

**161 Sussex St – Wheat Rd
Upgrade**

Lighting Design Proposal

Brookfield Multiplex

21 August 2015

Revision: B

Reference: 220041

Document control record

Document prepared by:

Aurecon Australasia Pty Ltd

ABN 54 005 139 873

Level 5, 116 Military Road
Neutral Bay NSW 2089

PO Box 538
Neutral Bay NSW 2089
Australia

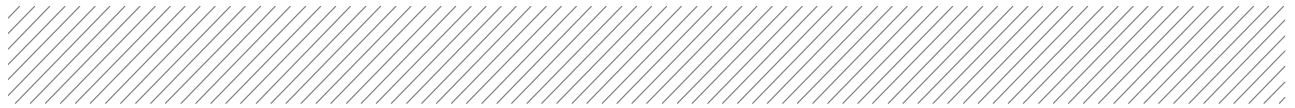
T +61 2 9465 5599
F +61 2 9465 5598
E sydney@aurecongroup.com
W aurecongroup.com

A person using Aurecon documents or data accepts the risk of:

- a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.
- b) Using the documents or data for any purpose not agreed to in writing by Aurecon.

Document control						aurecon
Report title		Lighting Design Proposal				
Document ID		Project number		220041		
File path		P:\BG\220041\ENG\Electrical\Lighting\WIP\Reports\RMS Approval Report\161 Sussex St Rev. B.docx				
Client		Brookfield Multiplex		Client contact		Daniel Sarman
Rev	Date	Revision details/status	Prepared by	Author	Verifier	Approver
A	5 August 2015		M.R.	M.R.	M.G	M.G.
B	21 August 2015	Revised Mounting Location	M.R.	M.R.	M.G.	M.G.
Current revision		B				

Approval			
Author signature		Approver signature	
			
Name		Name	
Michael Richards		Matt Gurr	
Title		Title	
Lighting Designer		Associate	



Contents

1	Introduction	1
2	Design Requirements	1
3	Design Approach	1
4	Design Assumptions	1
4.1	Carriageway	1
4.2	Footpath	2
4.3	Pedestrian Crossing	2
4.4	Carpark spaces and Bus Bays	2
4.5	Additional considerations	2
5	Lighting Layout	2
6	Calculation Results	3
7	Cable Requirements	4
8	Luminaires	4

Appendices

Appendix A

Luminaire Layout

Appendix B

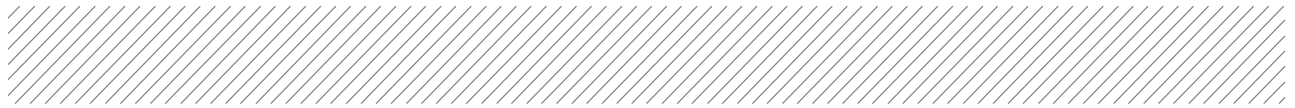
Luminaire Data Sheet

Figures

Figure 1 Luminaire mounting location	3
--------------------------------------	---

Tables

Table 1 Roadway Calculation Results	3
Table 2 Pedestrian Crossing Calculation Results	4



1 Introduction

Aurecon has been approached by Brookfield Multiplex to provide a lighting design for the Wheat Rd upgrade component of the 161 Sussex street project.

The purpose of this document is to provide information on the design direction which has been taken, for comment by the various stakeholders.

2 Design Requirements

Based on a meeting with Daniel Saman of Brookfield Multiplex and Michael Bradburn of Cox Richardson on Thursday 30th of July, the lighting requirements for this portion of the project were identified as the following.

- Adequate lighting to the vehicular carriageway of Wheat Rd.
- Adequate lighting to the pedestrian footpath adjacent to the eastern side of the Wheat Rd carriageway.
- Adequate lighting for the pedestrian crossing.
- Adequate lighting for the vehicle parking spaces (including one (1) disabled vehicle space), and bus parking bays.

The preferred lighting proposal was to demonstrate an effective installation which addresses all of the above requirements while minimising the quantity of various lighting types. The preferred lighting installation would be to capitalise on a single luminaire type and mounting location.

3 Design Approach

The previous design approach was to utilise the underside of the overpass to surface mount the luminaires however it has been advised that a total clearance height of 4500mm needs to be allowed for. For the majority of the carriageway length this is fine however at the entrance to wheat rd the clearance height is lower than 4000mm so an alternative strategy has been considered.

