

Honeysuckle City Campus Development (HCCD) Stage 1A

Lighting Impact Assessment

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Lighting Impact Assessment

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Prepared by Peter Skeen

Reviewed by George Theodoropoulos

Revision History


Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
0	18-Feb-2020	Lighting Impact Assessment	P Skeen Team Leader Buildings & Places	
1	27-Feb-2020	Revised Lighting Impact Assessment	P Skeen Team Leader Buildings & Places	

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1.0 Introduction

AECOM have been engaged by EJE Architecture to undertake the building services engineering detailed design inclusive of specialist lighting design for the University of Newcastle (UON) Honeysuckle City Campus Development (HCCD) Stage 1A project.

AECOM have been requested to provide a lighting impact assessment, which identifies impacts and mitigation measures to protect the amenity of adjoining residential development.

1.1 The Project Site

The location of the UON HCCD stage 1A site is on the corner of Honeysuckle Drive and Worth Place in Newcastle Central Business District (CBD). The site has residential multistorey apartments to the north opposite Honeysuckle drive. Opposite Worth Place to the west comprises of a mix of commercial office and multistorey residential development.

To the south and east of the site is currently vacant land owned by the University of Newcastle and is planned for further development of the Honeysuckle City Campus Development precinct.

2.0 Existing Environment

2.1 Description of the Environment

The University of Newcastle Stage 1A development is located in the CBD of Newcastle city and therefore, it is a location of high night time activity and relatively well-lit surrounds. The location has a mix of inner city CBD development including commercial office, residential apartments, retail restaurants, cafés and bars in the vicinity of the proposed development.

2.2 Control of the Obtrusive Effects of Outdoor Lighting

Australian Standard (AS/NZS 4282:2019 “Control of the obtrusive effects of outdoor lighting”) specifically addresses light spill and its obtrusive effects. The standard provides a basis for assessment of light trespass by defining impacts from development lighting installations in an adjacent property. The standard is written to control both the levels of light and glare.

Firstly, the extent to which an installation is obtrusive is dependent on the ambient light levels of the surrounds. If the ambient lighting is high then the obtrusive effects of the additional lighting will be diluted. If the ambient lighting level is low then even small amounts of additional lighting can be obtrusive.

The Australian standard AS/NZS 4282 divides the environment into eleven zones as outlined within table 3.1 of the document.

AECOM classify this development as **A4** in accordance with table 3.1 and is defined as, “High district brightness” (Town and city centres and other commercial areas, residential areas abutting commercial areas).

2.3 Effects on Residents

Effects on residents generally involve a perceived reduction of amenity arising from light technical factors as follows;

- Illumination from spill light.
- Direct view of bright luminaires from normal viewing directions. The luminous intensity of a luminaire is an indicator of this effect.
- Changes in luminance in the peripheral vision due to effects such as variable content in signage is an indicator of this effect.

3.0 Assessment Approach

3.1 Methodology

Australian Standard AS/NZS 4282 “Control of the obtrusive effects of outdoor lighting” defines limiting values of light technical parameters and are intended to control the obtrusive effects based on the ambient light conditions setout in each respective environmental zone. For this reason, two sets of limits are specified based on the times that the lighting system is to operate, i.e “Pre Curfew & Curfew” hours.

A higher level of light may be less obtrusive in the early hours of the evening when there is more activity and the majority of people are awake. For later times (in the curfew period) lower limits are applicable. In relation to when lower limits are to apply i.e. curfew period, should be taken as between 11pm and 6am.

3.2 Calculation Locations

The vertical illumination levels have been calculated around the perimeter of the building at a conservative distance of 15mtrs from the HCCD Stage 1A boundary, (note the residential properties are located at a greater distance meaning the illuminance will decrease as the distance is increased.

Refer to appendix A vertical illuminance calculation for further details.

3.3 AS/NZS 4282 Compliance Requirements

The following lighting technical parameters have been reviewed as part of this assessment.

3.3.1 Illuminance in the vertical plane (Ev)

The limiting values of Ev are differentiated according to the environment type. This calculation is assessing the illuminance (lux level) in the vertical plane at the site boundary and has been assessed in accordance with the compliance values within table 1.

3.3.2 Luminous Intensity (I)

The Luminous intensity of a luminaire is essentially the glare or the direct view of bright luminaires from normal viewing directions causing annoyance, distraction or discomfort. Luminous intensity does not decrease with distance to the observing position. The luminous intensity of the luminaires proposed on the development has been assessed in accordance with the compliance values within table 1.

3.3.3 Upward Light Ratio (ULR)

The proportion of flux of a luminaire that is emitted above the horizontal is defined as ULR = upward flux / total flux from the luminaire. The upward light ratio of the luminaires proposed on the development has been assessed in accordance with the compliance values within table 1.

Table 1 Maximum Values of Light Technical Parameters (Environment Classification A4)

Zone	Vertical Illuminance Levels (Ev) lx		Luminous Intensity (I) (cd)		Sky Glow
	Non Curfew	Curfew	Non Curfew L1	Curfew	Upward Light Ratio
A4	25	5	25,000	2,500	0.03

4.0 Lighting Impact Assessment

4.1 Compliance

The proposed lighting design for the University of Newcastle HCCD Stage 1A development has included for all external lighting to have zero light projection above the horizontal to comply with the proposed Green Star light pollution credit.

This requirement means the luminaires selected have controlled optics to limit light spill into the night sky. In addition, downlights are recessed within the awning directing the light distribution straight down.

4.2 Vertical Illuminance Assessment

As can be seen in the calculations shown within appendix A, the vertical illumination levels have been calculated around the perimeter of the building at a conservative distance of 15mtrs from the HCCD Stage 1A boundary, (note the residential properties are located at a greater distance meaning the illuminance will decrease as the distance is increased).

