

BUILDINGS AND BUILT ENVIRONMENT

Avant Homes (England) Ltd
Calver Lane
Dodworth
Lighting Impact Assessment

BUILDINGS AND BUILT ENVIRONMENT

Avant Homes (England) Ltd Calver Lane Lighting impact Assessment

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1. INTRODUCTION

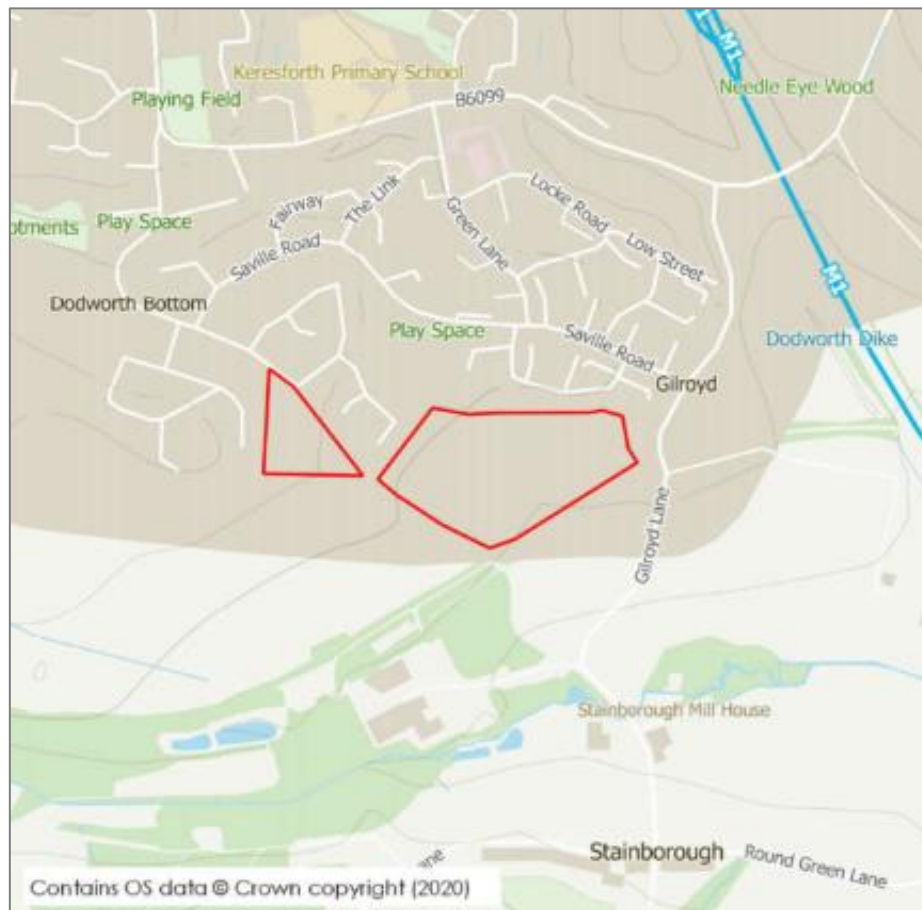
Instruction

- 1.1 BWB Consulting Limited (BWB) was instructed by Avant Homes (England) (the Client) to undertake a lighting impact assessment to support the planning application for a proposed residential development in Dodworth, Doncaster ('the Site').

Proposed Development

- 1.2 The proposed development comprises the construction of 198 houses off Calver Close, Dodworth, Doncaster.
- 1.3 **Figure 1** below shows the site location.

Figure 1. Site Location



Objectives

- 1.4 This report has been produced to identify the impact of the proposed external lighting installation on the existing site environment and the wider locality.
- 1.5 A lighting installation is required to enable users to operate safely and reduce the fear of crime. Lighting is needed for both pedestrians and vehicle drivers. For pedestrians, lighting for good viewing conditions and avoidance of dark areas is necessary. For vehicle drivers the emphasis is on good lighting for vehicle movement and use of roads.
- 1.6 This report reviews the potential effects of new lighting and reviews methods of lighting the proposed external areas while limiting potentially obtrusive effects to receptors that may have a negative response to a change in their lighting condition. Nearby residential properties and wildlife / habitat which are found on, near or utilising the site are typical receptors considered for analysis.