The revised solution, which seeks permission from RMS, is to utilise the vertical surface of the overpass for wall mounting of the luminaires.

4 Design Assumptions

In undertaking the photometric analysis for this road section, assumptions have been made for the appropriate standards to be applied to the various road elements. The standards which have been nominated, which are yet to be agreed upon by the relevant stake holders, are detailed below.

4.1 Carriageway

Due to the location of the roadway with regards to the facilities and amenities upgrade, the pedestrian crossing thoroughfare and the number of bus bays, it can be expected that the carriageway will be shared by a reasonably high volume of pedestrians. For this reason a carriageway sub category of P2 has been nominated in accordance with *AS11158.3.1:2005 Lighting for Roads and Public Spaces – Pedestrian Area (Category P) Lighting Performance and Design*.



4.2 Footpath

For the purpose of retaining a uniform and adequate visibility of pedestrians using the pathway or on approach to the pedestrian crossing, a sub category of P2 has also been adopted for the footpath in accordance with *AS11158.3.1:2005 Lighting for Roads and Public Spaces – Pedestrian Area (Category P) Lighting Performance and Design*.

4.3 Pedestrian Crossing

The pedestrian crossing has been designed in accordance with sub category PX3 in accordance with *AS1158.4:2015 Lighting for Roads and Public Spaces – Lighting of Pedestrian Crossings*. The reason for this design choice is due to the low designed carriageway speed and the lack of visual obstruction from vehicles being a single lane carriageway.

4.4 Carpark spaces and Bus Bays

The carpark spaces and Bus Bays have been designed to the lower carpark sub category of P11c in accordance with *AS11158.3.1:2005 Lighting for Roads and Public Spaces – Pedestrian Area (Category P) Lighting Performance and Design*. This sub category has been nominated as the likelihood of an impact is reduced considering the predictable traffic flow and driving speeds of the vehicles using the adjacent carriageway. The disabled carpark space has been designed in accordance with sub category P12.

4.5 Additional considerations

Although the following calculation results demonstrate that this road segment complies with the nominated standards within its own right, additional calculations will need to be undertaken to ensure that this road section integrates into the existing adjacent road sections.

5 Lighting Layout

As mentioned in section 3 of this report, the most conducive lighting layout for these design parameters was to utilise the vertical surface of the overpass to mount the luminaires. This allows the luminaires to be arrayed and spaced evenly and uniformly with respect to the carriageway. This design requires that one (1) ceiling mounted luminaire remain to cater for the pedestrian crossing illuminance requirements. At this location the overhead clearance is approximately 4700mm above the carriageway. The luminaire to be mounted in this position is 75mm in height, allowing for sufficient clearance. See Figure 1.

The calculations have been based on the luminaires being surface mounted to the vertical surface of the first flanged area of the underpass indicated by the red shaded area.

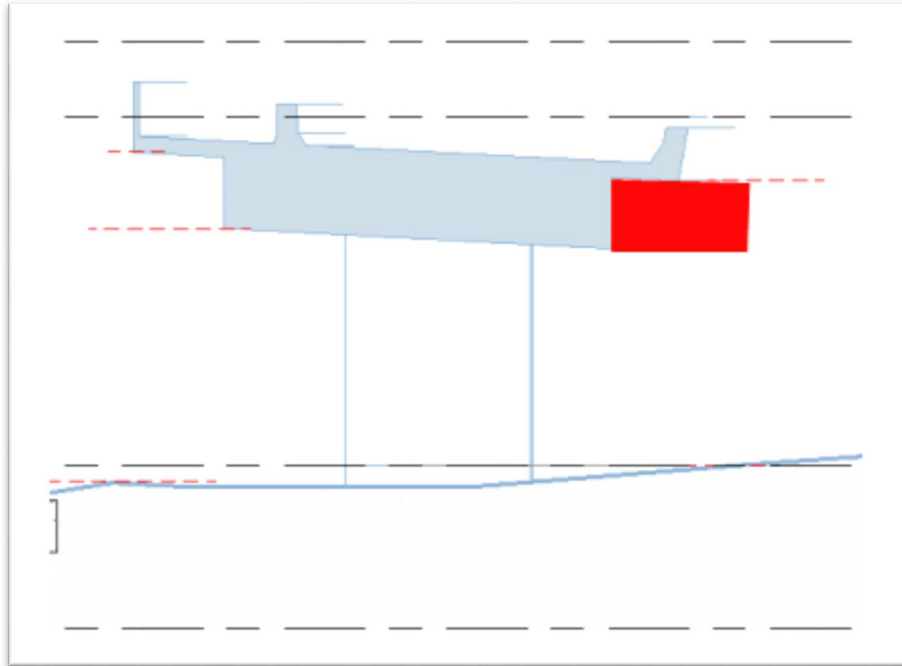
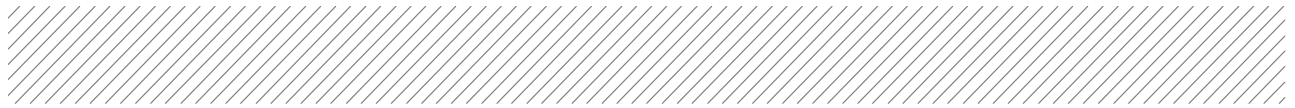