The calculations indicate the vertical illuminance levels are less than the 5 lux limit as nominated in table 1 during the most onerous curfew hours.

4.3 Luminous Intensity Assessment

Luminous intensity has been assessed for curfew hours and these values comply with the specified limits. In addition, as shown in the polar intensity curves for the external luminaires L9, D1 & P1 this confirms the candela values are less than the required 2500 cd during curfew hours.

Figure 1 – External Lighting Type L9 Polar Intensity Curve

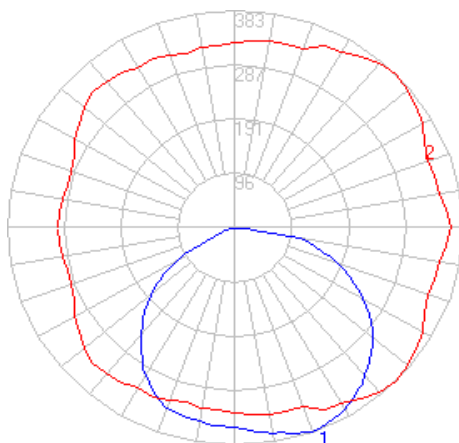
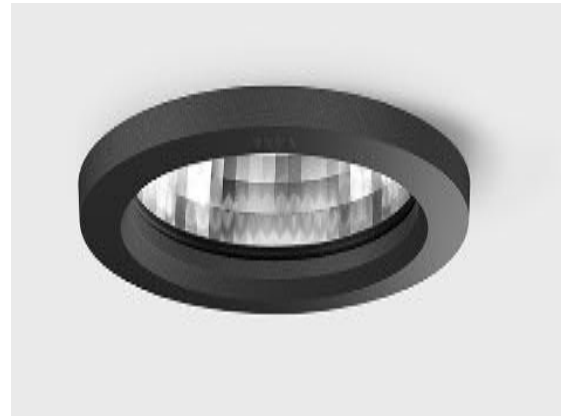
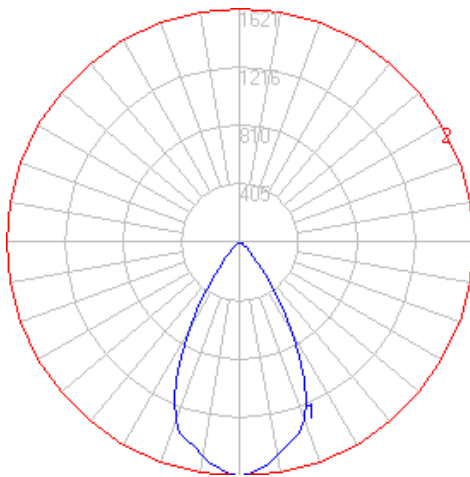
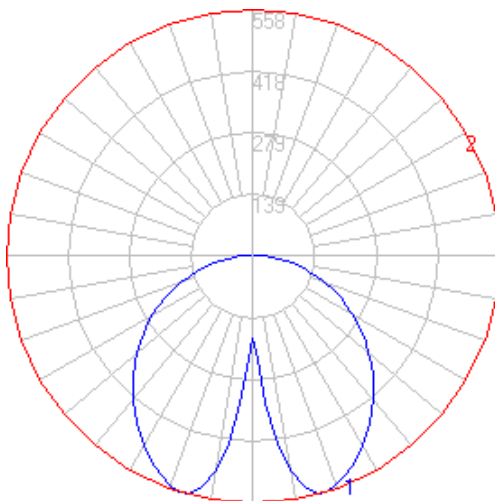


Figure 2 – External Lighting Type D6 Polar Intensity Curve**Figure 3 – External Lighting Type P1 Polar Intensity Curve**

4.4 Sky Glow (upward light ratio)

To comply with the sky glow requirement, uplight distribution requires to be less than 0.03 as nominated within table 1. As indicated in the polar intensity curves for the nominated external luminaires included within the current design, there is no upward light spill applicable to any of the luminaires designed for the proposed development.

5.0 Summary

In conclusion, the effects of the external lighting provided for the University of Newcastle Honeysuckle City Campus Development – Stage 1A project is compliant with Australian Standard AS/NZS 4282 “Control of the Obtrusive Effects of Outdoor Lighting” and therefore meet the criteria set out in the standard for the installation type, environmental classification and curfew conditions.

The external luminaires included on the project have been carefully selected to ensure light spill is contained and intensity and vertical illuminance values are within the specified limits.

Any additional illuminated signage or façade projection proposed by the client will require to consider the effects of adjacent properties and reviewed following final selection of the products. The intensity, location and control of such systems should be reviewed as together this minimises the disturbance to the surrounding environment.