Scope of Works

- 1.7 The Scope of work includes:
 - Identification and assessment of receptors and their sensitivity.
 - Identification of required / anticipated lighting provisions for the proposed development; and
 - Assessment of the potential effects created by a new lighting strategy with respect to the baseline condition.

2. RELEVANT POLICY AND GUIDANCE

International guidance

Commission Internationale De L'Eclairage (CIE 150)

- 2.1 The purpose of this guide is to help formulate guidelines for assessing the environmental effects of outdoor lighting and to give recommended limits for relevant lighting parameters to contain the obtrusive effects of outdoor lighting within tolerable levels. As the obtrusive effects of outdoor lighting are best controlled initially by appropriate design, the guidance given is primarily applicable to new installations; however, some advice is also provided on remedial measures which may be taken for existing installations. This guide refers to the potentially adverse effects of outdoor lighting on both natural and man-made environments for people in most aspects of daily life, from residents, sightseers, transport users to environmentalists and astronomers.

Guidelines for Minimising Sky Glow (CIE 126)

- 2.2 These guidelines prepared by Commission Internationale De L'Eclairage provide general guidance for lighting designers and policy makers on the reduction of sky glow. The report gives recommendations about maximum permissible values for lighting installations. These values must be regarded as limiting values. Lighting designers should seek to meet the lowest specifications for the design. Other uses of the open air areas at night will usually result in less stringent sky-glow requirements. Practical implementation of the general guidance is left to National Regulations.

National guidance

National Planning Policy Framework (2021)

- 2.3 The Revised National Planning Policy Framework (NPPF) provides guidance relating to planning and pollution control for new development in England. The purpose of the planning system is to contribute to achievement of sustainable development. In relation to lighting, Paragraph 185 states: "Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation"

DEFRA's Lighting in the Countryside: Towards Good Practice (2001)

- 2.4 The Office of the Deputy Prime Minister (ODPM – now Department for Communities and Local Government) in conjunction with the Countryside Commission published 'Lighting in the Countryside: Towards Good Practice' in July 1997, and a revised issue in 2001. The guidance was developed to 'provide practical advice on the prevention and control of lighting effects through appropriate action by all those involved with lighting in the countryside'. Its objective is 'to identify good practice in the planning and design of lighting in rural areas; and advise on how it can be achieved, using case study examples'. The guide aims to provide an overview and common understanding of all aspects of good lighting practice stating that close co-operation and participation is

required for all those involved in planning, designing and installing lighting schemes. The guidance provides valuable information on lighting best practice and the standard methodology outlined in this guidance document has been followed as part of this assessment. Whilst the guidance relates to 'lighting in the countryside', it is considered best practice to adopt many of the principles contained within the guidance to sites of a more urban nature.

Institute of Lighting Professionals (ILP) Guidance Notes for the Reduction of Obtrusive Light (2021)

- 2.5 The ILP has proposed lighting guidance and criteria for local authorities with a recommendation that they are incorporated at the local plan level. The guidance defines various forms of light pollution and describes a series of environmental zones (similar to the CIE 150 environmental zones). The ILP guidance provides suitable criteria against which the effects of artificial lighting can be assessed and is used in this assessment.
- 2.6 The ILP Guidance Notes recommends that the immediate environment is classified systematically as shown in **Table 1**. ILP Guidance Notes then make recommendations for limiting obtrusive light according to the environmental zone in which the lighting would be situated. The stringency depends on the capacity to absorb lighting effects, with Zone E0 requiring the strictest level of control and E4 the lowest.

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

- 2.7 For each Environmental Zone, recommended obtrusive light limits for exterior lighting installations have also been determined. These are summarised in **Table 2**.

Table 2. Obtrusive Light Limitations for Exterior Lighting Installations

Light Technical Parameter	Application Conditions	Environmental Zones				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (E _v)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx	1 lx	2 lx	5 lx
Upward light ratio (ULR) %		0	0	2.5	5	15

Institute of Lighting Professionals (ILP) Guidance Note 08 for Bats and artificial lighting in the UK (2018)

- 2.8 This document is aimed at lighting professionals, lighting designers, planning officers, developers, bat workers/ecologists and anyone specifying lighting. It is intended to raise awareness of the impacts of artificial lighting on bats, and mitigation is suggested for various scenarios.

