

Lendlease

LIGHTING & LIGHT SPILL REPORT (LSSR)

BUILDING R5 BARANGAROO SOUTH, NSW

5th July 2022

Ref: 2972

Lighting & Light Spill Report (LLSR) Building R5 Barangaroo South, NSW

Electrolight Australia Pty Ltd
ABN: 44 600 067 392

info@electrolight.com
www.electrolight.com

4/414 Bourke St
Surry Hills NSW 2010
T + 612 9267 4777

DATE	REV	COMMENT	PREPARED BY	CHECKED BY
05/07/22	REV A	For Information	RS	DS

CONTENTS

1. INTRODUCTION	3
2. DEFINITIONS	4
2.1 Illuminance	4
2.2 Luminance	4
2.3 Luminous Intensity	4
2.4 Obtrusive Light	4
2.5 Threshold Increment	4
2.6 AGI32 Light Simulation Software	4
3. SITE DESCRIPTION AND SCOPE	5
4. DESIGN GUIDELINES AND STANDARDS	6
5. AS4282 ASSESSMENT	6
6. SUMMARY	8
7. DESIGN CERTIFICATION	9
APPENDIX A	10
APPENDIX B	22
APPENDIX C	26
APPENDIX D	48

1. INTRODUCTION

Barangaroo is located on the north western edge of the Sydney Central Business District (CBD), bounded by Sydney Harbour to the west and north, the historic precinct of Millers Point (for the northern half), The Rocks and the Sydney Harbour Bridge approach to the east; and bounded to the south by a range of new development containing large CBD commercial tenants.

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park (Barangaroo Reserve), Barangaroo Central and Barangaroo South. The Residential Building R5 site is located within Barangaroo South. The site of this proposed DA is located on land generally known and identified in the approved Concept Plan (as modified) as Block 4B, as shown in Figure 1 below.

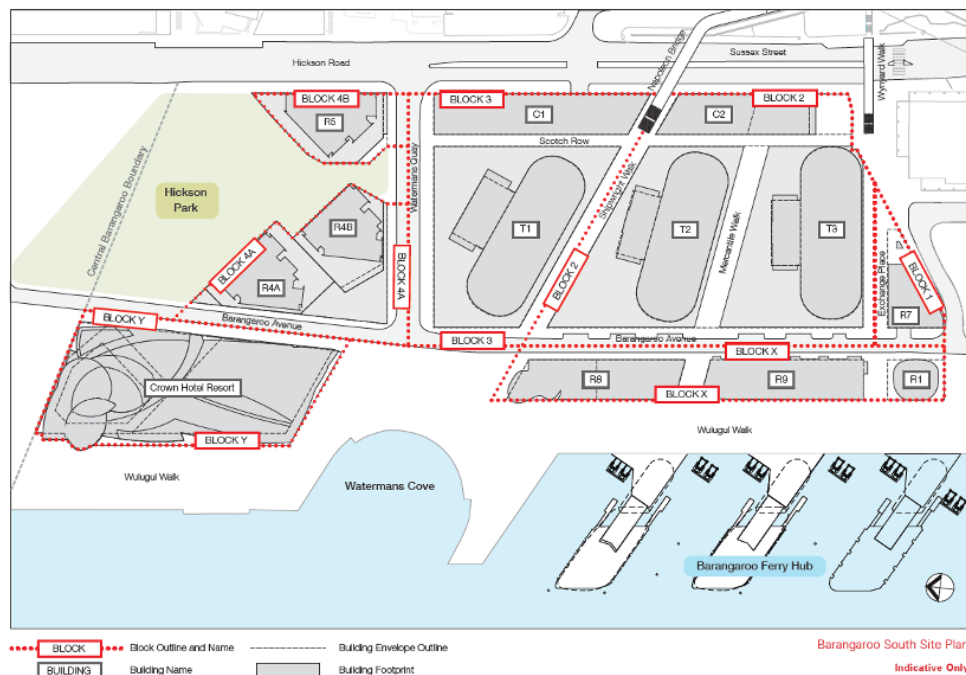


Figure 1 Block 4B (Building R5) in relation to Barangaroo South

Source: Lendlease

Electrolight was engaged by Lendlease to undertake the external lighting design of the front of house spaces for the One Sydney Harbour R5 Building (“Tower R3”), including:

- Ground floor external perimeter, including awnings and entry
- Level 2 “Key Worker” Terrace
- Level 31 “On Market” Terrace
- Typical Apartment Balconies

This objective of this report is to outline to key stakeholders (including the Sydney Observatory) the lighting design approach, associated light spill mitigation strategies and to confirm that the design complies with AS4282-1997 Control of the Obtrusive Effects of Outdoor Lighting. This report is to be read in conjunction with the Obtrusive Lighting Study prepared by Aurecon - refer Appendix C.

2. DEFINITIONS

2.1 Illuminance

The physical measure of illumination is illuminance. It is the luminous flux arriving at a surface divided by the area of the illuminated surface. Unit: lux (lx); $1 \text{ lx} = 1 \text{ lm/m}^2$.

(a) Horizontal illuminance (E_h) The value of illuminance on a designated horizontal plane

(b) Vertical illuminance (E_v) The value of illuminance on a designated vertical plane

Where the vertical illuminance is considered in the situation of potentially obtrusive light at a property boundary it is referred to as environmental vertical illuminance (E_{ve}).

2.2 Luminance

The physical quantity corresponding to the brightness of a surface (e.g. a lamp, luminaire or reflecting material such as the road surface) when viewed from a specified direction. SI Unit: candela per square metre (cd/m^2) – also referred to as “nits”.

2.3 Luminous Intensity

The concentration of luminous flux emitted in a specified direction. Unit: candela (cd).

2.4 Obtrusive Light

Spill Light which, because of quantitative, directional or spectral attributes in a given context, gives rise to annoyance, discomfort, distraction or a reduction in the ability to see essential information.

2.5 Threshold Increment

The measure of disability glare expressed as the percentage increase in contrast required between a standard object and its background (the carriageway) for it to be seen equally as well with the source of glare present as with it absent, derived in the specified manner. This metric is directly related to Veiling Luminance.

NOTE: The required value is a maximum for compliance of the lighting scheme.

2.6 AGI32 Light Simulation Software

AGI32 (by U.S. company Lighting Analysts) is an industry standard lighting simulation software package that can accurately model and predict the amount of light reaching a designated surface or workplane. AGI32 has been independently tested against the International Commission On Illumination (CIE) benchmark, CIE 171:2006, Test Cases to Assess the Accuracy of Lighting Computer Programs.

3. SITE DESCRIPTION AND SCOPE

The R5 Building is one of 3 residential towers proposed for the One Sydney Harbour Site. Two other towers in the development ("Building R4A and Building R4B") are located to the west of R5 Building. The R5 Building is also bordered by Hickson Park to the north, Hickson Rd to the east, the T1-T3 International Commercial Towers to the south and Crown Casino to the West. This report will assess the impact of the external lighting (outlined in Section 1) on the proposed R4A and R4B buildings, as well as to the existing residential buildings located outside the Barangaroo precinct (primarily east of Hickson Rd) and to the Sydney Observatory.

The lighting design for Building R5 incorporated the following Key Design Strategies to minimise Obtrusive light to neighbouring properties:

- A design process based upon deliberate and selective application of light on target objects/ surfaces to create light and shadow, rather than blanket even illumination of all areas. This avoided over-lighting of spaces and reduced associated spill light into the environment.
- A design process that sought to create an intimate and atmospheric residential environment, with lighting levels that are on the lower end of the acceptable range, but which still satisfied safety and CPTED requirements. This minimised spill lighting into the environment, including from indirect reflection off illuminated surfaces.
- Not floodlighting the building facades through direct application of light. Activation of the building envelope comes from the internal illumination of the apartments and communal spaces as seen through the windows of the facades. This provided a far more sympathetic and minimal lighting impact upon neighbouring properties.
- A design process that encouraged and enabled transparency and views from the R5 Building to the surrounding environment. This restricted the use and selection of luminaires at the perimeter edge of the building which may have caused veiling lighting effects (or be directly visible from outside of the building), which in turn reduced the potential light spill into the surrounding environment.
- Selection of modern luminaires that have precision optics and are full cut-off (zero uplight) when mounted outside. Utilisation of glare shields, louvres and baffles on luminaires (where required) to reduce or eliminate spill light leaving the site.
- Use of warm white 2700K light sources for all external luminaires to minimise light scattering in the atmosphere from blue light.
- For the level 2 & 31 terrace spaces, a preference for low level mounted luminaires that provide targeted illumination to the task surface, rather than high mounted pole tops or large area floodlights.
- Use of a digital lighting control system which enables individual dimming of each luminaire to allow fine tuning of the installation at initial commissioning stage to prevent over-lighting of the spaces. This shall be combined with timeclock controls that will switch off non-essential lighting during after hours operation.

The lighting to the ground floor plane and external perimeter awnings of the R5 Building has been designed in accordance with Lighting Subcategory "P8" of AS1158.3.1 (2005) as outlined in the Barangaroo Lighting Masterplan developed by Spiers and Major. External building perimeter lighting will be dimmed to ensure that this minimum illumination level is not significantly exceeded, to reduce the obtrusive lighting impact to neighbouring properties.

The Lighting Design Drawings & Schedule are to be found in Appendix A. In assessing the obtrusive lighting of the design, it has been assumed that the lighting will be operating during curfewed periods (between 11pm-6am), and as such, the more stringent curfew lighting limits outlined in AS4282 have been applied to the assessment.

4. DESIGN GUIDELINES AND STANDARDS

The Lighting & Light Spill Report will review the proposed lighting installation against the following Criteria, Design Guidelines and Standards.

- AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting.

5. AS4282 ASSESSMENT

The proposed installation has been assessed against AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting.

AS4282 provides limits for different obtrusive factors associated with dark hours (night time) operation of outdoor lighting systems. Two sets of limiting values for spill light are given based on whether the lighting is operating before a curfew (known as “pre-curfew” operation) or operating after a curfew (known as post-curfew or curfewed operation). Pre-curfew spill lighting limits are higher than post-curfew values, on the understanding that spill light is more obtrusive late at night when residents are trying to sleep. Under AS4282, the post-curfew period is taken to be between 11pm and 6am daily.

The AS4282 assessment includes a review of nearby residences and calculation of the amount of illuminance (measured in Lux) that the properties are likely to receive from the lighting installation during night time operation. As it has been assumed that the lighting will operate all night, the assessment will review the proposed lighting installation under the “post-curfew” limits.

Building R5 is located in a mixed residential and commercial area, therefore the maximum illuminance in the vertical plane of adjacent residential properties is limited to 25 lux on the residential boundaries during pre-curfew operation, and 4 lux on the habitable windows during post-curfew operation (as outlined in Table 2.1 of AS4282). Under the Standard, spill light of 4 lux or lower is deemed to not affect the amenity of local residents during post curfew operation.

The nearest buildings with habitable windows are the following (Refer to Appendix B for plan):

15/21 Barangaroo Ave	123 Kent St
38 Hickson Rd (The Bond Apartments)	127 Kent St
3-7A High St	155 Kent St
44-72 High St	159-161 Kent St
74-80A High St	168 Kent St
89-113 Kent St	Building R4A
115-121 Kent St	Building R4B
Crown Hotel Sydney	

The residential properties above will form the basis of this obtrusive lighting assessment.

The lighting design was modelled in computer software AGI32 to determine the potential spill light impact (if any) on neighbouring residential properties. Appendix B shows the lighting model and the results of the calculations.

It can be seen from the lighting model that the maximum vertical illuminance on the nearest residential boundary is 0.9 lux at 38 Hickson Rd (the Bond Apartments). When the maximum vertical illuminance value of 1 lux from the Aurecon Scope Areas is included in the calculations (refer Appendix C*) the total potential maximum spill light to 38 Hickson Road is 1.9 lux. This is approximately 50% of the maximum allowable vertical illuminance of 4 lux outlined in AS4282 for post curfew operation. The installation therefore complies with the illuminance limits of the standard.

The Threshold Increment was also calculated for traffic approaches on Barangaroo Ave northbound, Barangaroo Ave southbound, Barton St eastbound, Barton St westbound, Watermans Quay eastbound, and Watermans Quay westbound. The calculation grids were located at 1.5m above ground level, with an approach viewing distance of between 10 m to 200 m. The calculation results show that the Threshold Increment does not exceed 0% for any traffic approach. The Threshold Increment was also included in the Aurecon Report for their scope areas and was calculated to be 0%, as such, the maximum Threshold Increment from the whole installation is 0%, which complies with the 20% limit outlined in AS4282.

The luminous intensity was also calculated to nearby residential properties for all luminaires included in the Electrolight and Aurecon scope areas. The calculation results show that all luminaires comply with the maximum luminous intensity curfew limit of 2500cd.