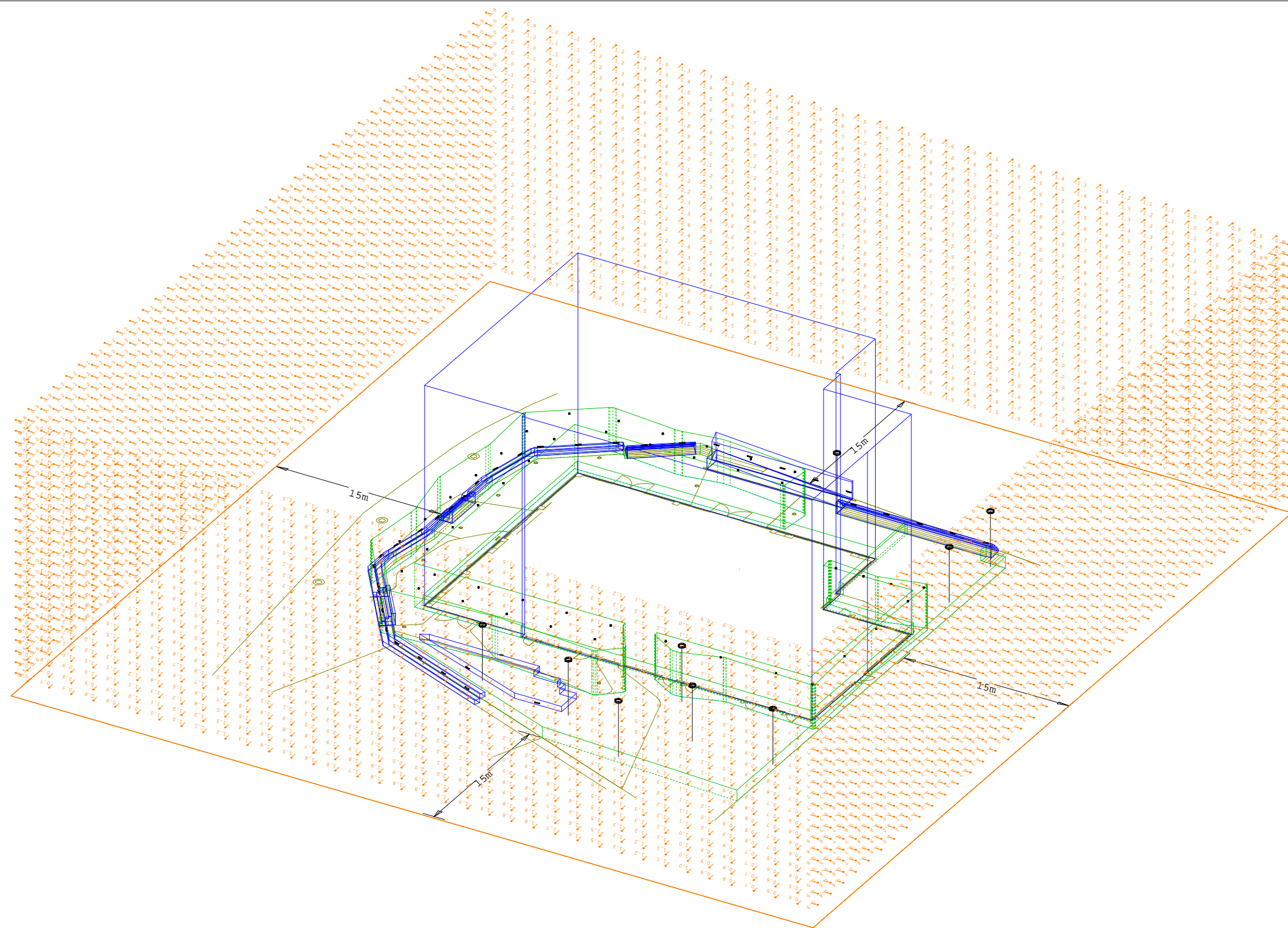
6.0 Clarifications

This assessment is based on the following assumptions;

- The design of the proposed development is approximately 85% complete and represents the lighting design based on the design development documentation provided. Novation and design completion phase updates may trigger a requirement to update this assessment.
- Details of any client illuminated signage are unknown at this stage and have not been included within this assessment.
- External façade projection is not proposed to be included with the Stage 1A project and hence assessment of this feature is not required.
- This report provides assessment of external lighting in accordance with Australian Standard AS/NZS 4282 “Control of the Obtrusive Effects of Outdoor Lighting and therefore no internal lighting has been assessed.
- Threshold Increment has not been assessed for any transport corridors.
- As noted within AS/NZS 4282:2019 with any outdoor lighting it is rarely possible to contain all light within the boundaries of a property on which the lighting system is installed. Some light will inevitably be spilled outside the property boundaries, either directly or by reflection. This report does not guarantee obtrusive lighting complaints will not be received by residents or the general public, however provides assessment based on the lighting technical parameters required to meet compliance with the Australian standard.