Figure 1 Luminaire mounting location

Appendix A of this report provides more detail on the required mounting locations and luminaire quantities.

6 Calculation Results

The calculation results, as shown in Table 1 and 2, demonstrate conformance for all of the roadway components except for the bus bay 5. The minimum illuminance calculations are slightly short of the minimum requirement of 3.5 lux average and 0.7 lux minimum as stipulated in *AS11158.3.1:2005 Lighting for Roads and Public Spaces – Pedestrian Area (Category P) Lighting Performance and Design*, however it is believed that the lighting for the circulation space will provide sufficient illumination to cover the difference.

Table 1 Roadway Calculation Results

Road Component	Nominated Standard					Achieved Results			
	Category	Min	Max	Ave	Ue2 (Max/Ave)	Min	Max	Ave	Ue2 (Max/Ave)
Bus Bay 1	P11c	0.7	n/a	3.5	<10	1.5	6.30	3.09	2.04
Bus Bay 2	P11c	0.7	n/a	3.5	<10	1.5	25.2	5.84	4.32
Bus Bay 3	P11c	0.7	n/a	3.5	<10	2.0	10.7	4.35	2.46
Bus Bay 4	P11c	0.7	n/a	3.5	<10	2.2	8.0	4.77	1.68

Bus Bay 5	P11c	0.7	n/a	3.5	<10	0.6	3.7	1.49	2.48
Carriageway Horizontal	P2	0.7	n/a	3.5	<10	9	70.1	29.75	2.36
Carriageway Vertical North	P2	0.7	n/a	3.5	<10	2.6	54.8	18.23	3.01
Carriageway Vertical South	P2	0.7	n/a	3.5	<10	2.6	76.8	19.98	3.86
Parking 1	P11c	0.7	n/a	3.5	<10	13.6	39.5	24.25	1.63
Parking 2	P11c	0.7	n/a	3.5	<10	12.9	31.1	19.63	1.58
Disabled Parking	P12	>14	n/a	n/a	n/a	19.7	37.3	26.92	1.39
Pathway Horizontal	P2	0.7	n/a	3.5	<10	8.1	51.7	16.1	3.21
Pathway Vertical North	P2	0.7	n/a	3.5	<10	2.4	22.5	8.59	2.62
Pathway Vertical South	P2	0.7	n/a	3.5	<10	3.9	24.9	9.93	2.51

Table 2 Pedestrian Crossing Calculation Results

Road Component	Nominated Standard					Achieved Results			
	Category	Min	Max I @ 90°	Max I @ 70°	UWLR	Min	Max I @ 90°	Max I @ 70°	UWLR
Pedestrian Crossing Field A	PX3	16	170	4000	2%	21.3	1.20	1629.8	0%
Pedestrian Crossing Field B	PX3	16	170	4000	2%	24.2	1.20	1629.8	0%
Pedestrian Crossing Field C	PX3	16	170	4000	2%	20.3	1.20	1629.8	0%

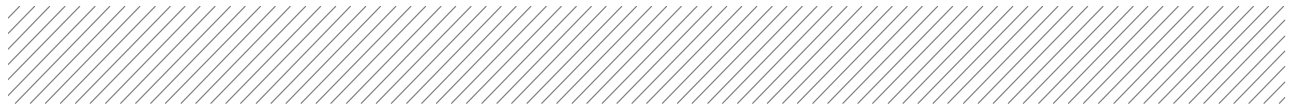
7 Cable Requirements

The proposed luminaire configuration will be wired using a side-entry conduit system for the pedestrian luminaire and a rear entry conduit system for the wall mounted luminaires. The conduit shall be able to feed in and out of the luminaires in a single cable, series wiring configuration.