British Standards

BS 5489: Code of Practice for the Design of Road Lighting – Part 1: Lighting of Roads and Public Amenity Areas (2020)

- 2.9 BS 5489 Part 1 provides recommendations on the general principles, aesthetic and technical aspects of road lighting and advises on statutory provisions, operation and maintenance of lighting. The standard provides recommendations for the design of lighting for all types of highways and public thoroughfares, including those specifically for pedestrians and cyclists, and for pedestrian subways and bridges.

BS EN 12464-2: Lighting of Workplaces, Outdoor Workplaces (2014)

- 2.10 BS EN 12464-2 focuses on the recommendations for outdoor workplaces that are used at night. BS EN 12464-2 includes important recommendations on how obtrusive light can be limited to keep night skies free of light pollution.

Local guidance

Barnsley Metropolitan Borough Council (BMBC) Local Plan

- 2.11 The Local Plan sets out the key elements of the planning framework for Barnsley, and the approach to its long term physical development to achieve the Council's vision of what sort of place Barnsley wants to become.
- 2.12 Policy 12 in the adopted local plan is about transport; referring to policy 12.27 makes note that people need to feel safer when in the environment, and lighting will improve the safety when on public transport: "To encourage people to make smarter choices, they need to feel safe when walking, cycling, and using public transport. Improvements might include closed circuit television (CCTV), improved lighting... and any other measures introduced as part of providing a secure environment."

- 2.13 Policy Poll1 refers to Pollution Control and Protection states that "Development will be expected to demonstrate that it is not likely to result, directly or indirectly, in an increase in air, surface water and groundwater, noise, smell, dust, vibration, light or other pollution which would unacceptably affect or cause a nuisance to the natural and built environment or to people."
- 2.14 Policy BTC4 refers to Improving Public Spaces and states that: "significant new developments in the town centre must improve the quality of the town centre's streetscape and public spaces for everyone's benefit. Public space improvements include such things as surfacing, street furniture, boundary treatments, paving, lighting benches, litter bins, signage and public art"

Guidance from the Appointed Ecologist

- 2.15 The Appointed Ecologist has identified the treeline on the southern boundary as a key area for bat foraging and has recommended a dark corridor is maintained here.
- 2.16 The Appointed Ecologist recommended that a good practice lighting regime should be used to avoid light spill onto adjacent retained habitats. The lighting should be based upon latest guidelines and should follow the recommendations of Institute of Lighting Professionals (ILP) Guidance Note 08 for Bats and artificial lighting in the UK (2018).

3. LIGHT POLLUTION

3.1 Light pollution is a generic term for all the adverse impacts that artificial lighting can have after dark. This section describes the three main types of direct effects that can be created by a new lighting installation, these are:

- i. Light spill.
- ii. Sky Glow; and
- iii. Glare.

Types of Light Pollution

Light Spill

- 3.2 Light spill is 'the spilling of light beyond the boundary of the site on which a light source is located', such that it causes a noticeably adverse effect. More simply, light spill is often termed as the intrusion of light into homes. It can also have a negative effect on wildlife and ecological systems local to an installation.
- 3.3 As set out in the ILP Guidance Notes, the limits for light spill vary according to the environmental zone of the existing location and have been set to encourage appropriate lighting design. Through careful design, it can readily be ensured that this impact is prevented and that the illumination falling within any residential property can be reduced to zero. This is incorporated into the Lighting Strategy contained within this report.

Sky Glow

- 3.4 Sky glow is the 'the brightening of the night sky' above illuminated areas. The brightness created is constantly varying as a function of many parameters such as direct upward-lighting, ground surface reflectance, overhead cloud cover, and the degree of water droplets in the atmosphere - rain, fog/mist, and snow, for example, exacerbate the effect.
- 3.5 Mitigation is achieved by complying with the recommended limits in the ILP Guidance Notes for upward light emission. The limits vary according to the environmental zone of the existing location and have been set to encourage appropriate lighting design. The Lighting Strategy will ensure that these limits can be met for the Proposed Development.
- 3.6 To mitigate sky glow as much as possible, lighting must be accurately targeted and kept to a minimum, and this design principle is incorporated into the Lighting Strategy.
- 3.7 The magnitude of the impact is a matter of judgement, taking into account the existing night-time view. The magnitude is lessened for those views where an observer is subject to direct illumination from, say, a nearby streetlight, or where light spill from a nearby light source illuminates the foreground, because the observer's vision is not fully dark adapted.