Appendix A

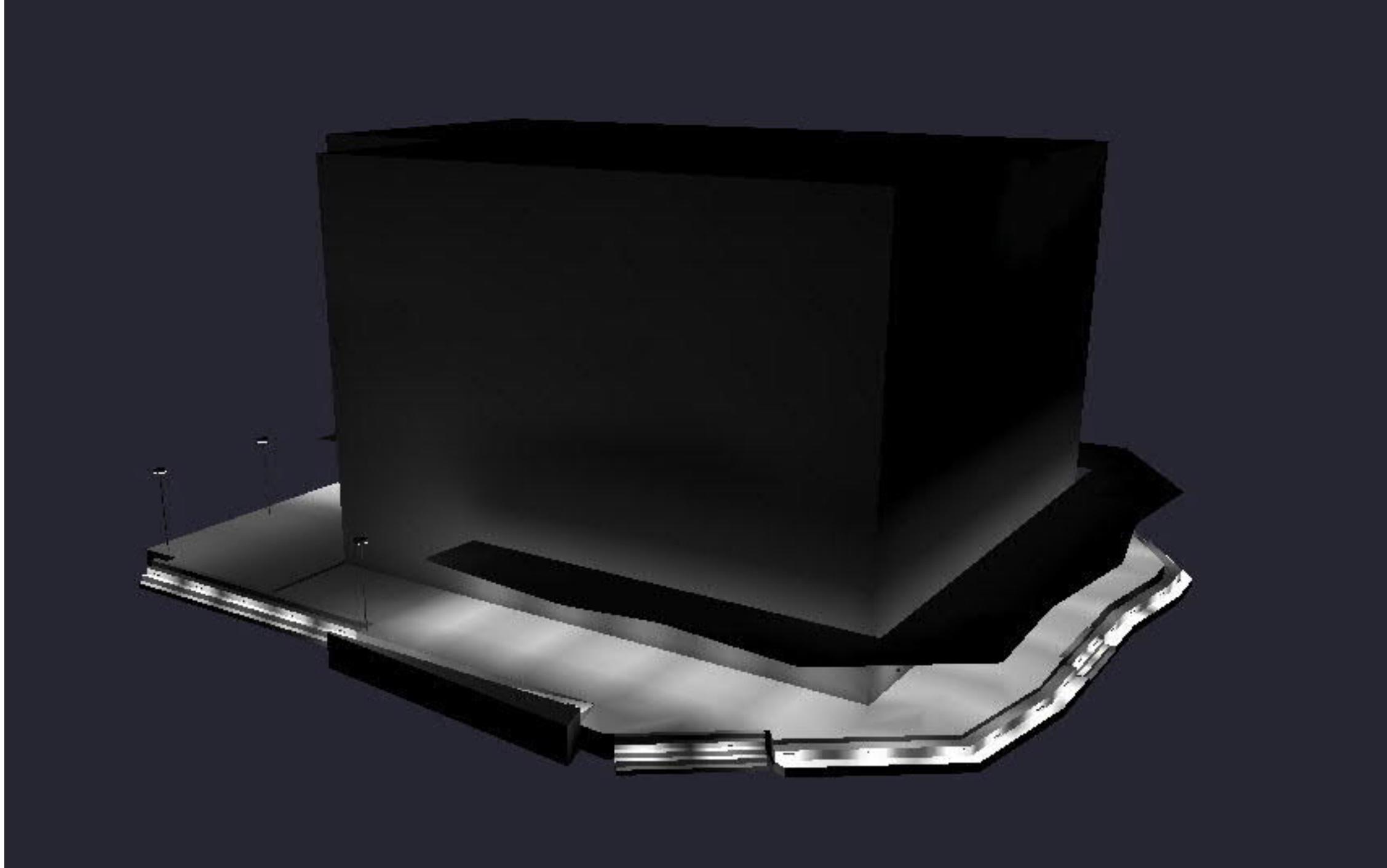
Vertical Illuminance Calculation

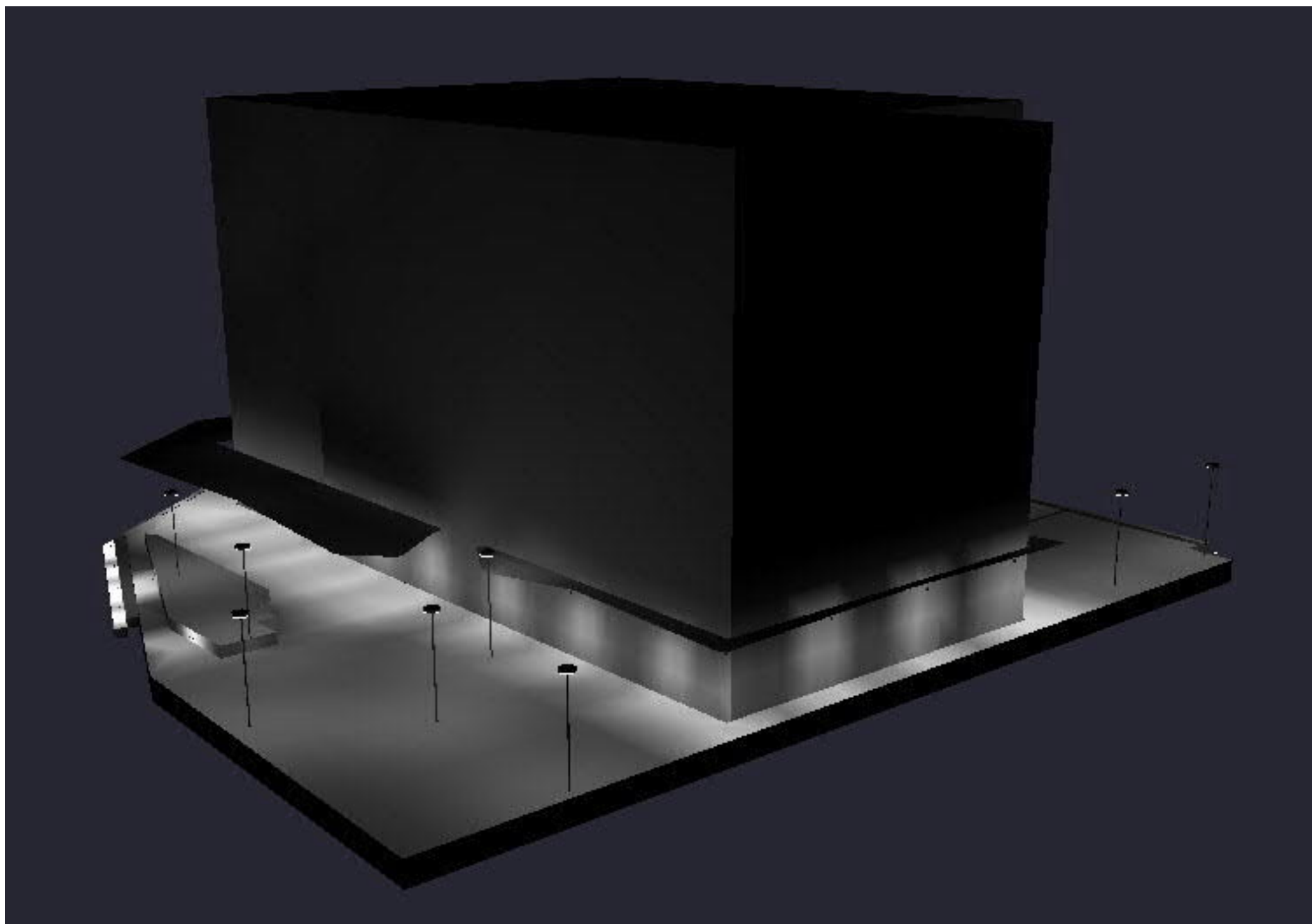


University of Newcastle
Honeysuckle City Campus Development (HCCD)
Stage 1A
Obtrusive Lighting Calculation
Date:19/02/2020