Astronomical Assessment - Sydney Observatory

The effects of light spill on astronomical observations can be broken down into two main categories: direct light from the installation falling directly on to the Telescope/s and a lightening of the night sky caused by scattering of stray light in the atmosphere ie "Sky glow" The nearest Observatory is Sydney Observatory at Observatory Hill, approximately 300m away from the site and will form the basis of the assessment.

AS4282 states that if the installation complies with the limits under the standard, then the effects of direct lighting falling on to the Telescope/s will be mitigated. As the final lighting design complies with the AS4282 limits (refer above), it can be seen that no direct light will detrimentally affect the Observatory.

Sky glow is common in urban areas and is less readily controlled. Any light source visible in the environment, including light from buildings, street lights, car head lights etc will cause sky glow. As observatories desire the lowest possible amount of sky glow, and urban environments (such as the Sydney CBD) by their very nature produce large amounts of sky glow, the question becomes one of what is deemed reasonable by both parties. The growth and development of Sydney City and the successful operation of the Observatory are both key outcomes and as outlined below, the design of the building utilities mitigation strategies and a restrained lighting design to enable both of these to be achieved.

The external lighting design of Building R5 is intimate, restrained and utilises all of the spill light mitigation strategies as outlined in Section 3. Furthermore, there is no decorative lighting proposed for the facades of the building. The amount of light emitted from this development can be viewed as small when compared to other commercial towers located nearby (particularly those with facade lighting). Given the existing ambient night time lighting environment of the CBD, and the amount of calculated light spill from the development, it is our view that the proposed development would not be detrimental to the Sydney Observatory.

* Electrolight takes no responsibility for the accuracy of calculations provided by Aurecon.

6. SUMMARY

- The proposed lighting installation at Building R5 Barangaroo South, NSW, has been found to comply with all relevant requirements of AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting (less than 4 lux vertical illuminance and 2500cd on habitable windows and less than 20% Threshold Increment for vehicular traffic).
- In complying with the above requirements, the proposed lighting installation should not cause any reduction in visual amenity to nearby residences or accommodation. Additionally, the proposed lighting should not result in unacceptable glare nor should it adversely impact the safety of pedestrians, residents, vehicular traffic, or the Sydney Observatory.

7. DESIGN CERTIFICATION

The proposed lighting to be installed at Building R5 Barangaroo South, NSW if commissioned according to this report, will comply with the following criteria, guidelines and standards:

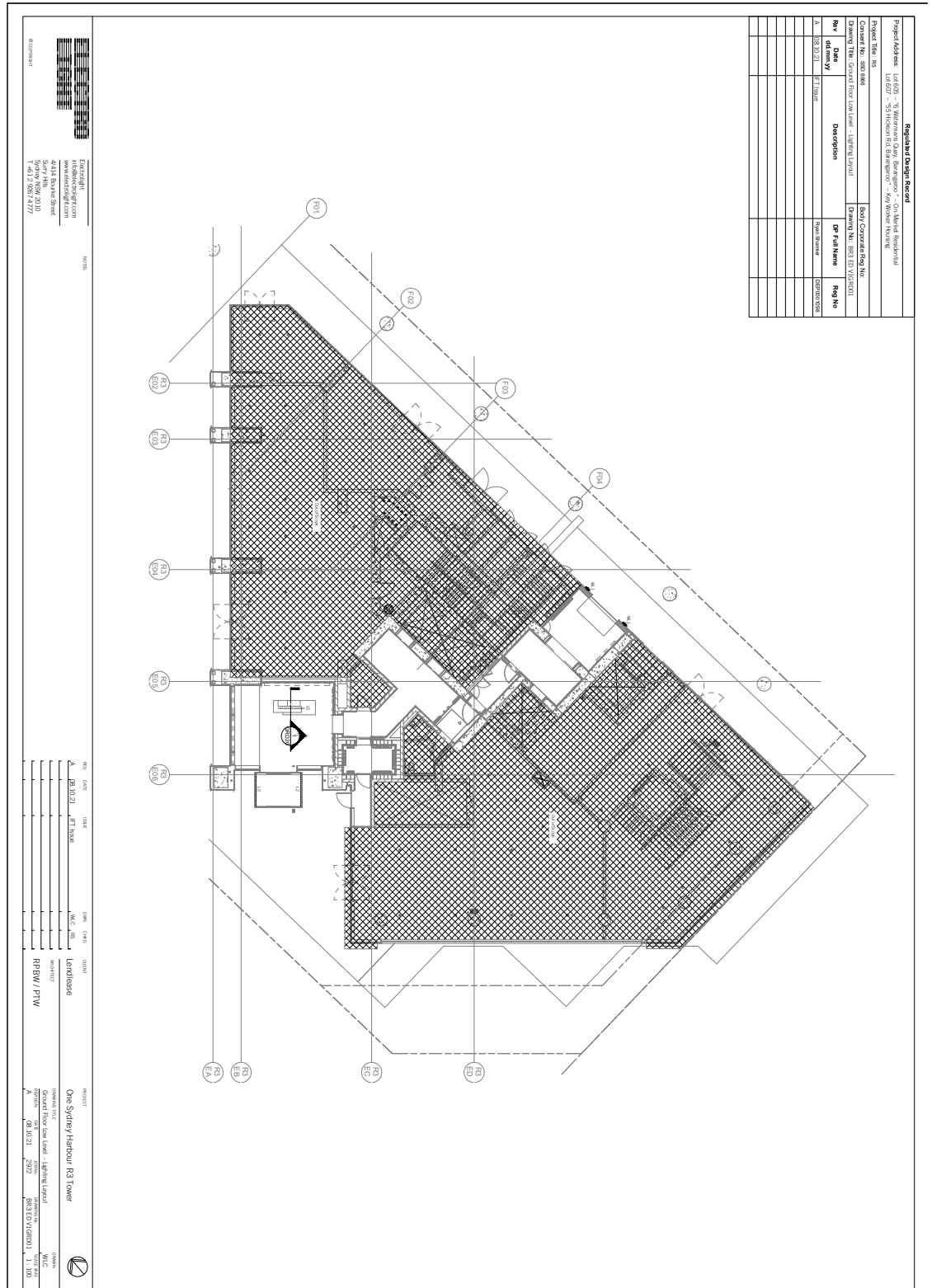
- AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting

A handwritten signature in black ink, appearing to read 'Ryan Shamier', with a long horizontal stroke extending to the right.