Glare

- 3.8 Glare occurs when an individual experiences visual discomfort or disability stemming from direct views of lamp sources, or high contrast of a lighting installation against a dark background. The placement of luminaires, their photometric characteristics, and the viewing context contribute to glare, which has been noted to result from uncontrolled private lighting installations, security lighting, street lighting mounted at high level near residences or habitat.

Design Aspects

Building Luminance

- 3.9 This considers the appropriateness and scale of brightness for the lighting / highlighting of built structures. Design criteria is included within ILP guidance notes as more of a main effect. While this is addressed independently, building luminance can also be considered as an indirect contributor to light spill, sky glow and glare.

Light Levels

- 3.10 Light levels, both as designed and installed, have the potential to create areas which have a noticeable difference in brightness. A new lighting installation in an area that has not been lit or is significantly brighter than the surrounding area may affect both adjacent receptors in the form of light spill or glare, and those over a larger area by contributing to sky glow through over-lighting.

Light Colour

- 3.11 Light colour has the potential to alter an individual's perception of their environment with respect to colour and clarity, as the human eye responds best to whiter light with higher quantities of ultraviolet wavelengths. Various wildlife species may respond differently to spectral composition depending on how reliant they are on darkness; many nocturnal animals continue their social habits and feeding behaviours with increased activity in the area while others may decrease their activity and possibly desert their habitat. This type of impact could affect pedestrians, vehicle operators and wildlife, and is likely to occur where new lighting is placed.

4. BASELINE

- 4.1 This section provides a review of the existing conditions at the site. The review is based on a desktop study using Google Earth satellite and street view imagery.
- 4.2 The development comprises two parcels of land, west and east.
- 4.3 The west site is bound to the east and west by existing residential development. To the south lies open fields.
- 4.4 The east site is bound to the north and west by existing residential development. To the south lies Smithywood Lane and a row of trees with the Trans Pennine Trail and open fields beyond.

On-site lighting

- 4.5 No artificial lighting is currently located on the site.

Off-site lighting

- 4.6 The adjacent existing residential developments appear to be illuminated via 5m column mounted LED type luminaires. Smithywood Lane and The Trans Pennine trail are unlit.
- 4.7 **Figure 2** shows an aerial view of the proposed site.

Figure 2. Aerial View



Environmental Zone

- 4.8 Following the baseline lighting survey, it was concluded that the development is in a suburban location and the proposed development site should be classified as 'Environmental Zone E2 – Low district brightness area, in accordance with the ILP guidance limits outlined within **Table 1**. Therefore, with reference to **Table 2**, the worst case permitted light trespass limit at an offsite receptor in the pre-curfew period (typically considered to be 07:00-23:00) is 5 lux and in the post curfew period (typically considered to be 23:00-07:00) is 1 lux. The maximum upward light ratio (ULR) is 2.5%.

5. PROPOSED DEVELOPMENT

Proposed Site Lighting

5.1 A lighting design has been prepared that reflects:

- Environmental requirements and the applicable guidance / standards.
- Local Authority requirements
- Technical requirements and the applicable guidance / standards; and
- Appropriate selection of lighting typologies to suite the above.

5.2 The proposed lighting comprises high quality 6m high column mounted LED luminaires, providing illumination to meet the recommendations of BS 5489-1 Code of practice for the design of road lighting Part 1: Lighting of Roads and Public Amenity Areas. The design has been produced to provide illuminance at Lighting Class P4 (5 Lux average, 1 Lux minimum).

5.3 **Table 3** illustrates the design lighting levels meet target levels for lighting Class P4 without over lighting.

Table 3. Proposed External Lighting Design Levels

Area	Target		Design	
	Maintained Illuminance Em (Lux)	Minimum Illuminance Em (Lux)	Maintained Illuminance Em (Lux)	Minimum Illuminance Em (Lux)
East Site	5	1	5.38	1
West Site	5	1	5.88	1.1

5.4 Luminaires close to or adjacent to site boundaries generally face the opposite direction, providing light to be targeted into the site. A lower wattage luminaire with a specific optic has been proposed on the southeast of the eastern site adjacent to the treelines containing value to the local habitat to minimise light spill.

5.5 The proposed luminaires are 2700K colour temperature in accordance with accordance to Institute of Lighting Professionals (ILP) Guidance Note 08 for Bats and artificial lighting in the UK (2018).

5.6 The lighting design layout is included in **Appendix 2**. The lighting lux plot layout is included in **Appendix 3**. Literature from the manufacturer of the proposed luminaire types is included in **Appendix 4**.