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University of Newcastle
Honeysuckle City Campus Development (HCCD)
Stage 1A
Obtrusive Lighting Calculation
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Appendix B

External Luminaire Data Sheets

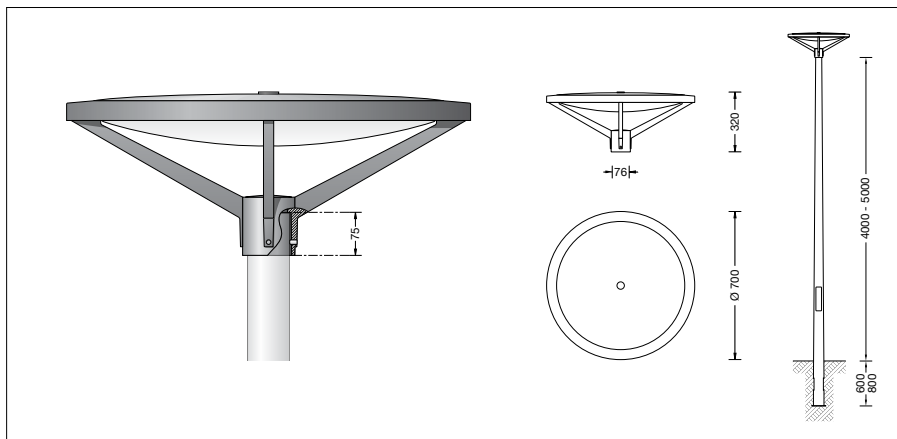
BEGA**88 260**

Pole top luminaire



Project · Reference number

Date



Product data sheet

Application

LED pole-top luminaire with symmetrical light distribution.

For mounting heights 4000 - 5000 mm.

Product description

Luminaire made of aluminium alloy, aluminium and stainless steel

Synthetic diffuser with white light-diffusing matt finish

Silicone gasket

For pole top \varnothing 76 mm

Slip fitter insert depth 75 mm

Connecting cable X05BQ-F 5 G 1[□]

Cable length 5 m

LED power supply unit

220-240 V \sim 0/50-60 Hz

DC 176-276 V

DALI controllable

A basic isolation exists between power cable and control line

Safety class I

Protection class IP 65

Dust-tight and protection against water jets

Impact strength IK09

Protection against mechanical

impacts < 10 joule

– Safety mark

CE – Conformity mark

Wind catching area: 0.09 m²

Weight: 11.5 kg

Lamp

Module connected wattage 16 W

Luminaire connected wattage 19 W

Rated temperature $t_a = 25^\circ\text{C}$

Ambient temperature $t_{a\text{ max}} = 55^\circ\text{C}$

88 260 K4

Module designation 4x LED-0600/840

Colour temperature 4000 K

Colour rendering index CRI > 80

Module luminous flux 2800 lm

Luminaire luminous flux 1809 lm

Luminaire luminous efficiency 95,2 lm/W

88 260 K3

Module designation 4x LED-0600/830

Colour temperature 3000 K

Colour rendering index CRI > 80

Module luminous flux 2660 lm

Luminaire luminous flux 1718 lm

Luminaire luminous efficiency 90,4 lm/W

Service life of the LED

Ambient temperature $t_a = 25^\circ\text{C}$

– at 210,000h: L70B50

max. ambient temperature $t_a = 55^\circ\text{C}$

– at 175,000h: L70B50

Light technique

Luminaire data for the light planning program DIALux for outdoor lighting, street lighting and indoor lighting as well as luminaire data in EULUMDAT- and IES-format you will find on the BEGA web page www.bega.com.

Inrush current

Inrush current: 12 A / 24.2 μs

Maximum number of luminaires of this type per miniature circuit breaker:

B 10A: 50 luminaires

B 16A: 50 luminaires

C 10A: 50 luminaires

C 16A: 50 luminaires

Article No. 88 260

LED colour temperature optionally 4000 K or 3000 K

4000 K – Article number + **K4**

3000 K – Article number + **K3**

Colour graphite or silver

graphite – article number

silver – article number + **A**

Accessories

For this luminaire we recommend the following BEGA luminaire poles:

Tapered aluminium poles, lacquered with access door and C-clamp

70914 Pole with anch.section H 4000 mm

70725 Pole with anch.section H 4500 mm

70915 Pole with anch.section H 5000 mm

70791 Pole with baseplate H 4000 mm

70792 Pole with baseplate H 4500 mm

70794 Pole with baseplate H 5000 mm

Cylindrically stepped aluminium poles, lacquered with door und C rail

70901 Pole with anch.section H 4000 mm

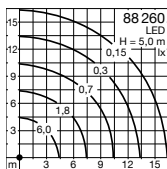
70903 Pole with anch.section H 5000 mm

70905 Pole with anch.section H 6000 mm

70900 Pole with baseplate H 4000 mm

70902 Pole with baseplate H 5000 mm

For suitable connection boxes please see the instructions for use of the luminaire poles.

Light distribution

BEGA**24 386**

Recessed ceiling luminaire

IP 65

Project · Reference number


Date

Product data sheet

Application

LED recessed ceiling luminaire with symmetrical broad spread light distribution. With external DALI controllable power supply unit for installation into concrete ceilings or suspended ceilings both indoors and out.