Ryan Shamier MIES
Senior Lighting Designer
Electrolight Sydney
05/07/22

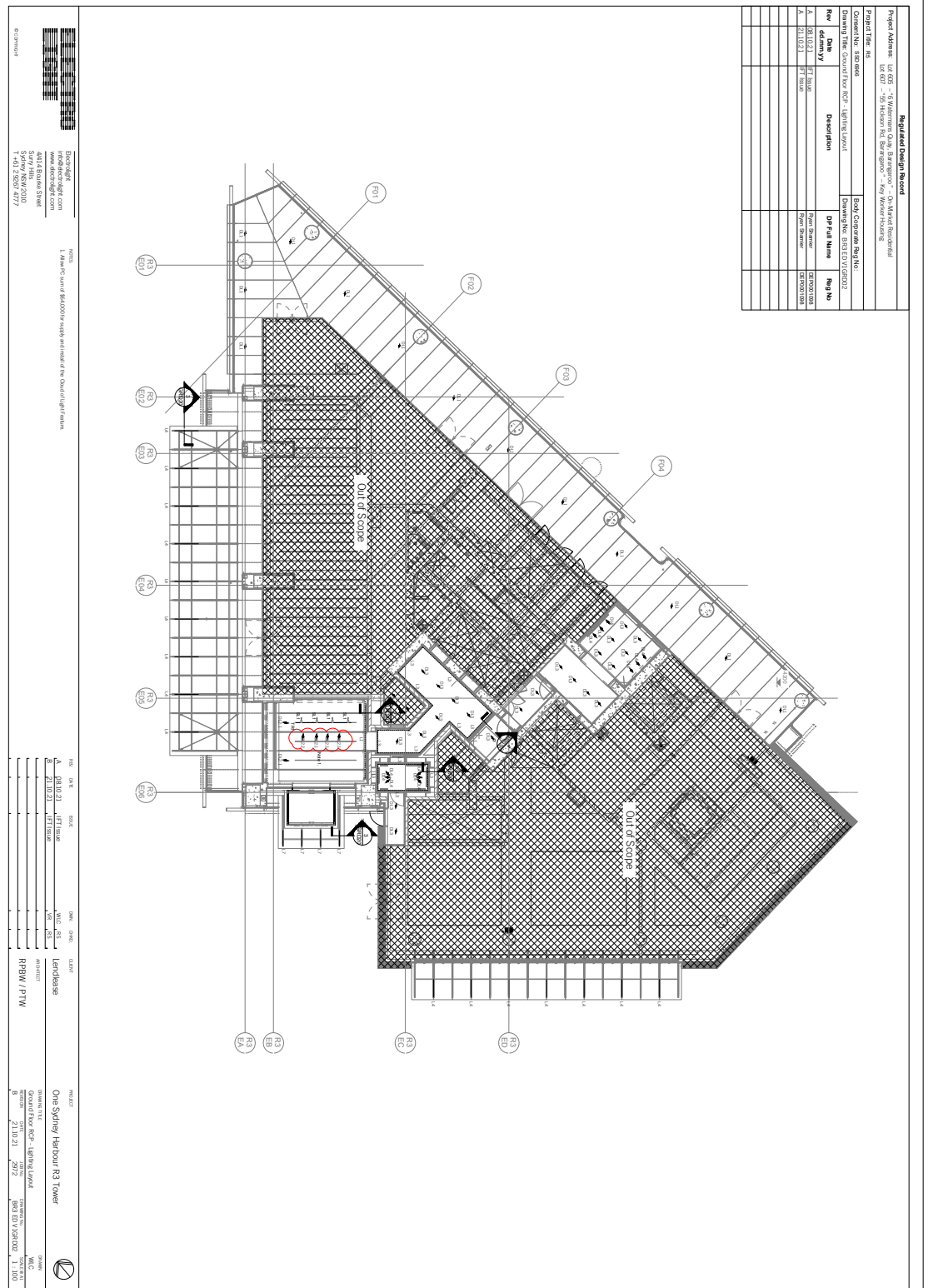
APPENDIX A

ELECTROLIGHT LIGHTING LAYOUTS AND DETAILS

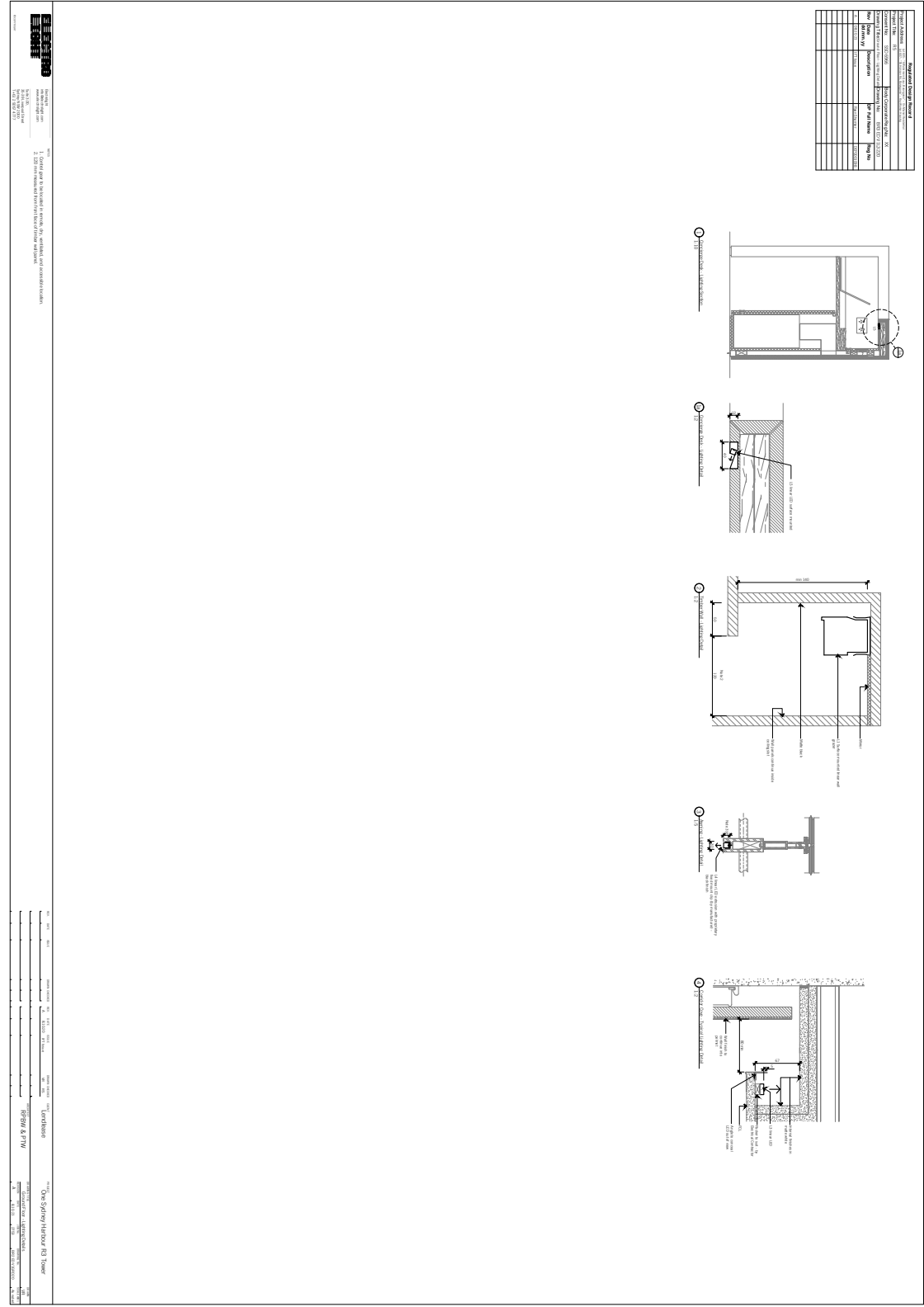


APPENDIX A

ELECTROLIGHT LIGHTING LAYOUTS AND DETAILS



APPENDIX A
ELECTROLIGHT LIGHTING LAYOUTS AND DETAILS

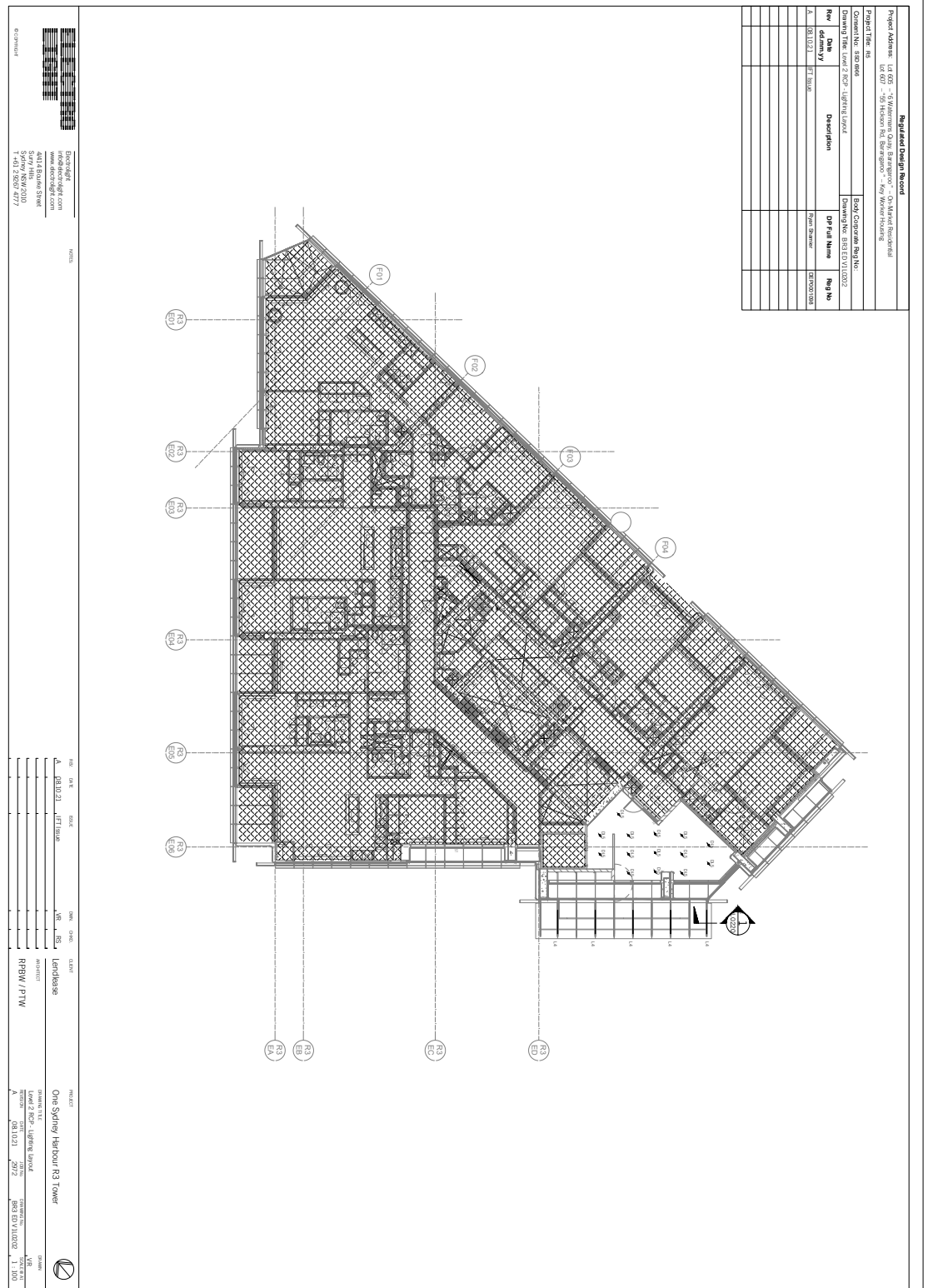


APPENDIX A

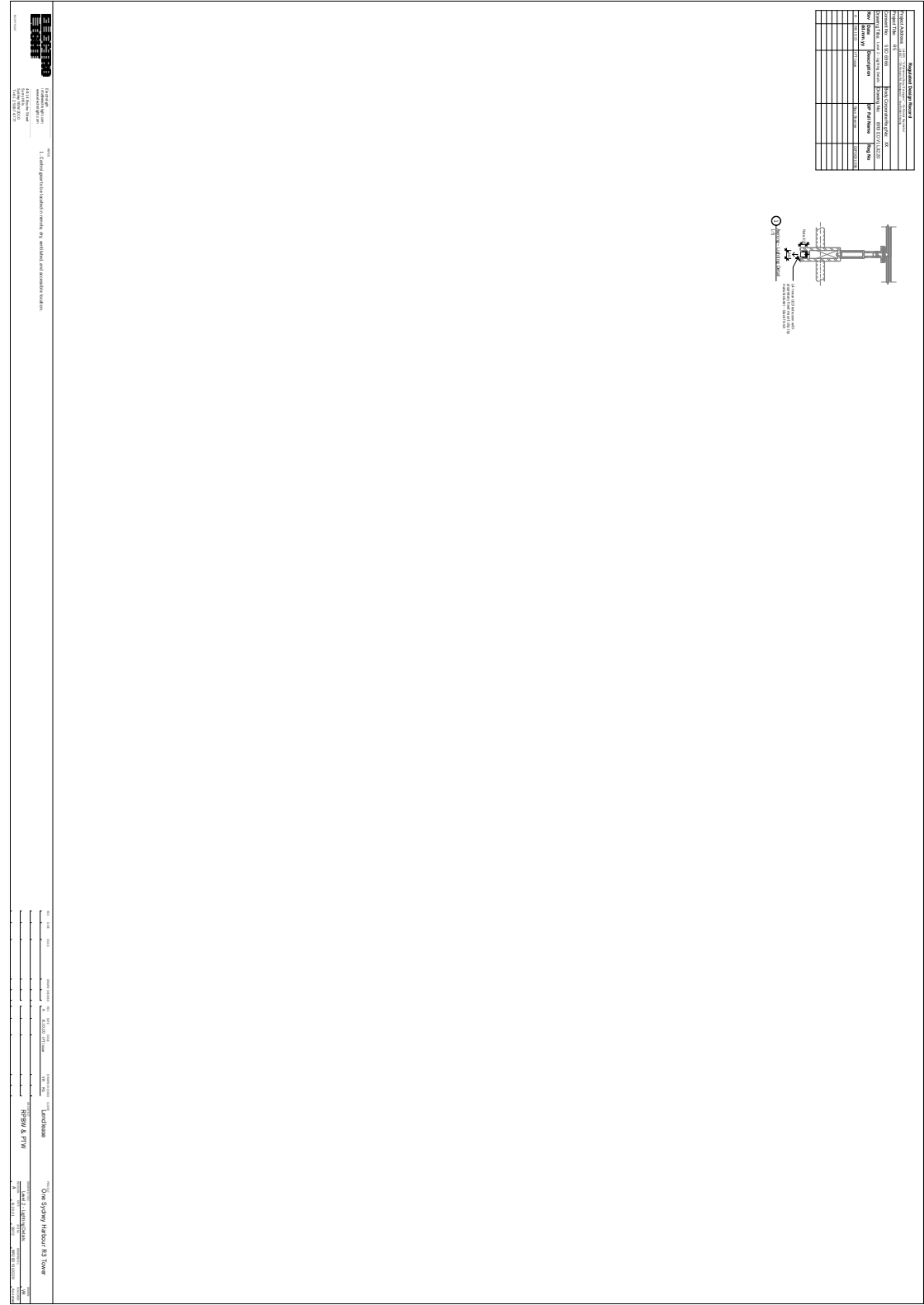
ELECTROLIGHT LIGHTING LAYOUTS AND DETAILS

APPENDIX A

ELECTROLIGHT LIGHTING LAYOUTS AND DETAILS

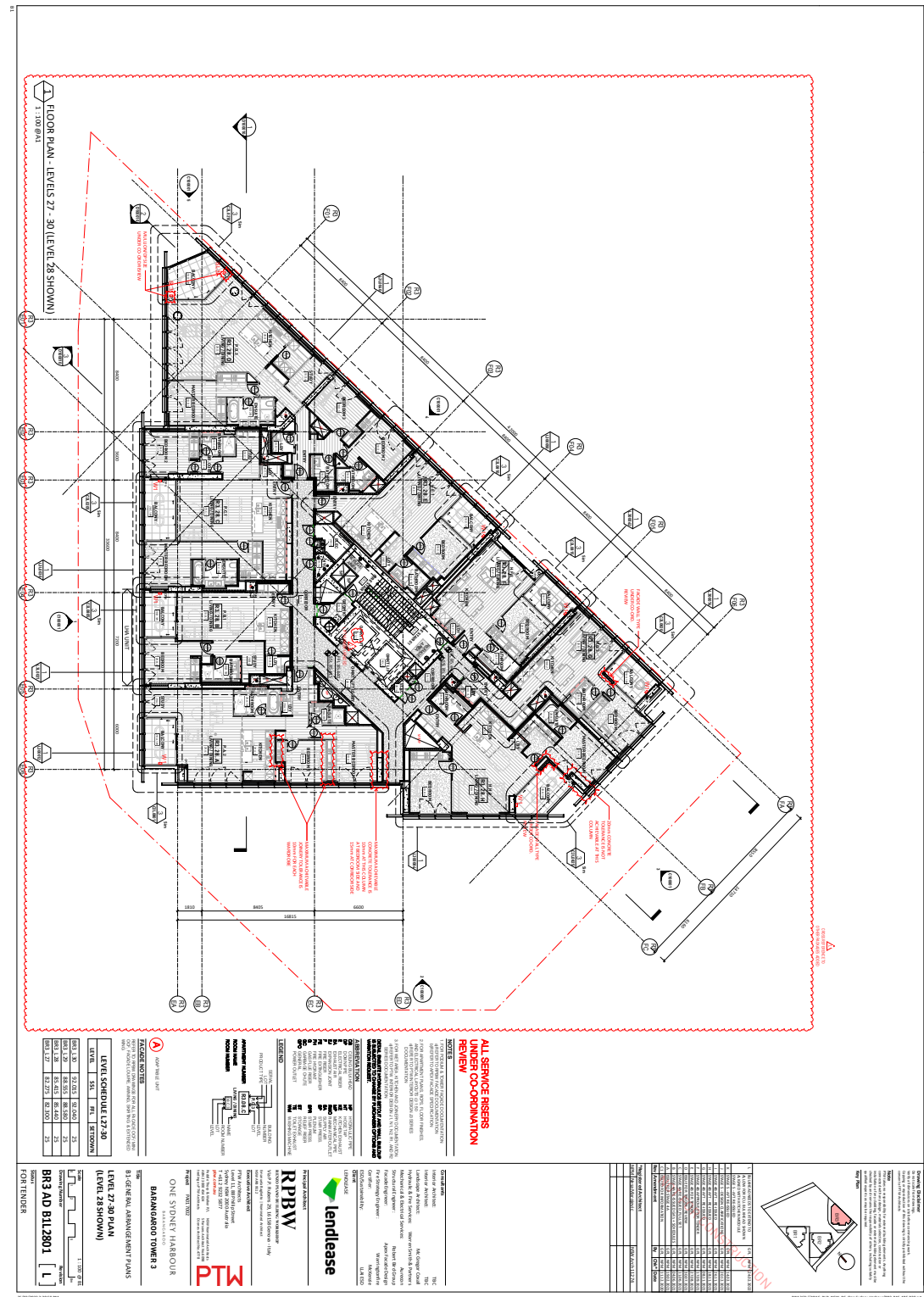


APPENDIX A
ELECTROLIGHT LIGHTING LAYOUTS AND DETAILS



ELECTROLIGHT LIGHTING LAYOUTS AND DETAILS

TYPICAL ELECTROLIGHT BALCONY LIGHTING LAYOUTS AND DETAILS





Electrolight
austrelia@electrolight.com
www.electrolight.com
4/414 Bourke Street, Sunny Hills
Sydney NSW 2010
T +612 9267 4777