Operational Effects

- 5.7 The effects of the proposed lighting are considered to be long-term and permanent in nature.
- 5.8 A lighting design has been included to show the required lighting levels can be achieved whilst still minimising any associated light spill within the limits of the applicable guidance.
- 5.9 The design reflects the luminaire characteristics and recommended environmental constraints established in this report.
- 5.10 Key considerations of the proposed development lighting include incorporation of a thoughtful design which does not provide light to areas which have a confirmed requirement for strict light control.
- 5.11 The effects created by light spill is expected to be generally negligible to minor adverse with respect to light spill, and minor to moderate adverse with respect to sky glow. This has been minimised as far as practicable by utilising luminaires with 0% upward light ratio (ULR) and achieving the required levels with no additional tilt to the head position, so a true flat glass installation. This complies with the ILP Guidance Notes.
- 5.12 Vertical calculation surfaces have been included to simulate existing residential properties on Calver Close and Rockingham Road. The calculation shows 0 Lux vertical illumination. This complies with the ILP Guidance Notes.

6. RECOMMENDATIONS

- 6.1 All external lighting, whether for the construction or operation phase, must comply with the recommended limitations given in the ILP Guidance Notes for an Environmental Zone E2 location. The limits, set out in Table 2, prohibits excessive emission of upward light and helps to minimise light spill and glare.
- 6.2 Light colour should be addressed as part of the overall approach to the masterplan lighting design. Whiter light tends to be recommended for increased visual clarity for people driving and walking, so can be expected to be most appropriate for the proposed development. The light colour should take due account of the existing neighbouring residential areas to ensure continuity as required.
- 6.3 Spectral composition is somewhat related to light colour, but the effects are not always immediately apparent. It is desirable for light quality, safety and wildlife effect limitation purposes to use LED technology. LEDs present good working efficacy, a smaller light emitting area which is good for light control and spectral compositions which are less disturbing to nocturnal wildlife or their food sources than UV rich traditional light sources.
- 6.4 The use of horizontal cut-off luminaires installed at minimal tilt with flat glass lenses, back reflectors and internal optics is recommended to limit views of the lamp, control glare and direct light in a controlled pattern. This will help to minimise potential glare, sky glow and light spill.
- 6.5 New generation LED light sources are recommended for new external lighting.
- 6.6 Wattages shall achieve required light levels without over-lighting.

7. CONCLUSION

- 7.1 A review has been made of the potential impact created by new lighting in relation to the proposed development.
- 7.2 Legislation, British standards, and good practice guidance indicate the development requires new exterior lighting for purposes of vehicular and pedestrian safety.
- 7.3 The likely significant effects created by new lighting indicate effective management of direct lighting effects can be achieved.
- 7.4 Potentially significant effects from the proposed lighting on sensitive receptors can be managed to create a negligible night-time impact.
- 7.5 The lighting design presented indicates the potential significant effects from new lighting for the proposed development can be adequately managed and all tested parameters are expected to meet recommended guidance benchmarks.
- 7.6 The indicative lighting design presented indicates the proposed lighting installation can achieve the required minimum lighting levels and distribution to meet the applicable standards while causing negligible light trespass to the adjoining land.
- 7.7 The impact of the proposed development lighting is considered to be negligible with respect to sensitive receptors. The most noticeable effect due to the proposed lighting installation expected to remain is sky glow.

APPENDICES

APPENDIX 1: Proposed Development Masterplan

APPENDIX 2: Proposed External Lighting Layout



Qty	Range	Light Source	Lamp Lumens	Circuit Watts	Lm/W	LOR	Luminaire Lumens	ULOR	Upward Lmns	RA	ART Hour Per Day	CO ₂ Calculation for year
30	Italo 1	STE-M - S25mA 1 Module	2510	21	122.44	100.0%	75300	0.0%	0	70	12	CO ₂ (Tonnes)
1	Italo 1	S05 - S25mA 1 Module	1800	16	112.50	100.0%	1800	0.0%	0	70	12	Kwh/Year

Total Installation Lumens	77100.00	Total ULR	0.00%
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Table 1 compliance

Environmental zone	E2
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Sky Glow	Target	Achieved	Status
	2.50%	0.00%	Pass

Source Intensity (candelas)			
Pro curfew	7,500	156	Pass
Post curfew	500	156	Pass