Product description

Luminaire made of aluminium alloy, aluminium and stainless steel
 Cover ring aluminium alloy
 Clear safety glass
 Optical silicone lens
 Reflector surface made of pure aluminium
 Luminaire housing with 2 fixing claws and guide screws
 Recessed opening \varnothing 97 mm
 Recessed depth required 90 mm
 The external connection housing is made of glass fibre reinforced synthetic material (polyamide).
 2 screw cable glands with strain relief for through-wiring of the mains supply cable from \varnothing 4-10 mm, max. 5×1.5 [□]
 Connecting terminals 2.5[□]
 0.5 m connection cable with plug between the luminaire and the power supply unit
 Safety class II 
 Protection class IP 65
 Dust-tight and protection against water jets
CE – Conformity mark

Inrush current

Inrush current: 12 A / 24.2 μ s
 Maximum number of luminaires of this type per miniature circuit breaker:
 B 10 A: 50 luminaires
 B 16 A: 50 luminaires
 C 10 A: 50 luminaires
 C 16 A: 50 luminaires

Lamp

Module connected wattage	12.3 W
Luminaire connected wattage	14 W
Rated temperature	$t_a = 25^\circ\text{C}$
Service life criteria	50 000 h / L_{70}

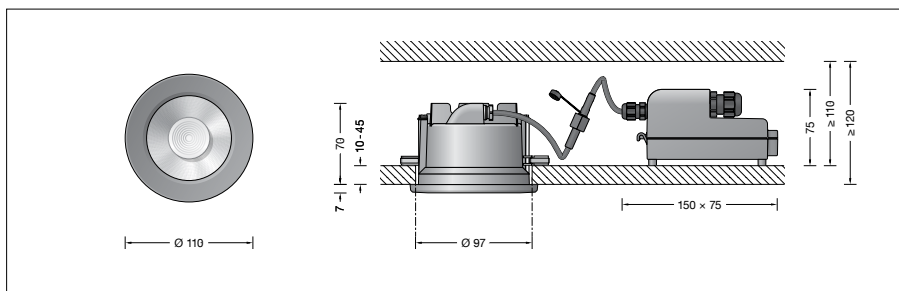
24 386 K3

Module designation	LED-0986/830
Colour temperature	3000 K
Colour rendering index	CRI > 80
Module luminous flux	1915 lm
Luminaire luminous flux*	1500 lm
Luminaire luminous efficiency*	107,1 lm/W

24 386 K4

Module designation	LED-0986/840
Colour temperature	4000 K
Colour rendering index	CRI > 80
Module luminous flux	1965 lm
Luminaire luminous flux*	1539 lm
Luminaire luminous efficiency*	109,9 lm/W

* preliminary data

**Lighting technology**

Half beam angle 54°
 Luminaire data for the light planning program DIALux for outdoor lighting, street lighting and interior lighting as well as luminaire data in EULUMDAT and IES format are available on our website www.bega.com.

Article No. 24 386

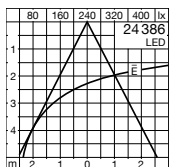
LED colour temperature optionally 3000 K or 4000 K
 3000 K – Article number + **K3**
 4000 K – Article number + **K4**

Colour optionally graphite or white
 Graphite – Article number
 White – Article number + **W**

Accessories

10 440 Installation housing

A separate instructions for use can be provided upon request.

Light distribution

SIMES

luce per l'architettura

Ghost,
just light.



Ghost

Lighting void

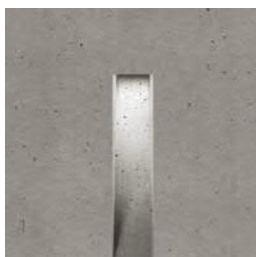


Marc Sadler

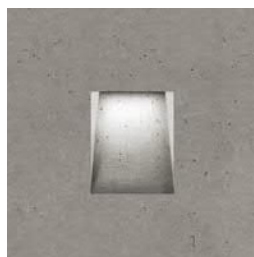
“The light blade comes from the concrete. When it’s off, it disappears, with no visible luminaire structure but just a cut in the concrete with brutal and magic inspiration.”



Ghost horizontal



Ghost vertical



Ghost square



Ghost linear

The Ghost line represents a revolution in the way of conceiving outdoor lighting.

It works by “subtraction” rather than “addition”: no visible lighting fixture is added to the building’s structure, but on the contrary it consists in a void filled with light.

The light comes directly from the structure and emphasizes the creative path envisaged by the lighting designer.

Ghost is a sign, a bright pixel that appears or disappears marking the architectural rhythm.

It is a primary element, similar to a brick. With a brick you can build a small wall but also a cathedral.

It will be the ability of the designers to utilize such lighting pixel and create something extraordinary.

Ghost, what we want to add is **just light**.

2016



reddot award 2016
winner

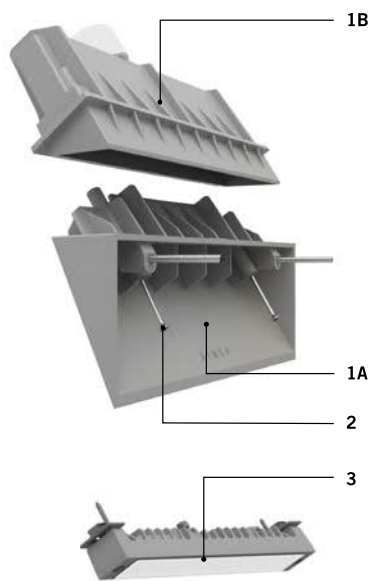
2016



2016



Ghost



Ghost is a **lighting void** that is created using a housing anchored to two retaining panels before pouring in concrete to make the structure. Once the concrete is dry, the housing is removed and the left space is a natural and sharp cast created in the drying process.

Ghost is composed of two elements: the **housing** and the **lighting element**. The housing has two separate parts, firstly, a jig (**1A**), which forms the housing, and is extracted together with the retaining panel after completing the casting and removing the anchor screws (**2**). Secondly, a housing (**1B**) that remains embedded inside the casting and houses the lighting element when the jig is removed.