PROJECT		PROJECT NUMBER	
OSH R3 Tower		2872	
ZONE/STAGE		DATE	
-		5/07/2022	
CLIENT		REVISION	
Landlease		E	

Luminaire Schedule

Ref.	Image	Description	Manufacturer / Supplier	Type / Specification	Finish	Dimensions (mm)	Light Source	Source Wattage	Luminaire Output	Optic	Colour Temp	IP Rating	Control Gear	Accessories	Mounting Details
BL1		Bollard Light	Gardens At Night / Jade Cross - Nick van Someren - 0422 564 976	Path Light Linear Luminaire	Black (TBC Architect)	550 H x 112 L (approx)	LED	4W	-	Diffuse	2700 K	IP66	Non dim	Surface mounted accessory	Surface mounted on concealed concrete plinth (by Contractor)
DL1		Exterior downlight	BL / Lucan - Brendan Harris - 0499 023 232	CAN 140	Black (TBC)	140 mm Dia / 200 mm H	LED	25 W	2777 lm (source)	Wide 40°	2700 K	IP55	Remote DALI dimmable		Surface mounted
DL2.1		Recessed adjustable downlight	Lucent / JSB Lighting - Daniel Churchill - 0418 465 700	ProSpec Soft 90Accent	White	108 Dia x 104 H	LED CRI 90+	30.2 W	2218 lm (delivered)	24°	2700K (max 3 MacAdam ellipse variation)	IP20	Remote DALI dimmable		Ceiling recessed
DL2.2		Recessed adjustable downlight	Lucent / JSB Lighting - Daniel Churchill - 0418 465 700	ProSpec Soft 90Accent	White	108 Dia x 104 H	LED CRI 90+	18.4 W	843 lm (delivered)	10°	2700K (max 3 MacAdam ellipse variation)	IP20	Remote DALI dimmable		Ceiling recessed
DL3		Recessed fixed pinhole downlight	Inlite - Russell Lee 0402 313 504	Pico Starr Fixed Pinhole	White	68.5 Dia x 68 H	LED	9W	450 lm (approx)	24°	2700K (max 3 MacAdam ellipse variation)	IP20	Remote DALI dimmable (shared drivers where possible)		Recessed
DL4		Recessed wall wash downlight	Reggan / Eurodure - John Aiello 0418 751 261	Mood Pro Wall Washer Round Drop	White	102 Dia x 121 H	LED	21W	2670 lm (source)	Wall wash	2700K (max 3 MacAdam ellipse variation)	IP20	Remote DALI dimmable		Recessed
DL5		Recessed fixed pinhole downlight	Inlite - Russell Lee 0402 313 504	Pico Starr Fixed Pinhole	White	68.5 Dia x 68 H	LED	9W	450 lm (approx)	38°	2700K (max 3 MacAdam ellipse variation)	IP54	Remote DALI dimmable (shared drivers where possible)		Recessed

APPENDIX A

ELECTROLIGHT LIGHTING LAYOUTS AND DETAILS



Electrolight
austalia@electrolight.com
www.electrolight.com
4/414 Bourke Street, Sunny Hills
Sydney NSW 2010
T +612 9267 4777

PROJECT	PROJECT NUMBER
OSH R3 Tower	2972
ZONE/STAGE	DATE
-	9/07/2022
CLIENT	REVISION
Landlease	E

Luminaire Schedule

Ref.	Image	Description	Manufacturer / Supplier	Type / Specification	Finish	Dimensions (mm)	Light Source	Source Wattage	Luminaire Output	Optic	Colour Temp	IP Rating	Control Gear	Accessories	Mounting Details
DL6		Exterior downlight	IBL / Lucian - Brendan Harris 0499 023 232	CAN 60	White (TBC Architect)	60 mm Dia / 120 mm H	LED	8.6 W	1028 lm (source)	Wide 60°	2700 K	IP65	Remote DALI dimmable (shared drivers where possible)		Surface mounted
L1		Surface mounted linear wall grazer	Eco / Jade Cross - Nick Van Soeren 0422 564 976	Lightgap	Black	57 W x 73 H x L to site measure	LED	18 W/m	1850 lm/m	Grazing	2700 K	IP20	DALI		Surface mounted, refer to detail drawing
L2		Recessed in-ground linear LED	Flik / Litesource - Matt Roworth 0423 486 309	Step up slim	Glass	33 W x 92 H x L to site measure	LED	10 W/m	350 lm/m	Diffuse	2700 K	IP67	Remote DALI diminable	Recess housing	In-ground recessed
L3		Cove LED	Litesource - Matt Roworth (02) 92699175	Omicron	Aluminium	16 W x 6 H x length to site measure	LED	9.6 W/m	816 lm /m	Diffuse	2700K (max 3 MacAdam ellipse variation)	IP20	Remote DALI diminable	Proprietary mounting clips	Surface mounted, refer to detail drawing
L4		Surface mounted linear light with integrated baffle louvre	Luciano / Modular Lighting & Partners - Michael Down 0421 719 829	V205 Optic	Custom "Outigger" RAL 7045 TBC	20 W x 24 H x 1500 L	LED	24 W/m	2400 lm/m	Grazing	2700 K	IP67	Remote DALI diminable	Fixed mount clips - custom black finish	Surface mounted, Refer to detail
L5		Surface mounted linear LED extrusion	Lucian - Brendan Harris 0499 023 232	Inclinatus 40	Black (TBC)	12 H x 40 W x length to suit	LED	10 W/m	466 lm/m	Diffused	2700K (max 3 MacAdam ellipse variation)	IP20	Remote DALI diminable	Proprietary mounting clips	Surface mounted using proprietary mounting clips
L6		Deleted													

APPENDIX A ELECTROLIGHT LIGHTING LAYOUTS AND DETAILS



Electrolight
austalis@electrolight.com
www.electrolight.com
44/4 Bourke Street, Sunny Hills
Sydney NSW 2010
T +612 9267 4777

PROJECT		PROJECT NUMBER	
OSH R3 Tower		2972	
ZONE/STAGE		DATE	
-		06/07/2022	
CLIENT		REVISION	
Landlease		E	

Luminaire Schedule

Ref.	Image	Description	Manufacturer / Supplier	Type / Specification	Finish	Dimensions (mm)	Light Source	Source Wattage	Luminaire Output	Optic	Colour Temp	IP Rating	Control Gear	Accessories	Mounting Details
L7		Surface mounted linear light with integrated baffle louvre	Lumino / Modular Lighting & Partners - Michael Down 0421 719 829	V20S Optic	Custom 'Our tiger' RAL 7045 TBC	20 W x 24 H x 1000 L	LED	24 W/m	2400 lm/m	Grazing	2700 K	IP67	Remote DALI dimmable	Fixed mount clips - custom black finish	Surface mounted. Refer to detail
SL1		Single head LED track light	Euroclue/ Reggiani - John Alejo 02 9356 9900	Yori Evo Ghostack - Cluster 1x	White	95mm DIA Head / 180 mm L	LED >90 CRI (Note 13)	33W	3635lm (source)	Wide beam (Performance Optic) 40 deg.	2700K (max 3 MacAdam ellipse variation)	IP20	DALI Dimmable. (Remote Gear to be in accessible location)		Mounted on Track
SL2		Surface mounted exterior spot light	Nocturnal Lighting Lucian - Brendan Harris 0499 023 232	Firefly spot	Black (TBC Architect) / 120 mm L	58.8 mm Dia	LED	6W	476lm	30°	2700 K	IP65	Remote DALI dimmable - shared drivers where possible	Honeycomb louvre	
SL3		Surface mounted exterior spot light	iGuzzini - Bruno Scardi 0410 664 488	Palco InOut	White (TBC)	83mm Dia x 145 mm L	LED	10.9W	682lm	86°	2700 K	IP66	Remote DALI dimmable		Wall Mounted @1950 AFPL (to top of fitting)
TL1		Deleted													
TR1		Recessed 3-circuit DALI lighting track - surface	Euroclue- John Alejo 02 9356 9900	Three Circuit DALI Global Recessed	White	37.8 mm W x 31.4 mm H x length to Suit	-	-	-	-	-	-	-	-	-
W1		Wall uplight - Note 13	Flos / Euroclue - John Alejo 0418 751 261	Mile Wall 2 Up	White	240 L x 100 W x 50 H	LED CR180+	10W	855lm	Asymmetric	2700 K	IP65	Integral DALI dimmable.		Wall Mounted @1950 AFPL (to top of fitting)

APPENDIX A

ELECTROLIGHT LIGHTING LAYOUTS AND DETAILS



Electrolight
austrelia@electrolight.com
www.electrolight.com
4/414 Bourke Street, Sunny Hills
Sydney NSW 2010
T +612 9267 4777

PROJECT		PROJECT NUMBER	
OSH R3 Tower		2972	
ZONE/STAGE		DATE	
-		5/07/2022	
CLIENT		REVISION	
Lendlease		E	

Luminaire Schedule

Ref.	Image	Description	Manufacturer / Supplier	Type / Specification	Finish	Dimensions (mm)	Light Source	Source Wattage	Luminaire Output	Optic	Colour Temp	IP Rating	Control Gear	Accessories	Mounting Details
WL1		Exterior wall light	Simes	COOL APPLIQUE L 290mm	Black (TBC)	290 mm H / 105 mm D / 43 mm W	LED	19W	914lm	Diffuse	2700 K	IP54	Remote DALI dimmable		
WL2		Wall up-light	Nocturnal Lighting Lucian - Brendan Harris 0499 023 232	Glider small	White	195 mm L / 80 mm W / 20 mm H	LED	20 W	-	Diffuse	2700 K	IP20	Remote DALI dimmable		
WL3		Surface mounted wall light	We-el / Buckford Illumination - Usa Murray 0427 160 443	OUV334 LED	Black (TBC Architect)	222 L x 220 W x 220H	LED	12W	1200 lm	Asymmetri c Forward Throw	2700 K	IP66	DALI dimmable		Surface mounted
WL4		Low level wall light	Nocturnal Lighting Lucian - Brendan Harris 0499 023 232	Possum	Black (TBC Architect)	115 mm Dia / 20 mm	LED	6W	-	Diffuse	2700 K	IP65	Remote DALI dimmable - shared drivers where possible		

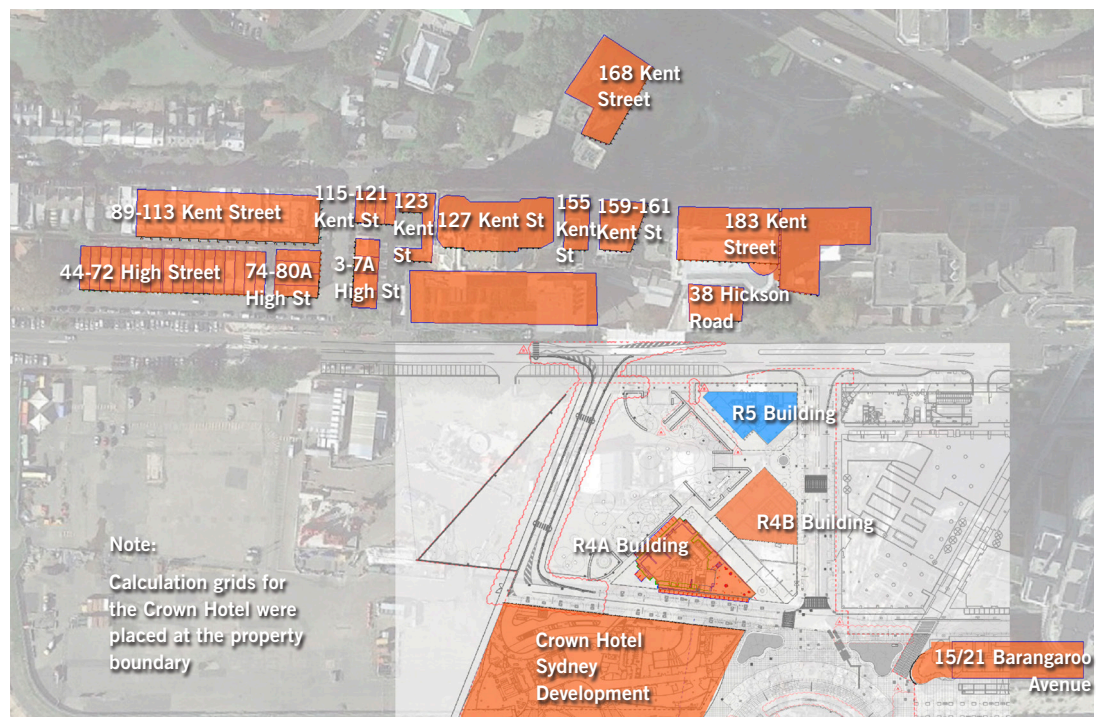
Notes:

- Any changes to the document are shown highlighted in yellow
- Luminaire Schedule should be read in conjunction with the full set of Lighting Documentation as well as Architectural & Services drawings
- Before ordering, it is the Contractor's responsibility to ensure lead times of luminaires are within programme
- Catalogue Numbers / Order codes are indicative only. Where there is a discrepancy between the specified luminaire information and the catalogue number provided clarification MUST be sought from Electrolight before ordering
- All luminaire finishes to be confirmed by Architect before ordering
- Data sheets with specification information shall be provided for all luminaire types for approval by Electrolight prior to order. Shop drawings are required for linear lengths and custom fittings
- For system wattage of luminaires, refer to Manufacturers data
- Mounting heights to be confirmed with Electrolight prior to installation
- Contractor is responsible for co-ordinating the location of remote driver in a secure and accessible location
- For trimless fittings it is the Contractor's responsibility to co-ordinate ceiling works with the builder
- It is the Contractor's responsibility to ensure phase dimmable drivers provided by the supplier are compatible with the lighting control system and devices.
- It is the Contractor's responsibility to allow for drainage for all inground luminaires
- For initial locations refer to Aurecon's Apartment Documentation - final design and layout by Electrical Contractor. Lighting calculations and associated design certification by Electrical Contractor.