Light Trespass into windows (Lux)			
Pro curfew	5	0	Pass
Post curfew	1	0	Pass

Building Luminance (cd/m²)	5		
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Compliance Status		
Pro 04	Reduction of night time light pollution	Pass
Ena 03	Energy efficient external lighting	Pass
Ena 01	Internal and external lighting levels	Pass

Note - HBA01 in this report only applies to exterior lighting

Luminaire Schedule	Symbol	Qty	Label	Arrangement	LLF	Description
30	A	1	A	SINGLE	0.900	20 xw LED 2700K (1 module) S25mA Italo 1 with STE-M Optic column mounted at 6m
1	B	1	B	SINGLE	0.900	16w LED 2700K (1 module) S25mA Italo 1 with S05 Optic column mounted at 6m

Calculation Summary	Label	CalcType	Units	Avg	Max	Min	MinAvg	MinMax
East Road Site	East Road Site	Illuminance	Lux	5.38	19.8	1.0	0.19	0.05
West Road Site	West Road Site	Illuminance	Lux	5.88	19.3	1.1	0.19	0.06
ObtrusiveLight_1_III_Seg1	ObtrusiveLight_1_III_Seg1	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_2_III_Seg1	ObtrusiveLight_2_III_Seg1	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_2_III_Seg2	ObtrusiveLight_2_III_Seg2	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_3_III_Seg1	ObtrusiveLight_3_III_Seg1	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_4_III_Seg1	ObtrusiveLight_4_III_Seg1	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_5_III_Seg1	ObtrusiveLight_5_III_Seg1	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_6_III_Seg1	ObtrusiveLight_6_III_Seg1	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_6_III_Seg2	ObtrusiveLight_6_III_Seg2	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_7_III_Seg1	ObtrusiveLight_7_III_Seg1	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_7_III_Seg2	ObtrusiveLight_7_III_Seg2	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.



- Notes
- Do not scale this drawing. All dimensions must be checked verified on site. If it should ask.
 - This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
 - All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
 - Any discrepancies noted on site are to be reported to the engineer immediately.

Key Plan

Legend

P1	11.11.21	Preliminary Issue	GCL	DA
Rev	Date	Details of issue / revision	Dwn	Rev

Issues & Revisions

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Client
Avant Homes (England) Ltd

Project Title
**Calver Lane
Dodworth**

Drawing Title
**Electrical Services
Proposed External Lighting
Layout
Proposed Site Plan**

Drawn:	G. C. Leeming	Reviewed:	D. Alastair
BWB Ref:	LDP2520	Date:	28.10.21
Scale:	As Shown	Scale:	As Shown

Drawing Status
PRELIMINARY

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
CLD-BWB-00-XX-DR-E-2300	S2	P1

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U:\LDP\2520_Calver Lane_Dodworth\02 - Project Delivery\01 - WIP\Drawings\CLD-BWB-00-XX-DR-E-2300-S2-P1_Proposed External Lighting Layout_Proposed Site Plan.dwg

APPENDIX 3: Proposed External Lux Plot Layout



Qty	Range	Light Source	Lamp Lumens	Circuit Watts	Lm/W	LOR	Luminaire Lumens	ULOR	Upward Lmms	RA	ART Hour Per Day	CO ₂ Calculation for year
30	Italo 1	STE-M - S25mA 1 Module	2510	21	122.44	100.0%	75300	0.0%	0	70	12	CO ₂ (Tonnes)
1	Italo 1	S05 - S25mA 1 Module	1800	16	112.50	100.0%	1800	0.0%	0	70	12	Kwh/ hour

Total Installation Lumens	77100.00	Total ULR	0.00%
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Table 1 compliance

Environmental zone	E2
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Sky Glow	Target	Achieved	Status
	2.50%	0.00%	Pass

Source Intensity (candelas)			
Pro curbew	7,500	156	Pass
Post curbew	500	156	Pass

Light Trespass into windows (Lux)			
Pro curbew	5	0	Pass
Post curbew	1	0	Pass
Building Luminance (cd/m²)	5		

Compliance Status		
Part 04	Reduction of night time light pollution	Pass
Ena 03	Energy efficient external lighting	Pass
Ena 01	Internal and external lighting levels	Pass

Note - H&M1 is the report only applies to exterior lighting

Total CO ₂ per year (Tonnes)	0.64
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Total Electrical consumption (Kwh)	0.63
------------------------------------	------