The wall mounted luminaires will require a stand-off bracket to allow for rear entry without having to drill the concrete structure for cabling.

The conduit will be surface mounted to the underside of the overpass and run parallel to the carriageway. The precise location for where the live connection is to be obtained from is yet to be determined by Ausgrid pending the approval of the proposed luminaire installation by RMS.

8 Luminaires



The luminaires which have been used for this design study are a discreet wall mounted LED luminaire with street light optics, and a low profile, surface mount LED luminaire with forward throw optics for the pedestrian crossing. See Appendix B.

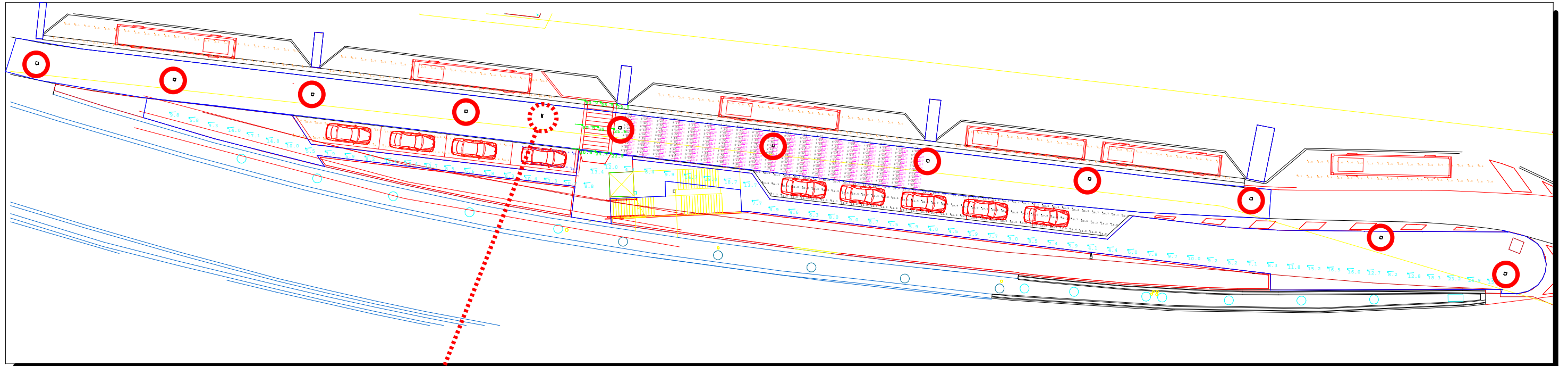
This luminaire family is IP66 and has a high level of anti-corrosion characteristics which ensure its suitability to the environment and proximity to the harbour.