The housing is supplied with bolts, locking system and stickers to be applied on the outside of the retaining panels to ensure the perfect alignment if installing multiple luminaires.

The **lighting element** (**3**) is die cast aluminium and is anchored to the casing (**1B**) through proper screws. It remains completely hidden in the void.

Ghost is ideal for concrete based structures including walls and facades of residential or commercial buildings, as well as concrete staircases of stadiums, public buildings and anti vandal project applications.

Ghost linear



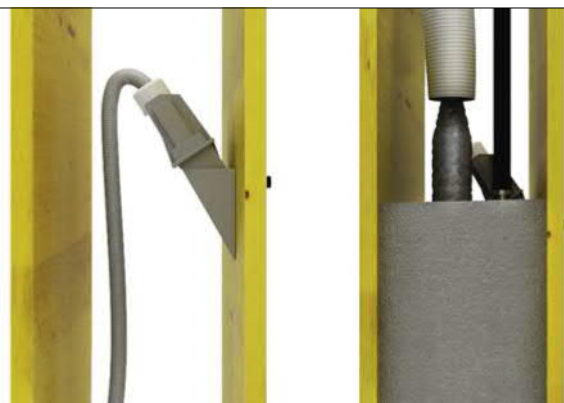
The new linear versions of Ghost are designed to be embedded in contexts that require compact size, as in the case of concrete casting staircases.

Ghost linear is also suitable for making thin and horizontal cuts of light along the walls.

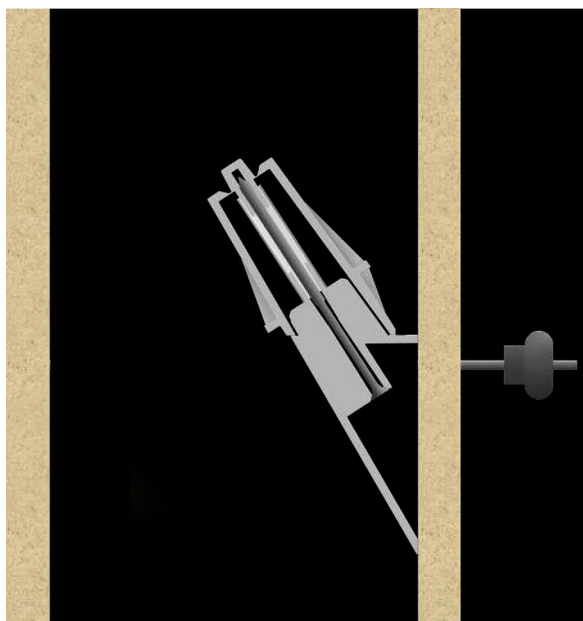
In this case the housings are made in painted extruded aluminium (**4A** and **4B**) in order to maintain a uniform and perfectly linear profile over the entire length of the cut. The surface paint treatment facilitates the removal of the “jig”. The lamp body, made of anodized aluminium (**5**), can be installed through a practical interlocking system.

**“Ghost is a technical prodigy,
directly casted into the concrete,
the product of a sophisticated and
invisible genius to fuse architecture
and light in a natural way”.**

Marc Sadler



Before casting



After casting



Protection class

IP65

Isolation class

CLASS I ⊕ MINIGHOST SQUARE
GHOST SQUARE
GHOST HORIZONTAL
GHOST VERTICAL
CLASS II □ GHOST LINEAR
CLASS III ⬠ MICROGHOST SQUARE

Mechanical resistance of diffuser

IK 06

Leds 4000K CRI80 versions are available on request.

**PATENT PENDING
REGISTERED DESIGN**

Finishing

Cast cement

Housing suitable for single cable gland.
Lighting element hard wired with:
- 6m cable for GHOST VERTICAL and LINEAR;
- 3m cable for MICROGHOST SQUARE;
- 30 cm cable and fast connector for MINIGHOST SQUARE, GHOST SQUARE and GHOST HORIZONTAL.

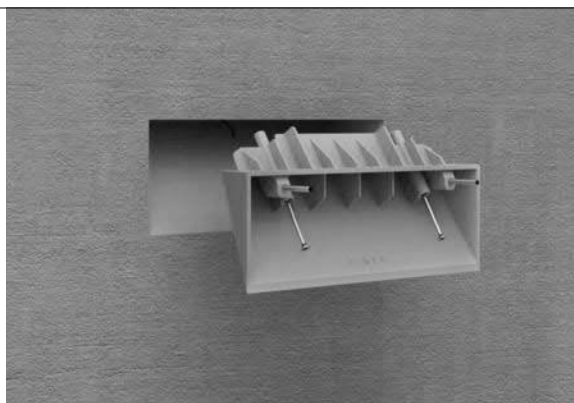
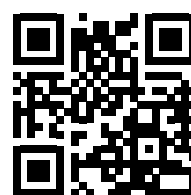
Led circuit 24V
MICROGHOST SQUARE

Led circuit 230V
MINIGHOST SQUARE
GHOST SQUARE
GHOST HORIZONTAL
GHOST VERTICAL
GHOST LINEAR

This product is manufactured on site during the concrete casting of the wall with hand crafted procedures; therefore, small imperfections caused by the low accuracy of the casting, subsidence of the concrete surface, actual and future cracks, colour ripples and variations over time, will be deliberately present and they are a feature of the concrete, proving the hand-made manufacturing procedure.



