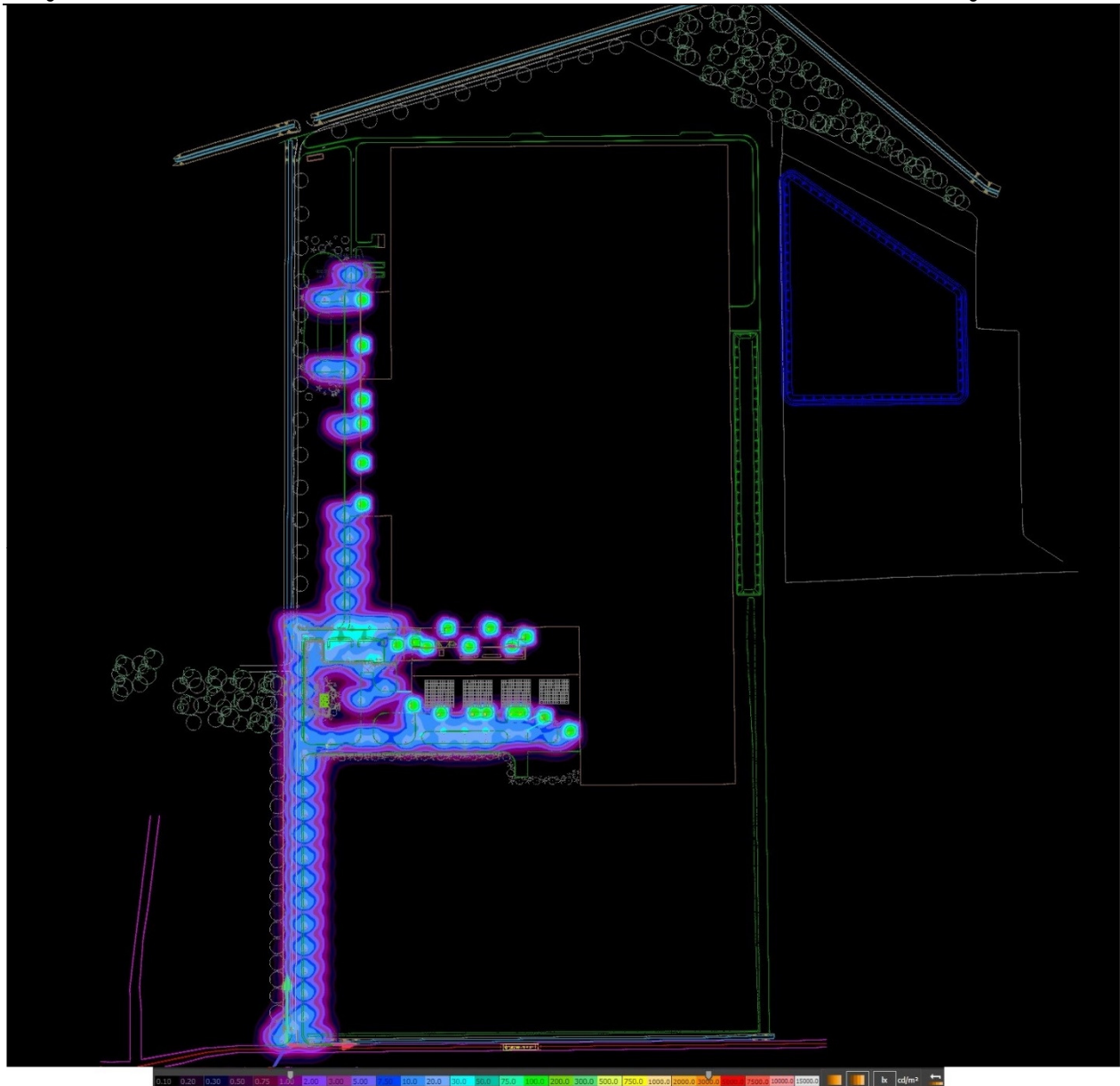


Figure 5 Overall Site Lighting Levels

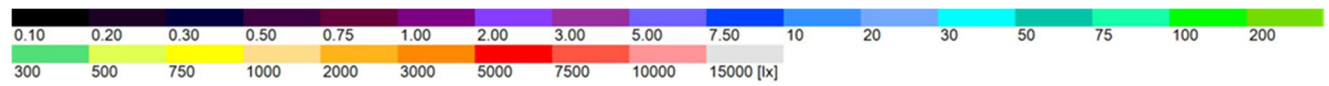
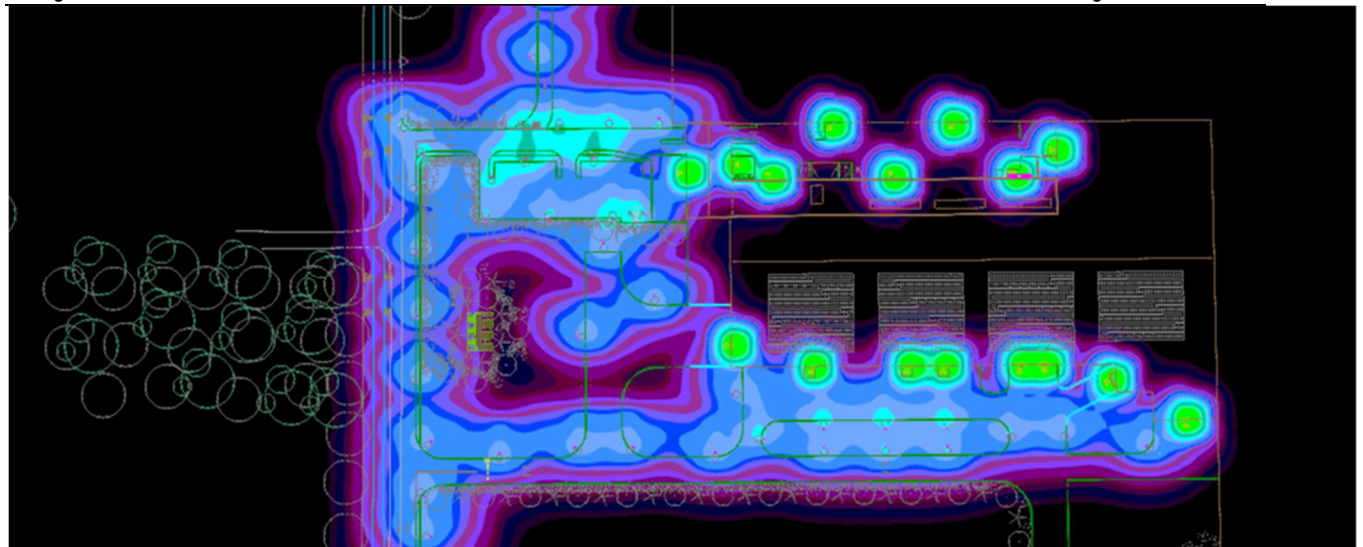


Figure 6 Service Yard Lighting Levels

9 LIGHT FITTING SPECIFICATION

Manufacturer: ANSELL



AONIXLED/3 Street luminaire FLOODLIGHTING - Onix LED Street Light

AONIXLED/3
FLOODLIGHTING
Onix LED Street Light
LED 60W - Cool White

Supplied c/w Integral Driver

- Die-cast aluminium construction for optimal heat dissipation for optimal performance
- UV stabilized polycarbonate cover
- Toolless gear tray removal for ease of maintenance
- Built in anti-tamper isolation facility
- Compatible with post top or side entry utility 76mm spigot
- IK10 Rated
- G3 Glare Rating
- Surge protection
- Available in standard, complete with photocell option
- LED lifespan L70 50,000 hours

Options

/PC Electronic Photocell

Accessories

AONIXLED/SBA 48-60mm Spigot Bracket

Operating Temp -20°C to 50°C

- 5 Year Product Warranty
- IP66

Luminaire data

Absolute Photometry

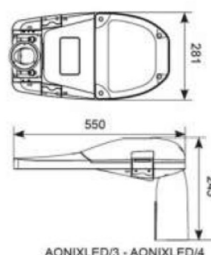
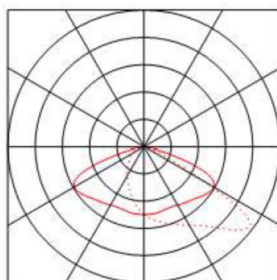
Luminaire efficacy	: 102.78 lm/W
Classification	: A30 ↓ 100.0% ↑ 0.0%
CIE Flux Codes	: 37 76 99 100 100
UGR 4H 8H	: 33.8 / 22.1
Control gear	: Electronic ballast
Power	: 60 W
Luminous flux	: 6167 lm