Appendices

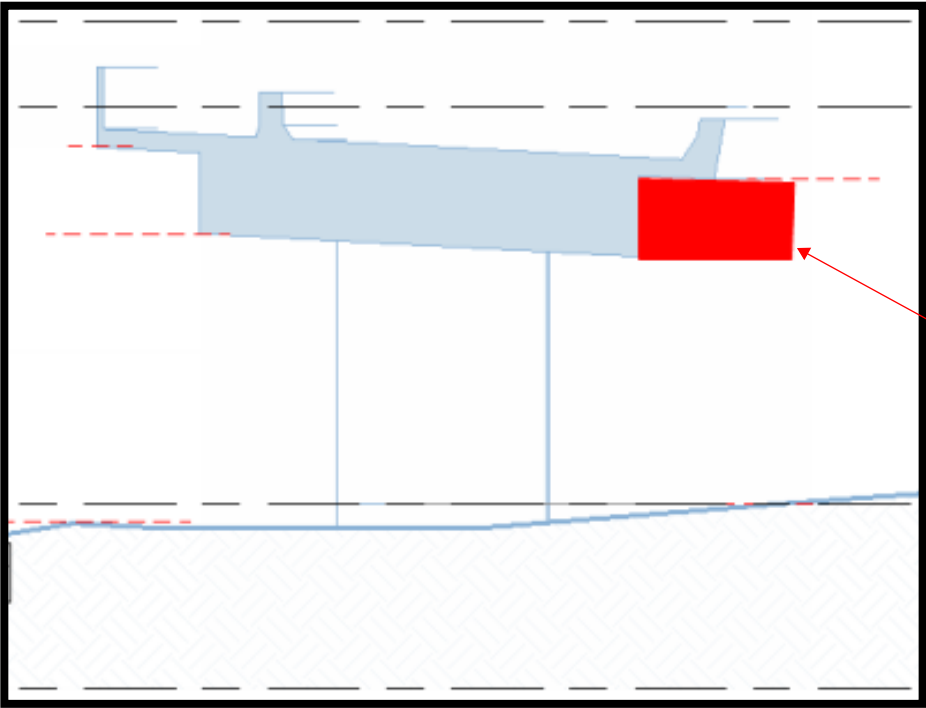


Appendix A

Luminaire Layout



1x ceiling mounted luminaire remains to service the pedestrian crossing.



Luminaires mounted to vertical surface of existing fly-over. mounting heights range from 3.9m - 5.2m.

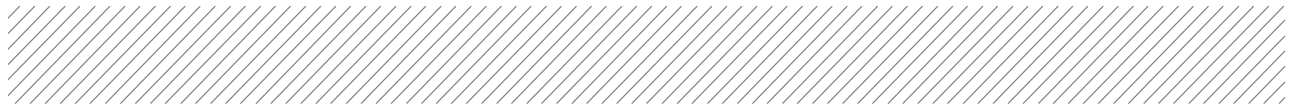
Luminaire Schedule						
Symbol	Label	Description	Qty	Arrangement	Lumens	LLF
□	195-8517	195-8517	1	SINGLE	N.A.	0.800
□+	132-0556	132-0556	11	SINGLE	N.A.	0.800

Numeric Summary						
Label	CalcType	Units	Avg	Max	Min	Max/Avg
Bus Bay 1	Illuminance	Lux	3.09	6.3	1.5	2.04
Bus Bay 2	Illuminance	Lux	5.84	25.2	1.5	4.32
Bus Bay 3	Illuminance	Lux	4.35	10.7	2.0	2.46
Bus Bay 4	Illuminance	Lux	4.77	8.0	2.2	1.68
Bus Bay 5	Illuminance	Lux	1.49	3.7	0.6	2.48
Carriageway Horizontal	Illuminance	Lux	29.75	70.1	9.0	2.36
Carriageway Vertical North	Illuminance	Lux	18.23	54.8	2.6	3.01
Carriageway Vertical South	Illuminance	Lux	19.92	76.8	2.6	3.86
Disabled	Illuminance	Lux	26.92	37.3	19.7	1.39
Parking 1	Illuminance	Lux	24.25	39.5	13.6	1.63
Parking 2	Illuminance	Lux	19.63	31.1	12.9	1.58
Pathway Horizontal	Illuminance	Lux	16.10	51.7	8.1	3.21
Pathway Vertical North	Illuminance	Lux	8.59	22.5	2.4	2.62
Pathway Vertical South	Illuminance	Lux	9.93	24.9	3.9	2.51
Ped Cross A	Illuminance	Lux	26.45	31.6	21.3	N.A.
Ped Cross B	Illuminance	Lux	36.42	56.5	24.2	N.A.
Ped Cross C	Illuminance	Lux	37.38	67.5	20.3	N.A.

Note:
 1. The report contains information provided to Aurecon by other parties. The report is provided strictly on the basis that the information that has been provided to Aurecon is accurate, complete and adequate.
 2. Aurecon therefore does not assume responsibility for the use of the report by any third party and the use of the report by and third party is at the risk of that party.