APPENDIX B

OBTRUSIVE LIGHTING CALCULATIONS (POST-CURFEW OPERATION)

Calculation Summary			
Label	CalcType	Units	Max
115-121 Kent St_Ill_Seg1	Obtrusive - Ill	Lux	0.0
123 Kent St_1_Ill_Seg1	Obtrusive - Ill	Lux	0.0
123 Kent St_Ill_Seg1	Obtrusive - Ill	Lux	0.0
127 Kent Street_1_Ill_Seg1	Obtrusive - Ill	Lux	0.1
127 Kent Street_2_Ill_Seg1	Obtrusive - Ill	Lux	0.1
127 Kent Street_Ill_Seg1	Obtrusive - Ill	Lux	0.0
15-21 Barangaroo Avenue_Ill_Seg1	Obtrusive - Ill	Lux	0.0
15-21 Barangaroo Avenue_Ill_Seg1	Obtrusive - Ill	Lux	0.0
15-21 Barangaroo Avenue_Ill_Seg1	Obtrusive - Ill	Lux	0.0
15-21 Barangaroo Avenue_Ill_Seg2	Obtrusive - Ill	Lux	0.0
15-21 Barangaroo Avenue_Ill_Seg3	Obtrusive - Ill	Lux	0.0
15-21 Barangaroo Avenue_Ill_Seg4	Obtrusive - Ill	Lux	0.0
15-21 Barangaroo Avenue_Ill_Seg5	Obtrusive - Ill	Lux	0.0
15-21 Barangaroo Avenue_Ill_Seg6	Obtrusive - Ill	Lux	0.0
15-21 Barangaroo Avenue_Ill_Seg7	Obtrusive - Ill	Lux	0.0
15-21 Barangaroo Avenue_Ill_Seg8	Obtrusive - Ill	Lux	0.0
15-21 Barangaroo Avenue_Ill_Seg9	Obtrusive - Ill	Lux	0.0
155 Kent Street_Ill_Seg1	Obtrusive - Ill	Lux	0.2
159-161 Kent Street_Ill_Seg1	Obtrusive - Ill	Lux	0.3
159-161 Kent Street_Ill_Seg2	Obtrusive - Ill	Lux	0.4
168 Kent Street_Ill_Seg1	Obtrusive - Ill	Lux	0.1
168 Kent Street_Ill_Seg2	Obtrusive - Ill	Lux	0.1
183 Kent Street_Ill_Seg1	Obtrusive - Ill	Lux	0.5
189 Kent St_Ill_Seg1	Obtrusive - Ill	Lux	0.0
189 Kent St_Ill_Seg2	Obtrusive - Ill	Lux	0.1
3-7A High Street_Ill_Seg1	Obtrusive - Ill	Lux	0.0
38 Hickson Road_Ill_Seg1	Obtrusive - Ill	Lux	0.9
44-72 High Street_Ill_Seg1	Obtrusive - Ill	Lux	0.0
74-80A High Street_Ill_Seg1	Obtrusive - Ill	Lux	0.0
74-80A High Street_Ill_Seg2	Obtrusive - Ill	Lux	0.0
89-113 Kent St_Ill_Seg1	Obtrusive - Ill	Lux	0.0
89-113 Kent St_Ill_Seg2	Obtrusive - Ill	Lux	0.0
Crown Hotel_Ill_Seg1	Obtrusive - Ill	Lux	0.0
R4a_Ill_Seg1	Obtrusive - Ill	Lux	0.0
R4a_Ill_Seg2	Obtrusive - Ill	Lux	0.0
R4b_Ill_Seg1	Obtrusive - Ill	Lux	0.0
R4b_Ill_Seg2	Obtrusive - Ill	Lux	0.0



APPENDIX B

THRESHOLD INCREMENT CALCULATIONS (POST-CURFEW OPERATION)

Calculation Summary			
Label	CalcType	Units	Max
Barangaroo Ave Northbound	Obtrusive - TI	%	0.0
Barangaroo Ave Southbound	Obtrusive - TI	%	0.0
Barton St Eastbound	Obtrusive - TI	%	0.0
Barton St Westbound	Obtrusive - TI	%	0.0
Hickson Rd Northbound	Obtrusive - TI	%	0.0
Hickson Rd Southbound	Obtrusive - TI	%	0.0
Watermans Quay Eastbound	Obtrusive - TI	%	0.0
Watermans Quay Westbound	Obtrusive - TI	%	0.0



APPENDIX B

COMPLIANCE TEST REPORT (POST-CURFEW OPERATION)

Obtrusive Light - Compliance Report

AS 4282-1997, Commercial, Post-Curfew
Filename: 2972 - OSH R3 LLSR Rev 2
5/07/2022 12:21:31 PM

Illuminance

Maximum Allowable Value: 4 Lux

Calculations Tested (37):

Calculation Label	Test Results	Max. Illum.
Crown Hotel_Ill_Seg1	PASS	0.0
15-21 Barangaroo Avenue_Ill_Seg1	PASS	0.0
15-21 Barangaroo Avenue_Ill_Seg2	PASS	0.0
15-21 Barangaroo Avenue_Ill_Seg3	PASS	0.0
15-21 Barangaroo Avenue_Ill_Seg4	PASS	0.0
15-21 Barangaroo Avenue_Ill_Seg5	PASS	0.0
15-21 Barangaroo Avenue_Ill_Seg6	PASS	0.0
15-21 Barangaroo Avenue_Ill_Seg7	PASS	0.0
15-21 Barangaroo Avenue_Ill_Seg8	PASS	0.0
15-21 Barangaroo Avenue_Ill_Seg9	PASS	0.0
15-21 Barangaroo Avenue_Ill_Seg10	PASS	0.0
15-21 Barangaroo Avenue_Ill_Seg11	PASS	0.0
38 Hickson Road_Ill_Seg1	PASS	0.9
168 Kent Street_Ill_Seg1	PASS	0.1
168 Kent Street_Ill_Seg2	PASS	0.1
127 Kent Street_2_Ill_Seg1	PASS	0.1
127 Kent Street_1_Ill_Seg1	PASS	0.1
127 Kent Street_Ill_Seg1	PASS	0.0
159-161 Kent Street_Ill_Seg1	PASS	0.3
159-161 Kent Street_Ill_Seg2	PASS	0.4
155 Kent Street_Ill_Seg1	PASS	0.2
3-7A High Street_Ill_Seg1	PASS	0.0
123 Kent St_Ill_Seg1	PASS	0.0
123 Kent St_1_Ill_Seg1	PASS	0.0
115-121 Kent St_Ill_Seg1	PASS	0.0
89-113 Kent St_Ill_Seg1	PASS	0.0
89-113 Kent St_Ill_Seg2	PASS	0.0
74-80A High Street_Ill_Seg1	PASS	0.0
74-80A High Street_Ill_Seg2	PASS	0.0
44-72 High Street_Ill_Seg1	PASS	0.0
183 Kent Street_Ill_Seg1	PASS	0.5
189 Kent St_Ill_Seg1	PASS	0.0
189 Kent St_Ill_Seg2	PASS	0.1
R4b_Ill_Seg1	PASS	0.0
R4b_Ill_Seg2	PASS	0.0
R4a_Ill_Seg1	PASS	0.0
R4a_Ill_Seg2	PASS	0.0

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 2500 Cd

Calculations Tested (37):

Calculation Label	Test Results
Crown Hotel_Cd_Seg1	PASS
15-21 Barangaroo Avenue_Cd_Seg1	PASS
15-21 Barangaroo Avenue_Cd_Seg2	PASS
15-21 Barangaroo Avenue_Cd_Seg3	PASS
15-21 Barangaroo Avenue_Cd_Seg4	PASS
15-21 Barangaroo Avenue_Cd_Seg5	PASS
15-21 Barangaroo Avenue_Cd_Seg6	PASS
15-21 Barangaroo Avenue_Cd_Seg7	PASS
15-21 Barangaroo Avenue_Cd_Seg8	PASS
15-21 Barangaroo Avenue_Cd_Seg9	PASS
15-21 Barangaroo Avenue_Cd_Seg10	PASS

APPENDIX B

COMPLIANCE TEST REPORT (POST-CURFEW OPERATION)

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 2500 Cd

Calculations Tested (37):

15-21 Barangaroo Avenue_Cd_Seg11		PASS
38 Hickson Road_Cd_Seg1	PASS	
168 Kent Street_Cd_Seg1	PASS	
168 Kent Street_Cd_Seg2	PASS	
127 Kent Street_2_Cd_Seg1	PASS	
127 Kent Street_1_Cd_Seg1	PASS	
127 Kent Street_Cd_Seg1	PASS	
159-161 Kent Street_Cd_Seg1	PASS	
159-161 Kent Street_Cd_Seg2	PASS	
155 Kent Street_Cd_Seg1	PASS	
3-7A High Street_Cd_Seg1	PASS	
123 Kent St_Cd_Seg1	PASS	
123 Kent St_1_Cd_Seg1	PASS	
115-121 Kent St_Cd_Seg1	PASS	
89-113 Kent St_Cd_Seg1	PASS	
89-113 Kent St_Cd_Seg2	PASS	
74-80A High Street_Cd_Seg1	PASS	
74-80A High Street_Cd_Seg2	PASS	
44-72 High Street_Cd_Seg1	PASS	
183 Kent Street_Cd_Seg1	PASS	
189 Kent St_Cd_Seg1	PASS	
189 Kent St_Cd_Seg2	PASS	
R4b_Cd_Seg1	PASS	
R4b_Cd_Seg2	PASS	
R4a_Cd_Seg1	PASS	
R4a_Cd_Seg2	PASS	

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (8):

Calculation Label	Adaptation Luminance	Test Results
Hickson Rd Southbound	10	PASS
Hickson Rd Northbound	10	PASS
Barton St Westbound	10	PASS
Barangaroo Ave Southbound	10	PASS
Barangaroo Ave Northbound	10	PASS
Watermans Quay Eastbound	10	PASS
Watermans Quay Westbound	10	PASS
Barton St Eastbound	10	PASS

Barangaroo Residential Tower 3

Obtrusive Lighting Study

Reference: 246937

Revision: 1

2022-03-01

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		Obtrusive Lighting Study					
Document code			Project number		246937		
File path		Https://aurecongroup.sharepoint.com/sites/246937/5 Deliver Design/501 Engineering/Reports/R3 Spill Lighting Report/22.03.01 - BR3 Obtrusive Lighting Study[1].docx					
Client		Lendlease					
Client contact		Martin Ferguson	Client reference		MF		
Rev	Date	Revision details/status	Author	Reviewer	Verifier (if required)	Approver	
1	2022-03-01	Draft Issue	JC	SB	EH	OL	
Current revision		1					

Approval			
Author signature		Approver signature	
Name	Josh Clancy	Name	Olivier Loyez
Title	Electrical Engineer	Title	Associate

Contents

1.1	Report Brief	1
1.2	Site location	1
1.3	Technical Parameters.....	2
1.3.1	Operating hours	2
1.3.2	Application and calculation conditions.....	2
1.3.3	Illuminance in vertical plane	2
1.3.4	Luminous intensity emitted by luminaires.....	2
1.3.5	Threshold increment.....	2
1.3.6	Upward Waste Light Ratio.....	2
1.3.7	Grid Definition.....	2
1.3.8	Recommended values from AS/NZS 4282:1997	3
1.4	Compliance Results.....	4

Appendices

Appendix A – Aurecon Lighting Layouts	5
Appendix B – Compliance Report	7
Appendix C – Calculation Summary.....	10
Appendix D – Photometric Assessment	12

Figures

Figure 1 - Site plan	1
Figure 2 – Expanded Site Plan.....	10

Tables

Table 1 - AS/NZS 4282:1997, Table 2.1	3
---	---

1.1 Report Brief

The objective of this report is to demonstrate the compliance of the proposed project (Barangaroo Residential Tower 3) with respects to the Australian Standard “AS 4282:1997 - Control of the obtrusive effects of outdoor lighting”.