Dimensions

: 550 mm x 281 mm x 95 mm

Equipped with

Quantity	: 1
Designation	: LED
Colour	: --
Socket	: --
Colour reproduction	: 1B/80...89



AONIXLED/3 - AONIXLED/4

Manufacturer: ANSELL



AONIXLED/2 Street luminaire FLOODLIGHTING - Onix LED Street Light
AONIXLED/2
FLOODLIGHTING
Onix LED Street Light
LED 40W - Cool White

Supplied c/w Integral Driver

- Die-cast aluminium construction for optimal heat dissipation for optimal performance
- UV stabilized polycarbonate cover
- Toolless gear tray removal for ease of maintenance
- Built in anti-tamper isolation facility
- Compatible with post top or side entry utility 76mm spigot
- IK10 Rated
- G3 Glare Rating
- Surge protection
- Available in standard, complete with photocell option
- LED lifespan L70 50,000 hours

Options

/PC Electronic Photocell

Accessories

AONIXLED/SBA 48-60mm Spigot Bracket

Operating Temp -20°C to 50°C

- 5 Year Product Warranty
- IP66

Luminaire data

Absolute Photometry

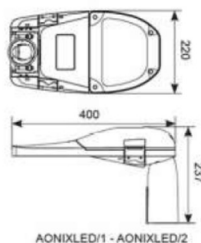
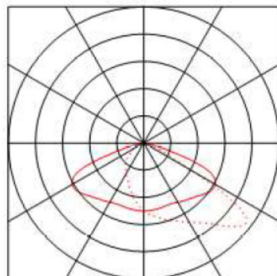
Luminaire efficacy	: 98.4 lm/W
Classification	: A30 ↓100.0% ↑0.0%
CIE Flux Codes	: 37 77 99 100 100
UGR 4H 8H	: 34.3 / 22.7
Control gear	: Electronic ballast
Power	: 40 W
Luminous flux	: 3936 lm

Dimensions

: 400 mm x 220 mm x 95 mm

Equipped with

Quantity	: 1
Designation	: LED
Colour	:
Socket	:
Colour reproduction	: 1B/80...89



Manufacturer: **ANSELL**



AAZLED100/ASY Rectangular projector FLOODLIGHTING - Aztec LED Asymmetric Floodlight

AAZLED100/ASY
FLOODLIGHTING
Aztec LED Asymmetric Floodlight
LED 100W - Cool White

Supplied c/w Integral Driver

- High performance die-cast aluminium LED floodlight
- High output, high efficiency asymmetric lens technology for anti-light pollution
- Pre-installed breathable gland prevents condensation
- High specification IP66, IK08 ratings
- 60x120° beam angle
- 100W exceeds performance of 150W HQL-TS
- Pre-wired with 1.5 metre of rubber insulated cable for ease of installation
- LED lifespan L80 B10 54,000 hours
- Non-dimmable

Option
/PIR

Operating Temp -30°C to 50°C

- Suitable for external use
- 5 Year Product Warranty
- IP66

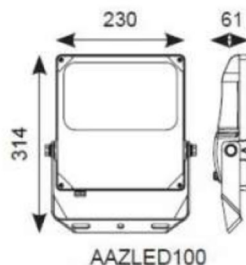
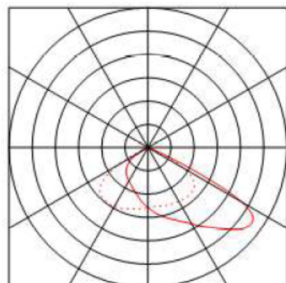
Luminaire data

Absolute Photometry	:	142.65 lm/W
Luminaire efficacy	:	A40 ↓ 100.0% ↑ 0.0%
Classification	:	43 88 99 100 100
CIE Flux Codes	:	37.9 / 32.3
UGR 4H 8H	:	Electronic ballast
Control gear	:	100 W
Power	:	14265 lm
Luminous flux	:	

Dimensions : 202 mm x 120 mm x 1 mm

Equipped with

Quantity	:	1
Designation	:	LED single 84l
Colour	:	--
Socket	:	--
Colour reproduction	:	--



AAZLED100



10 CONSULTATION

This Outline lighting plan fulfills the requirements of the operational site whilst also eliminating light pollution from the local area, final designs and implementation must be agreed with South Holland District Council prior to installation.