Total Electrical consumption per year (Kwh)	2,763.78
---	----------

Average luminaire lumens per circuit Watt	122.19
---	--------

Luminaire Schedule					
Symbol	Qty	Label	Arrangement	LLF	Description
	30	A	SINGLE	0.900	20 Watt LED 2700K (1 module) S25mA Italo 1 with STE-M Optic column mounted at 6m
	1	B	SINGLE	0.900	16W LED 2700K (1 module) S25mA Italo 1 with S05 Optic column mounted at 6m

Calculation Summary									
Label	CalcType	Units	Avg	Max	Min	MinAvg	MinMax		
East Road Site	Illuminance	Lux	5.38	19.8	1.0	0.19	0.05		
West Road Site	Illuminance	Lux	5.88	19.3	1.1	0.19	0.06		
Obscurelight_1_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_2_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_3_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_4_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_5_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_6_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_7_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_8_III_Seg2	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_9_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_10_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_11_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_12_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_13_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_14_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_15_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_16_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_17_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_18_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_19_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_20_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_21_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_22_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_23_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_24_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_25_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_26_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_27_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_28_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_29_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_30_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_31_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_32_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_33_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_34_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_35_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_36_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_37_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_38_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_39_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_40_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_41_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_42_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_43_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_44_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_45_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_46_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_47_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_48_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_49_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_50_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_51_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_52_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_53_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_54_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_55_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_56_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_57_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_58_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_59_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_60_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_61_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_62_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_63_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_64_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_65_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_66_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_67_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_68_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_69_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_70_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_71_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_72_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_73_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_74_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_75_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_76_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_77_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_78_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_79_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_80_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_81_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_82_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_83_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_84_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_85_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_86_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_87_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_88_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_89_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_90_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_91_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_92_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_93_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_94_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_95_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_96_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_97_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_98_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_99_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_100_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_101_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_102_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_103_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_104_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_105_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_106_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_107_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_108_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_109_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_110_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_111_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_112_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_113_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_114_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_115_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_116_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_117_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_118_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_119_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_120_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_121_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_122_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_123_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_124_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_125_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_126_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_127_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_128_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_129_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_130_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_131_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_132_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		
Obscurelight_133_III_Seg1	Obscure - III	Lux	0.00	0	0	N.A.	N.A.		

APPENDIX 4: Proposed Luminaire Type

Datasheet

Italo



Product Description

One product, three sizes. The Italo series offers high performance functionality, versatility and a wide variety of optics. A versatile solution suitable for any street application.

Specification Text

The luminaire shall be manufactured from high-pressure die-cast aluminium. It shall have an LED efficacy of up to 126 lm/W and will be capable of producing up to 35,170 luminaire lumens at 4000K with a CRI >70. It shall have an asymmetric forward throw optic and is rated at IP66 and IK09.

Specification

Weight: 7.0-19.0kg

Windage: Italo 1: 0.06 - 0.18m²

Italo 2: 0.06 - 0.25m²

Italo 3: 0.1 - 0.4m²

Material: Die-cast Aluminium

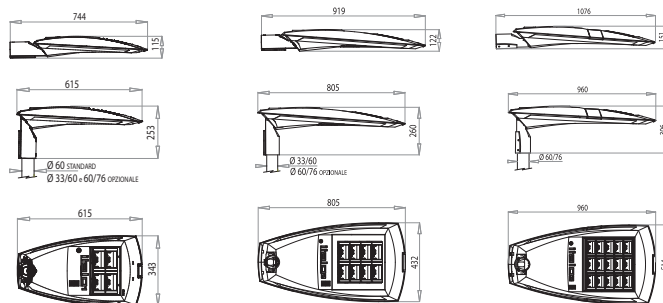
Paint finish: Semi-Gloss Satin Grey

Key Features

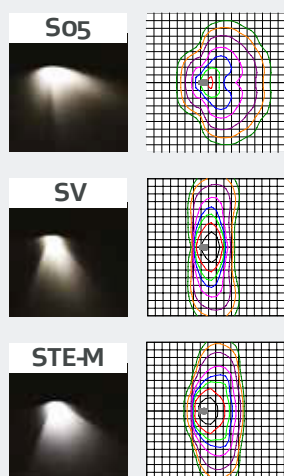
- 21.5W - 286.0W
- 2,360 - 35,170 Luminaire Lumens
- Efficacy up to 126 lm/W
- 4000K, CRI >70
- Lifetime >100,000hr, L90
- Toolless Entry