This report covers the back of house external maintenance lighting on the building rooftop which has been designed and documented by Aurecon. This report must be read in conjunction with the front of house obtrusive lighting study report prepared by Electrolight.

1.2 Site location

“Barangaroo Residential Tower 3” is located within the city of Sydney, in the north-western edge of the Sydney central business district known as Barangaroo. This area is being redeveloped with a mix of new residential and commercial buildings. Residential buildings outside of this redeveloped area on the other side of Hickson Road are included in this study to highlight any adverse effects on residents.

Tower R3 is bordered by Tower R1 (north-west), the Crown Casino (west), the International Towers (South), Tower R2 (west), and Hickson Park (north). Buildings and zones beyond Hickson Park are considered in this study.

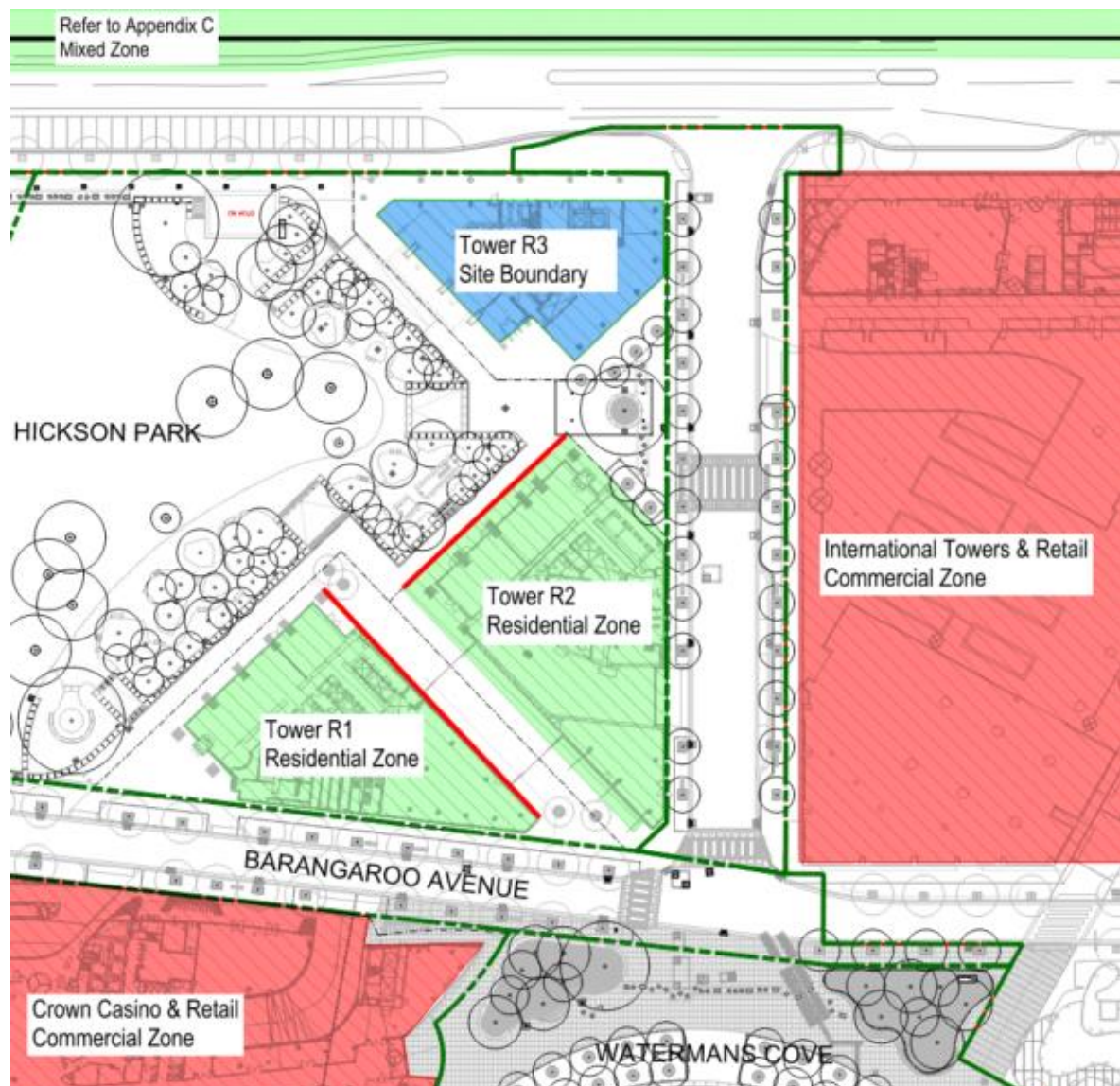


Figure 1 - Site plan

1.3 Technical Parameters

1.3.1 Operating hours

The exterior lighting assessed in this report will only operate when out of hours maintenance is required to be undertaken on equipment on the rooftop. These luminaires are controlled by manual wall switches rather than activated by PE cell, motion detector or timeclock. The controlling wall switches are located within areas which are only accessible by authorised contractors or maintenance staff, additionally, a timeout function will be provided to prevent the lighting from being inadvertently being left on.

1.3.2 Application and calculation conditions

The residential zones for this project are being assessed under the Curfewed conditions in “commercial areas, or at the boundary of commercial and residential areas” since the area contains a mix of residential properties and large commercial buildings such as the Crown in close proximity. Calculation fields are set to the face of windows in habitable residencies.

1.3.3 Illuminance in vertical plane

As per the above definitions, the maximum allowable lux value for light at the boundaries are set at 4 lx for the curfewed planes, as per Table 2.1 of AS/NZS 4282:1997.

1.3.4 Luminous intensity emitted by luminaires

Table 2.1 sets the maximum Luminous intensity emitted by luminaires to 2500 cd for the defined conditions above.

1.3.5 Threshold increment

Set at 20% based on adaptation luminance of 10 cd/m² for the roads around the site.

1.3.6 Upward Waste Light Ratio

All installed luminaires on the roof luminate below the 90 degree plane so the upward waste light ratio (UWLR) is zero.

Refer to Appendix D for the Luminaire Datasheets.

1.3.7 Grid Definition

External lighting exists on the rooftop of the property. For simplicity, grids are applied at the boundaries of residential or mixed properties in the vicinity and are the full height of Tower R1 plus 10m above. A vertical illumination grid is applied at the first instance of habitable windows at each property.

Horizontal spacing is set to 2 m and vertical spacing is set to 1 m.

1.3.8 Recommended values from AS/NZS 4282:1997

TABLE 2.1
RECOMMENDED MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS
FOR THE CONTROL OF OBTRUSIVE LIGHT
(See Clause 2.7)

1	2	3	4	5
Light technical parameter	Application or calculation conditions (see also Figure 2.1 and Section 5)	Recommended maximum values		
		In commercial areas or at boundary of commercial and residential areas*	Residential areas	
			Light surrounds†	Dark surrounds‡
Illuminance in vertical plane (E_v)	<i>Pre-curfew:</i> Limits apply at relevant boundaries of nearby residential properties, in a vertical plane parallel to the relevant boundary, to a height commensurate with the height of the potentially affected dwellings. Values given are for the direct component of illuminance	25 lx	10 lx	10 lx
	<i>Curfewed hours:</i> Limits apply in the plane of the windows of habitable rooms of dwellings on nearby residential properties. In the absence of development (i.e. vacant allotment), the limits apply on the potentially affected property, in a vertical plane parallel to the relevant boundary, at the minimum setback permitted for a dwelling, to a height commensurate with land use zoning provisions. Values given are for the direct component of illuminance	4 lx	2 lx	1 lx
Luminous intensity emitted by luminaires (I)	<i>Pre-curfew:</i> Limits apply to each luminaire (irrespective of the number on a head frame) in the principal plane, for all angles at and above the control direction, when aimed in accordance with the installation design	Limits as determined from Table 2.2. Alternatively, the limits and method of assessment associated with curfewed hours may be applied, at the discretion of the designer (see Clauses 2.7.1 and 2.7.2)		
	<i>Curfewed hours:</i> Limits apply in directions where views of bright surfaces of luminaires are likely to be troublesome to residents, from positions where such views are likely to be maintained, i.e. not where momentary or short-term viewing is involved	2 500 cd	1 000 cd	500 cd
Threshold increment (TI)	Limits apply at all times where users of transport systems are subject to a reduction in the ability to see essential information. Values given are for relevant positions and viewing directions in the path of travel	20% based on adaptation luminance ($\bar{L}$) of 10 cd/m ²	20% based on adaptation luminance ($\bar{L}$) of 1 cd/m ²	20% based on adaptation luminance ($\bar{L}$) of 0.1 cd/m ²

* Applies to residential accommodation in commercial areas or at the boundary between commercial and residential areas. The term 'commercial' is used as a generic description for zoning which provides for urban uses other than residential.

† Where the affected property abuts roads that are lit to Category V5 or higher in accordance with AS/NZS 1158.1.1.

‡ Where the affected property abuts roads that are lit to Category B1 or lower in accordance with AS 1158.1, or where there is no lighting.

Table 1 - AS/NZS 4282:1997, Table 2.1

1.4 Compliance Results

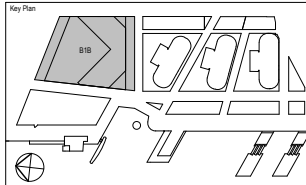
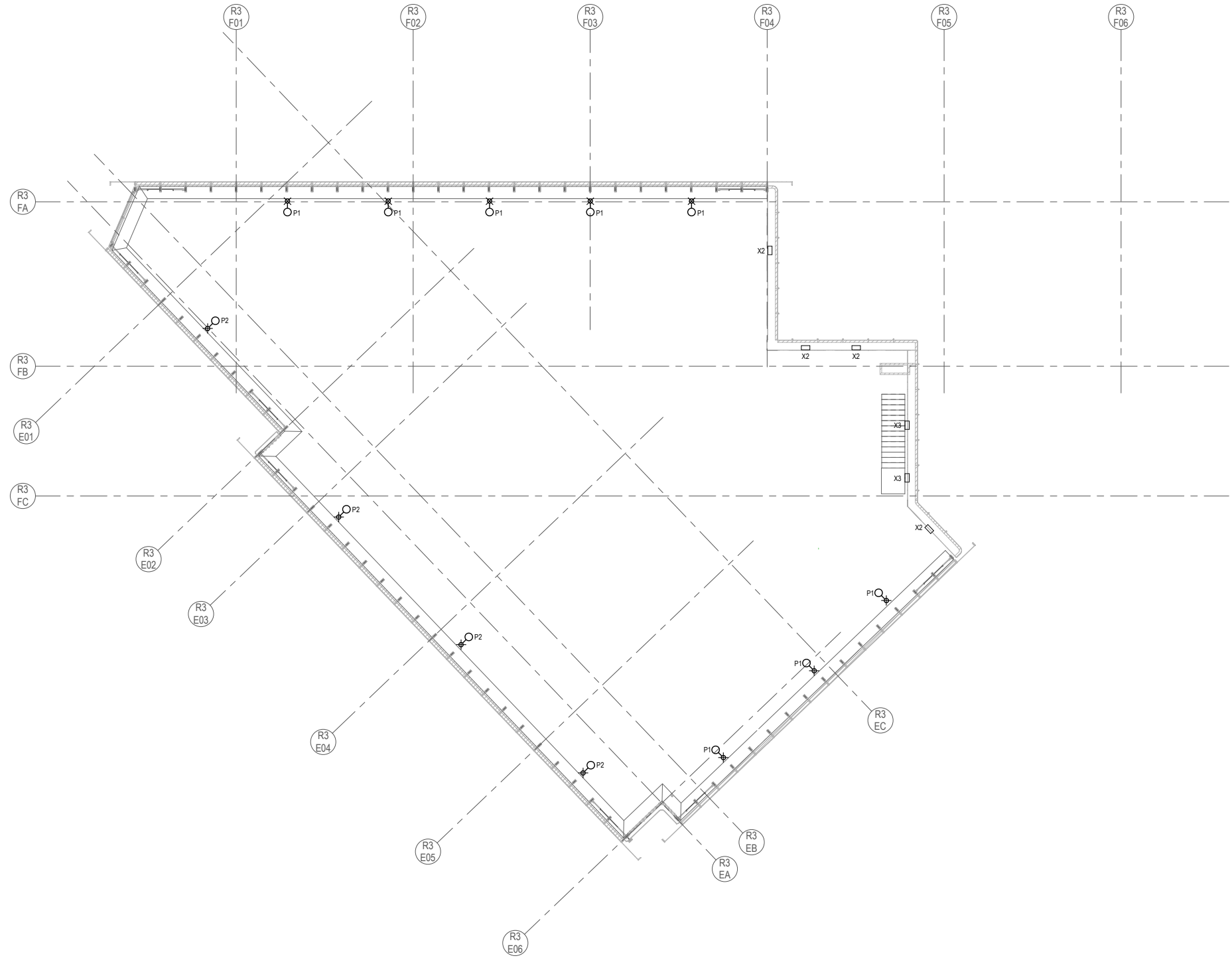
Based on the requirements and recommendations defined in AS/NZS 4282:1997. The exterior lighting design for Tower BR3 has been found to be compliant to the necessary standards.