Drawing Title	WHEAT RD UPGRADE - PRELIMINARY DESIGN	Date	21 AUGUST 2015
Project Name	220041 - 161 SUSSEX STREET	Revision	04



Appendix B

Luminaire Data Sheet

BUC230 LED

195-8517

1/2

we-ef



Description

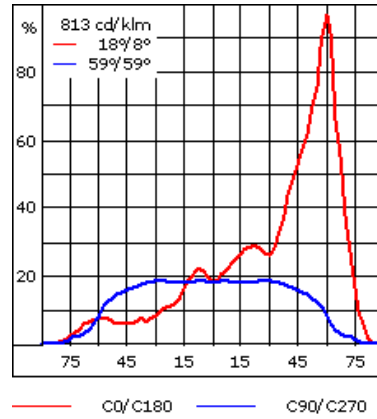
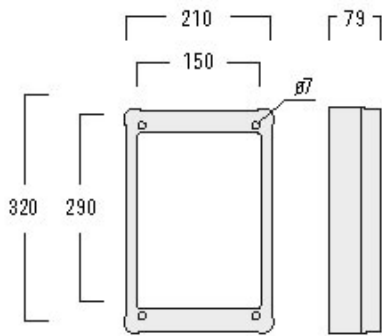
IP66. Marine-grade, die-cast aluminium alloy. 5CE superior corrosion protection including PCS hardware. PMMA lens. Silicone CCG® Controlled Compression Gasket. Integral EC electronic converter in thermally separated compartment. Advanced thermal management protects LEDs while optimising lumens output. CAD-optimised optics for superior illumination and glare control. Optional 1-10 V analogue dimming interface.

Beam Type	asymmetric, forward throw beam [A60], OLC® technology
Lamp Type	LED-18/36W/830 - 3000K
Gear Type	EC
Nominal Luminous Flux (lm)	
LED Lumens	230.4 lm
LEDs	18
Total Lumens	4147 lm
Tj	85 °C
Rated Luminous Flux (lm)	
LED Lumens	191.2 lm
Total Lumens	3442 lm
Ta	25 °C
Rated Input Power	43 W

BUC230 LED

195-8517

2/2



OLV344 LED

132-0556

1/2

we-ef



Description

IP65, Class I, IK08. Marine-grade die-cast aluminium alloy. 5CE superior corrosion protection including PCS hardware. Silicone rubber gaskets. Safety glass. CAD optimised OLC® PMMA lens for superior illumination and glare control. Two cable entries. Can be mounted up or down.

Beam Type	'Side throw' distribution [S70]
------------------	---------------------------------

Lamp Type	LED-24/48W/830 - 3000K
------------------	------------------------

Gear Type	EC
------------------	----

Nominal Luminous Flux (lm)

LED Lumens	230.4 lm
------------	----------

LEDs	24
------	----

Total Lumens	5530 lm
--------------	---------

Tj	85 °C
----	-------

Rated Luminous Flux (lm)

LED Lumens	180.6 lm
------------	----------

Total Lumens	4335.5 lm
--------------	-----------

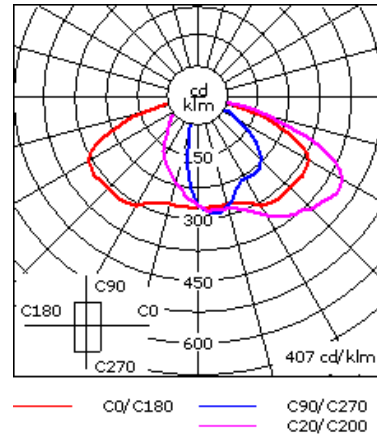
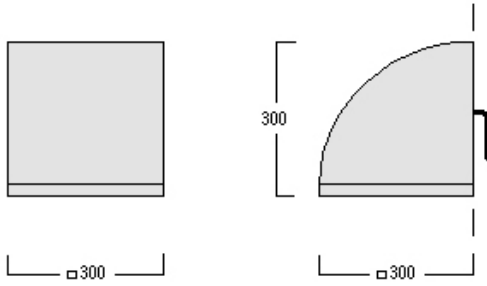
Ta	25 °C
----	-------

Rated Input Power	58 W
--------------------------	------

OLV344 LED

132-0556

2/2





Aurecon Australasia Pty Ltd

ABN 54 005 139 873

Level 5, 116 Military Road
Neutral Bay NSW 2089

PO Box 538

Neutral Bay NSW 2089
Australia

T +61 2 9465 5599

F +61 2 9465 5598

E sydney@arecongroup.com

W arecongroup.com

Aurecon offices are located in:

Angola, Australia, Botswana, Chile, China,
Ethiopia, Ghana, Hong Kong, Indonesia,
Lesotho, Libya, Malawi, Mozambique,
Namibia, New Zealand, Nigeria,
Philippines, Qatar, Singapore, South Africa,
Swaziland, Tanzania, Thailand, Uganda,
United Arab Emirates, Vietnam, Zimbabwe.