Dimensions



Optics



Code	Power	Luminaire Lumens	No. Modules	Drive Current	Optic	CCT(K)	IP	IK	Weight kg	Paint Finish	Driver Included	Driver Type
IT1-SO5-4.7-1M1F	21.5	2,420	1	700	Asymmetrical Suburban Street Optic (SO5)	4000	IP66	IK09	7.0	Semi-Gloss Satin Grey	Driver inc	DALI
IT1-SO5-4.7-2M1F	40.0	4,720	2	700		4000	IP66	IK09	7.0	Semi-Gloss Satin Grey	Driver inc	DALI
IT1-SO5-4.7-4M1F	76.0	8,990	4	700		4000	IP66	IK09	7.0	Semi-Gloss Satin Grey	Driver inc	DALI
IT1-SO5-4.8-4M1F	93.0	10,380	4	850		4000	IP66	IK09	7.0	Semi-Gloss Satin Grey	Driver inc	DALI
IT1-SO5-4.100-4M1F	146.0	15,130	4	1000		4000	IP66	IK09	7.0	Semi-Gloss Satin Grey	Driver inc	DALI
IT3-SO5-4.7-10M1F	191.0	23,730	10	700		4000	IP66	IK09	19.0	Semi-Gloss Satin Grey	Driver inc	DALI
IT3-SO5-4.7-11M1F	210.0	26,070	11	700		4000	IP66	IK09	19.0	Semi-Gloss Satin Grey	Driver inc	DALI
IT3-SO5-4.7-15M1F	286.0	35,170	15	700		4000	IP66	IK09	19.0	Semi-Gloss Satin Grey	Driver inc	DALI
IT1-SV-4.7-1M1F	21.5	2,420	1	700	Asymmetrical Urban Street Optic (SV)	4000	IP66	IK09	7.0	Semi-Gloss Satin Grey	Driver inc	DALI
IT1-SV-4.7-2M1F	40.0	4,720	2	700		4000	IP66	IK09	7.0	Semi-Gloss Satin Grey	Driver inc	DALI
IT1-STE-M-4.7-2M1F	52.0	6,530	2	700	Asymmetrical Suburban Street Optic (STE-M)	4000	IP66	IK09	7.0	Semi-Gloss Satin Grey	Driver inc	DALI
IT1-STE-M-4.7-4M1F	102.0	12,550	4	700		4000	IP66	IK09	7.0	Semi-Gloss Satin Grey	Driver inc	DALI
ITP-SO5-4.7-1M1F	21.5	2,360	1	700	Asymmetrical Suburban Street Optic (SO5)	4000	IP66	IK09	12.0	Semi-Gloss Satin Grey	Driver inc	DALI
ITP-SO5-4.7-2M1F	40.0	4,600	2	700		4000	IP66	IK09	12.0	Semi-Gloss Satin Grey	Driver inc	DALI
ITP-SO5-4.7-4M1F	76.0	8,770	4	700		4000	IP66	IK09	12.0	Semi-Gloss Satin Grey	Driver inc	DALI
ITP-SV-4.7-1M1F	21.5	2,360	1	700	Narrow Street Optic (SV)	4000	IP66	IK09	12.0	Semi-Gloss Satin Grey	Driver inc	DALI
ITP-SV-4.7-2M1F	40.0	4,600	2	700		4000	IP66	IK09	12.0	Semi-Gloss Satin Grey	Driver inc	DALI
ITP-STE-M-4.7-2M1F	52.0	6,370	2	700	Asymmetrical Suburban Street Optic (STE-M)	4000	IP66	IK09	12.0	Semi-Gloss Satin Grey	Driver inc	DALI
ITP-STE-M-4.7-4M1F	102.0	12,240	4	700		4000	IP66	IK09	12.0	Semi-Gloss Satin Grey	Driver inc	DALI



Accessories & Options

Mounting Options

- Post Top 60-76mm, 76mm recmd Side Entry Fixing
[Contact for details](#)

Dimming Options

- Constant light output
- Programmable
- Part night dimming
- Step dimming
- Wireless dimming
[Contact for details](#)

Other Options

- Colour temperature options
- Photocell options
- Emergency options
- Paint finish options
[Contact for details](#)