A summary of the results can be found in Appendix B.

A breakdown of the grid calculations and site layout can be found in Appendix C.

Appendix A – Aurecon Lighting Layouts

Roof Lighting Layouts



Rev	Revision Description	Date
E	APPROVED FOR TENDER	17.09.21
D	ISSUED FOR TENDER	27.08.21
C	STAGE 4A - UPDATED PRICING PACK	28.05.21
B	REVISED STAGE 4A ISSUE	27.04.21
A	STAGE 4A ISSUE	19.02.21

DRAWINGS COLOUR CODED -
PRINT ALL COPIES IN COLOUR

Mechanical & Electrical Consultant
aurecon
www.aurecongroup.com

Principal Architect
RPBW
RENZO PIANO BUILDING WORKSHOP
Via P.P. Rubens 29, 16158 Genova - Italy
Emanuela Baglietto | Principal Architect
NSW ARB 9512

Collaborating Architect
PTW
PTW Architects
Level 11, 88 Philip Street
Sydney NSW 2000 Australia
T +61 2 9552 8877

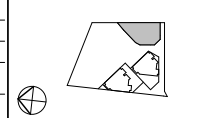
Structural Consultant
Robert Bird Group
Chris Potter | Principal
MEAus CPEng NPEER
151 Centemagh St
Sydney NSW 2000
PH (02) 9545 2000
ACN 010 980 248
www.robertbird.com

Principal
lendlease

Developer
lendlease
Project Management & Construction
Design
lendlease
Level 14, Tower Three, International Towers Sydney
Exchange Place, 300 Barangaroo Avenue
www.lendlease.com

These designs, plans and specifications and the copyright therein are the property of Lendlease and must not be used, reproduced or copied wholly or in part without the written permission of Lendlease.

Project
BARANGAROO SOUTH



TENDER

106
R3 ROOF LEVEL LIGHTING LAYOUT

Drawn By	Date	Project	Approved By	Date
LF	17.09.21	TENDER	OL	17.09.21

0 1:100 @ B1 5M 1:100

Project No. 246937
Site No. BR3
Drawing No. EDG1L3301
Revision E

Appendix B – Compliance Report

Obtrusive Light – Compliance Report.

This report has been generated from AGi32 (version 19.2) lighting software.

Obtrusive Light - Compliance Report

AS 4282-1997, Post-Curfew, Commercial

Filename: R3 Roof Obtrusive Study[01]

2/03/2022 10:59:20 AM

Illuminance

Maximum Allowable Value: 4 Lux

Calculations Tested (23):

Calculation Label	Test Results	Max. Illum.
168 Kent Street_III_Seg1	PASS	0.0
168 Kent Street_III_Seg2	PASS	0.1
The Bond Apartments_III_Seg1	PASS	1.0
189 Kent Street_III_Seg1	PASS	0.0
189 Kent Street_III_Seg2	PASS	0.1
167 Kent Street_III_Seg1	PASS	0.3
Stamford Marque_III_Seg1	PASS	0.2
Stamford Marque_III_Seg2	PASS	0.1
The Georgia_III_Seg1	PASS	0.1
HighGate Apartments_III_Seg1	PASS	0.0
Kent Street Townhouses_III_Seg1	PASS	0.0
Kent Street Townhouses_III_Seg2	PASS	0.0
Kent Street Townhouses_III_Seg3	PASS	0.0
High Street Gardens Townhouses_III_Seg1	PASS	0.0
High Street Gardens Townhouses_III_Seg2	PASS	0.0
The Langham_III_Seg1	PASS	0.0
The Langham_III_Seg2	PASS	0.0
High Street Townhouses_III_Seg1	PASS	0.0
High Street Townhouses_III_Seg2	PASS	0.0
Crown Hotel_III_Seg1	PASS	0.1
BR1_III_Seg1	PASS	0.4
60 Hickson Rd_III_Seg1	PASS	0.0
BR2_III_Seg1	PASS	0.6

Luminous Intensity (Cd) At Vertical Planes

Maximum Allowable Value: 2500 Cd

Calculations Tested (23):

Calculation Label	Test Results
168 Kent Street_Cd_Seg1	PASS
168 Kent Street_Cd_Seg2	PASS
The Bond Apartments_Cd_Seg1	PASS
189 Kent Street_Cd_Seg1	PASS
189 Kent Street_Cd_Seg2	PASS
167 Kent Street_Cd_Seg1	PASS
Stamford Marque_Cd_Seg1	PASS
Stamford Marque_Cd_Seg2	PASS
The Georgia_Cd_Seg1	PASS
HighGate Apartments_Cd_Seg1	PASS
Kent Street Townhouses_Cd_Seg1	PASS
Kent Street Townhouses_Cd_Seg2	PASS
Kent Street Townhouses_Cd_Seg3	PASS
High Street Gardens Townhouses_Cd_Seg1	PASS
High Street Gardens Townhouses_Cd_Seg2	PASS
The Langham_Cd_Seg1	PASS
The Langham_Cd_Seg2	PASS
High Street Townhouses_Cd_Seg1	PASS
High Street Townhouses_Cd_Seg2	PASS
Crown Hotel_Cd_Seg1	PASS
BR1_Cd_Seg1	PASS
60 Hickson Rd_Cd_Seg1	PASS
BR2_Cd_Seg1	PASS

Threshold Increment (TI)

Maximum Allowable Value: 20 %

Calculations Tested (4):

Calculation Label	Adaptation Luminance	Test Results
Hickson Road	10	PASS
Barangaroo Avenue	10	PASS
Northern Road	10	PASS
Watermans Quay	10	PASS

Calculation Summary

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
167 Kent Street_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	1384	0	N.A.	N.A.
167 Kent Street_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.3	0.0	N.A.	N.A.
168 Kent Street_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	1509	0	N.A.	N.A.
168 Kent Street_Cd_Seg2	Obtrusive Light - Cd	N.A.	N.A.	1533	0	N.A.	N.A.
168 Kent Street_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
168 Kent Street_Ill_Seg2	Obtrusive Light - Ill	Lux	N.A.	0.1	0.0	N.A.	N.A.
189 Kent Street_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	402	0	N.A.	N.A.
189 Kent Street_Cd_Seg2	Obtrusive Light - Cd	N.A.	N.A.	269	0	N.A.	N.A.
189 Kent Street_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
189 Kent Street_Ill_Seg2	Obtrusive Light - Ill	Lux	N.A.	0.1	0.0	N.A.	N.A.
60 Hickson Rd_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	143	0	N.A.	N.A.
60 Hickson Rd_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
Barangaroo Avenue	Obtrusive Light - T1	%	N.A.	0	0	N.A.	N.A.
BR1_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	1771	0	N.A.	N.A.
BR1_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.4	0.0	N.A.	N.A.
BR2_Cd_Seg1	Obtrusive Light - Cd	N.A.	37.34	982	0	N.A.	N.A.
BR2_Ill_Seg1	Obtrusive Light - Ill	Lux	0.02	0.6	0.0	N.A.	N.A.
Crown Hotel_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	1847	0	N.A.	N.A.
Crown Hotel_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.1	0.0	N.A.	N.A.
Hickson Road	Obtrusive Light - T1	%	N.A.	0	0	N.A.	N.A.
High Street Gardens Townhouses_C	Obtrusive Light - Cd	N.A.	N.A.	712	0	N.A.	N.A.
High Street Gardens Townhouses_C	Obtrusive Light - Cd	N.A.	N.A.	671	0	N.A.	N.A.
High Street Gardens Townhouses_I	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
High Street Gardens Townhouses_I	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
High Street Townhouses_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	726	0	N.A.	N.A.
High Street Townhouses_Cd_Seg2	Obtrusive Light - Cd	N.A.	N.A.	896	0	N.A.	N.A.
High Street Townhouses_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
High Street Townhouses_Ill_Seg2	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
HighGate Apartments_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	253	0	N.A.	N.A.
HighGate Apartments_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
Kent Street Townhouses_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	268	0	N.A.	N.A.
Kent Street Townhouses_Cd_Seg2	Obtrusive Light - Cd	N.A.	N.A.	198	0	N.A.	N.A.
Kent Street Townhouses_Cd_Seg3	Obtrusive Light - Cd	N.A.	N.A.	151	0	N.A.	N.A.
Kent Street Townhouses_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
Kent Street Townhouses_Ill_Seg2	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
Kent Street Townhouses_Ill_Seg3	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
Northern Road	Obtrusive Light - T1	%	N.A.	0	0	N.A.	N.A.
Stamford Marque_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	1369	0	N.A.	N.A.
Stamford Marque_Cd_Seg2	Obtrusive Light - Cd	N.A.	N.A.	1532	0	N.A.	N.A.
Stamford Marque_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.2	0.0	N.A.	N.A.
Stamford Marque_Ill_Seg2	Obtrusive Light - Ill	Lux	N.A.	0.1	0.0	N.A.	N.A.
The Bond Apartments_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	1531	0	N.A.	N.A.
The Bond Apartments_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	1.0	0.0	N.A.	N.A.
The Georgia_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	791	0	N.A.	N.A.
The Georgia_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.1	0.0	N.A.	N.A.
The Langham_Cd_Seg1	Obtrusive Light - Cd	N.A.	N.A.	441	0	N.A.	N.A.
The Langham_Cd_Seg2	Obtrusive Light - Cd	N.A.	N.A.	718	0	N.A.	N.A.
The Langham_Ill_Seg1	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
The Langham_Ill_Seg2	Obtrusive Light - Ill	Lux	N.A.	0.0	0.0	N.A.	N.A.
Watermans Quay	Obtrusive Light - T1	%	N.A.	0	0	N.A.	N.A.

Appendix D – Photometric Assessment

Photometric Assessment.

VFL530-SE LED

108-1312

P1



1/10



Description

IP66, Class I or Class II. IK08. Marine-grade die-cast aluminium alloy. 5CE superior corrosion protection including PCS hardware. Silicone CCG® Controlled Compression Gasket. RFC® cover. CAD optimised OLC® optics for superior illumination and glare control. The luminaire is factory- sealed and does not need to be opened during the installation. Optional 2200 K version available. To be specified at time of ordering. Brackets to be ordered separately.

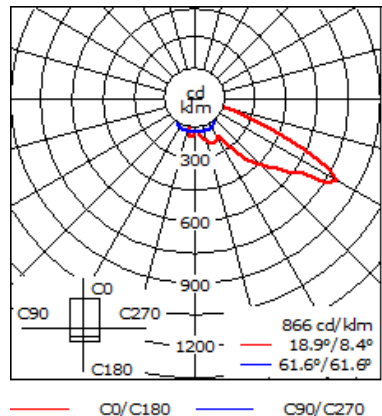
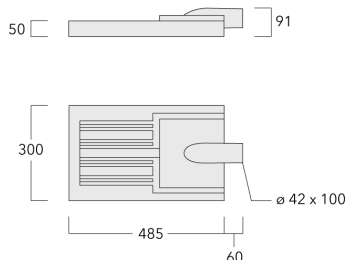
Beam Type	asymmetric, 'forward throw' [A60]
Light Source	LED-24/24W / 350 mA - 4000 K
CRI	80
Gear Type	EC
Nominal Luminous Flux (lm)	
LED Lumens	134.5 lm
LEDs	24
Total Lumens	3228 lm
Tj	85 °C
Rated Luminous Flux (lm)	
LED Lumens	115 lm
Total Lumens	2758.9 lm
Ta	25 °C
Rated Input Power	27 W

VFL530-SE LED

we-ef

108-1312

2/10



Material Specification

Body:	Marine-grade, die-cast aluminium alloy
Weight (kg):	5.80
Lens:	UV stabilised acrylic panel in RFC® technology
Colours:	RAL9004 Signal black RAL9006 White aluminium RAL9007 Grey aluminium RAL9016 Traffic white
Gasket:	Silicone CCG® Controlled Compression Gasket
Fasteners:	PCS Polymer Coated Stainless Steel Hardware (unpainted)
Ingress protection:	IP66
Impact protection:	IK08
Corrosion protection:	5CE. 5CE+Primer optional
Surge protection:	In-pole surge protection SP10 device supplied, dimensions 58x90x18mm (note: dimensions for dimmable versions may vary). Please refer to WE-EF installation instructions for details. Integral surge protection on request.
Mounting:	Spigot D: 42 x 100 mm.
Listings:	Listed on the AEMO load table at 28.6 W (12 LED version) and at 55.5 W (24 LED version)
Windage (EPA):	0.036 m ²

Electrical Specification

Power supply:	230V / 50 Hz
Power factor:	> 0.9
Driver / Ballast:	Integral EC electronic converter
Cable:	Pre-wired with 6 m cable in standard. The luminaire is factory-sealed.