**Product
guide video**





Ghost Linear L 240mm



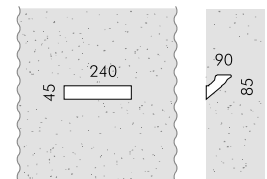
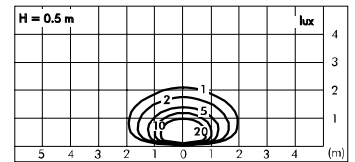
C.8034W



2 housings in aluminium
with locking system

+

Lighting element with white led
3000K CRI80 500lm
Rated luminaire luminous flux 159lm
Rated input power flux 6W 230V
Computer-simulated photometrics



Ghost Linear L 430mm



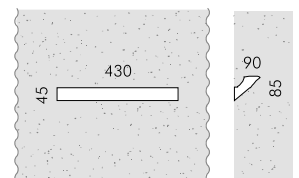
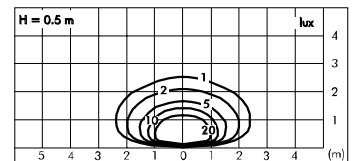
C.8036W



2 housings in aluminium
with locking system

+

Lighting element with white led
3000K CRI80 1000lm
Rated luminaire luminous flux 317lm
Rated input power flux 12W 230V
Computer-simulated photometrics



Ghost Linear L 810mm



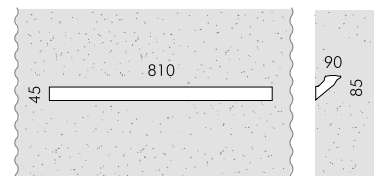
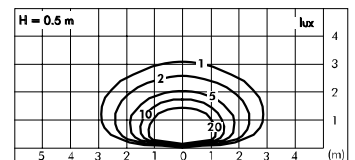
C.8038W



2 housings in aluminium
with locking system

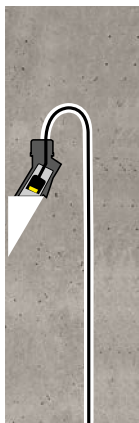
+

Lighting element with white led
3000K CRI80 2000lm
Rated luminaire luminous flux 635lm
Rated input power flux 24W 230V
Computer-simulated photometrics



Microghost Square

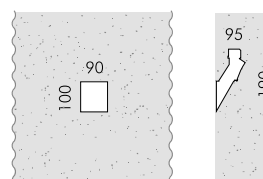
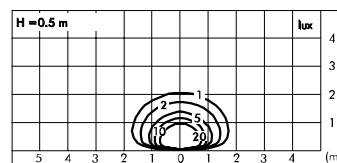
< Range extension

**C.8030W**

2 housings in polypropilene
with locking system

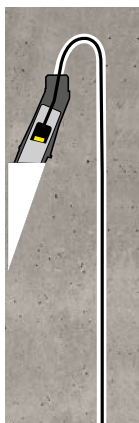
+

Lighting element with white led
3000K CRI80 320lm
Rated luminaire luminous flux 100lm
Rated input power flux 4W **24V**
Computer-simulated photometrics
Requires remote power supply 230V/24V DC
(type S.3402 or S.3407)



Minighost Square

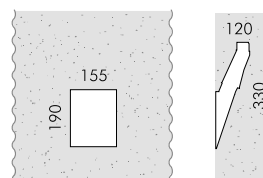
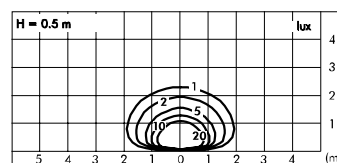
< Range extension

**C.8028W**

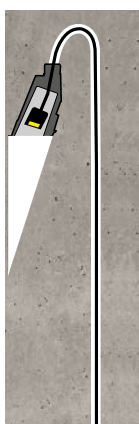
2 housings in polypropilene
with locking system

+

Lighting element with white led
3000K CRI80 490lm
Rated luminaire luminous flux 190lm
Rated input power flux 6W 230V
Computer-simulated photometrics



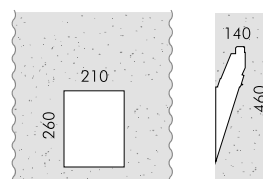
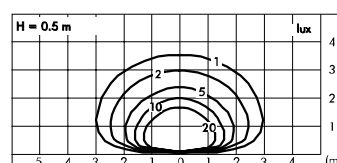
Ghost Square

**C.8026W**

2 housings in polypropilene
with locking system

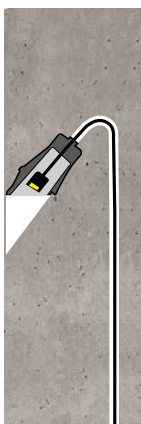
+

Lighting element with white led
3000K CRI80 1150lm
Rated luminaire luminous flux 438lm
Rated input power flux 12W 230V
Computer-simulated photometrics





Ghost Horizontal

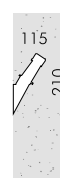
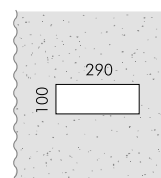
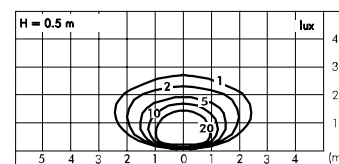


C.8022W

2 housings in polypropilene
with locking system

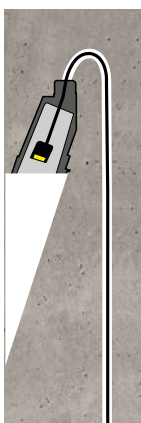
+

Lighting element with white led
3000K CRI80 880lm
Rated luminaire luminous flux 286lm
Rated input power flux 10W 230V



GHOST VERTICAL

Ghost Vertical

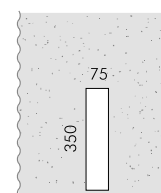
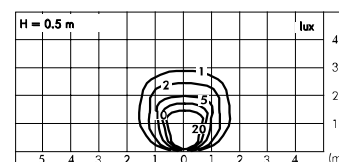


C.8024W

2 housings in polypropilene
with locking system

+

Lighting element with white led
3000K CRI80 800lm
Rated luminaire luminous flux 250lm
Rated input power flux 7,6W 230V





SIMES

luce per l'architettura

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