Lifetime

Ta=40° L90B10 > 90000h

VFL530-SE LED
108-1316



1/10



Description

IP66, Class I or Class II. IK08. Marine-grade die-cast aluminium alloy. 5CE superior corrosion protection including PCS hardware. Silicone CCG® Controlled Compression Gasket. RFC® cover. CAD optimised OLC® optics for superior illumination and glare control. The luminaire is factory- sealed and does not need to be opened during the installation. Optional 2200 K version available. To be specified at time of ordering. Brackets to be ordered separately.

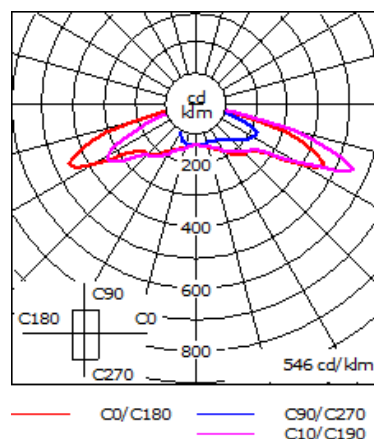
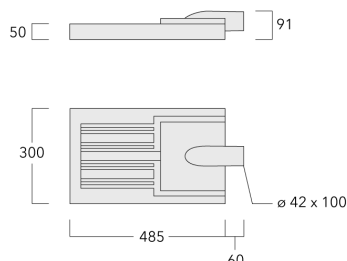
Beam Type	rectangular, 'side throw' [R65]
Light Source	LED-24/24W / 350 mA - 4000 K
CRI	80
Gear Type	EC
Nominal Luminous Flux (lm)	
LED Lumens	134.5 lm
LEDs	24
Total Lumens	3228 lm
Tj	85 °C
Rated Luminous Flux (lm)	
LED Lumens	117.5 lm
Total Lumens	2819 lm
Ta	25 °C
Rated Input Power	27 W

VFL530-SE LED

108-1316

2/10

we-ef



Material Specification

Body:	Marine-grade, die-cast aluminium alloy
Weight (kg):	5.80
Lens:	UV stabilised acrylic panel in RFC® technology
Colours:	RAL9004 Signal black RAL9006 White aluminium RAL9007 Grey aluminium RAL9016 Traffic white
Gasket:	Silicone CCG® Controlled Compression Gasket
Fasteners:	PCS Polymer Coated Stainless Steel Hardware (unpainted)
Ingress protection:	IP66
Impact protection:	IK08
Corrosion protection:	5CE. 5CE+Primer optional
Surge protection:	In-pole surge protection SP10 device supplied, dimensions 58x90x18mm (note: dimensions for dimmable versions may vary). Please refer to WE-EF installation instructions for details. Integral surge protection on request.
Mounting:	Spigot D: 42 x 100 mm.
Listings:	Listed on the AEMO load table at 28.6 W (12 LED version) and at 55.5 W (24 LED version)
Windage (EPA):	0.036 m ²

Electrical Specification

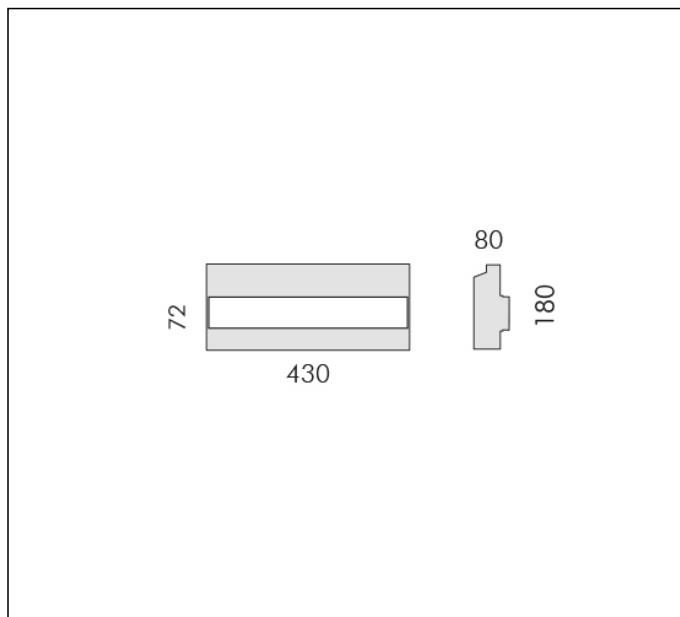
Power supply:	230V / 50 Hz
Power factor:	> 0.9
Driver / Ballast:	Integral EC electronic converter
Cable:	Pre-wired with 6 m cable in standard. The luminaire is factory-sealed.

Lifetime

Ta=40° L90B10 > 90000h

TECHNICAL DATA SHEET ART. C.8336N - GHOST L 430

Version is available on request



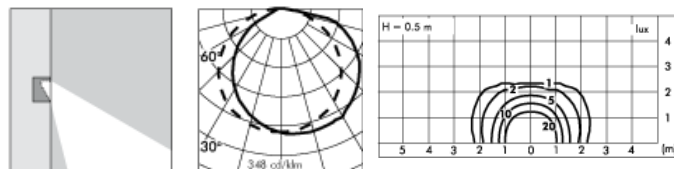
MODULES LED 4000K 230V 825lm CRI 80 MacAdam step 3

Rated luminaire luminous flux: 555lm

Rated input power: 7.5W

Luminaire efficacy: 74lm/W

Electronic ballast 220÷240V AC 50-60Hz / DC



* Computer-simulated photometrics

CE IP 65

LUMINAIRE TYPE

Wall mounted luminaire. IP rating IP 65

MATERIAL CHARACTERISTICS

Ghost for cladding can also be easily installed into plasterboard panels for indoor or outdoor. The fixture housing is fixed to the back wall that will later be covered with plasterboard panels and subsequently rendered over. The fixtures aperture can also be plastered so to integrate it completely. Ghost for cladding has also been engineered to take many different types of material finish (mosaic finish, ceramic tiles, stone finish) that can be contained within the thickness of the protruding edges of the housing (see above diag). Please take extra care during installation that the cut away made to house the recess box is suitable to guarantee a perfect flush finish between the fixture and the wall. Procedure for Plasterboard or exterior fibre cement siding panel: 1. Position the conduit for the electrical feed. 2. Fix the product to the plasterboard panel. 3. Cover the gaps between the panels with a mesh and plaster over. 4. Complete the surface finish. 5. The fixture is supplied with a slanted front panel accessory in anodised aluminium. For indoor applications this panel can be removed and then finished in plasterboard; for outdoor applications we suggest to use this panel (a 19mm recess depth has been provided for the final finish if the panel is not used). 6. Once the plaster is dry you can fit the LED profile into the void. This is the procedure for other walls built on site: 1. Cut away and position the conduit for the electrical feed; 2. Create a niche and recess the fixture housing and align correctly; 3. Cement the housing into the niche and use a gripping mesh to cover both the wall and the housing; 4. Cement the fixture into the wall, cut the gripping mesh around the fixtures aperture and continue with the finish by applying the relative material to the slanted aperture (19mm recess depth has been provided for the final finish if the panel is not used). 5. The fixture is supplied with an anodised aluminium front panel. You can decide to use this panel so to have a complete aperture in anodised aluminium or without so to render the aperture in the same material finish as the rest of the surface. 6. Once the cladding is dry you can fit the LED profile into the void.

Mechanical resistance IK 10

LIGHTING PERFORMANCE

Toughened glass diffuser. LOR --

WIRING

Supplied with a pre-wired 6m H05RN-F cable. Isolation: CLASS II . Weight: 0.6 Kg Glow Wire test: --

L.E.D circuit included.

Ghost for cladding PATENT PENDING, REGISTERED DESIGN

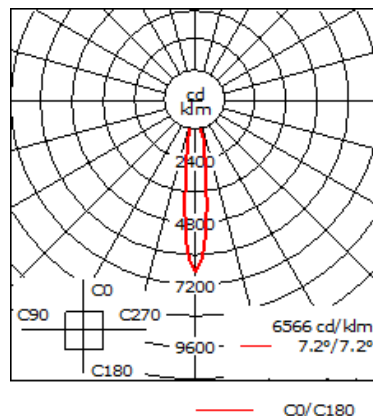
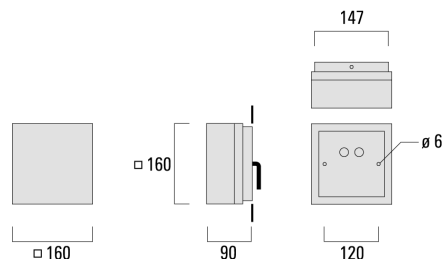
This luminaire contains built-in LED modules. In case of damage or malfunction please contact the manufacturer to receive additional instructions on how to replace and relative spare parts to order. The LED modules cannot be handled in the luminaire by the end user (Regulation UE 874/2012).

LED circuit boards are engineered accordingly to actual Lumen Maintenance regulation (LM80) and Technical Memorandum (TM21) where uniformity and quality of light is 50.000 hours referred to L70 B20 Ta 25°C.

Lifecycle refers to LED circuit boards only, all others components of the luminaire are excluded.

EMERGENCY VERSIONS

The fittings operates both on AC (50/60Hz) and DC (0Hz) voltage.



Material Specification

Body:	Marine-grade die-cast aluminium alloy
Weight (kg):	1.90
Lens:	Safety glass lens
Colours:	RAL9004 Signal black RAL9006 White aluminium RAL9007 Grey aluminium RAL7016 Anthracite grey RAL9016 Traffic white
Gasket:	Silicone rubber gasket
Fasteners:	PCS Polymer Coated Stainless Steel Hardware
Ingress protection:	IP66
Impact protection:	IK07
Corrosion protection:	5CE
Surge protection:	1/2 kV

Electrical Specification

Power supply:	220-240V / 50-60 Hz
Driver / Ballast:	Integral EC electronic converter
Cable:	Two cable entries

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

aurecon

*Bringing ideas
to life*

Aurecon offices are located in:

Angola, Australia, Botswana, China,
Ghana, Hong Kong, Indonesia, Kenya,
Lesotho, Mozambique,
Namibia, New Zealand, Nigeria,
Philippines, Qatar, Rwanda, Singapore, South Africa,
Swaziland, Tanzania, Thailand, Uganda,
United Arab Emirates, Vietnam, Zambia,



12 July 2018

Sydney Observatory
Museum of Applied Arts & Sciences
1003 Upper Fort Street
Millers Point NSW 2000

Dear Sir/Madam,

**SSD 6966
Residential Building R5 Barangaroo South
Preliminary Lighting Strategy**

In accordance with Condition C13 of the Barangaroo South Concept Plan (Reference MP06_0162 Modification 8), all future development applications at Barangaroo South for above ground works require a preliminary lighting strategy. The lighting strategy is to be prepared in consultation with the Sydney Observatory.

Building R5 is a thirty (30) storey residential building with ground and podium retail, located on the corner of Hickson Road and Watermans Quay, Barangaroo South. A Development Application was lodged in September 2016 to the Department of Planning and Environment for the proposed building, with public exhibition occurring from 29 September 2016 to 14 November 2016. The development application is still under planning assessment.

The attached letter provides preliminary lighting design practices and mitigation measures which will be addressed in a detailed lighting strategy which will be completed in consultation with the Observatory.

In the interim, if you however have any comments or would like to discuss further please feel free to contact the undersigned via 0448 451 028 or on email Daniel.Baxter@lendlease.com

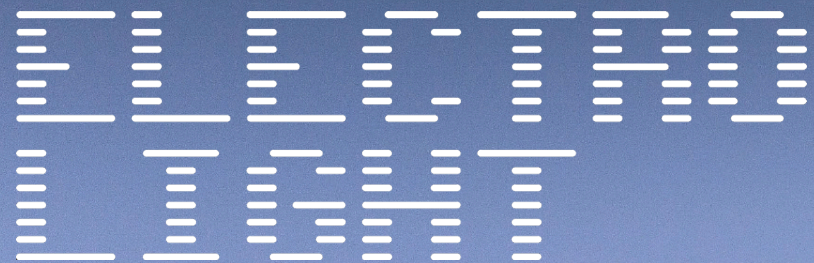
Yours sincerely,

A handwritten signature in black ink, appearing to read "D. Baxter".

Daniel Baxter
Development Manager, Barangaroo South
Lendlease (Millers Point) Pty Limited



Appendix A – Preliminary R5 Lighting Strategy Letter



BUILDING R5 - BARANGAROO SOUTH
EXTERNAL LIGHTING DESIGN
LIGHT SPILL MITIGATION STRATEGY
PROJECT 2972 REVISION A
14 OCTOBER 2021

Electrolight
Melbourne | Sydney
San Francisco

Sydney Studio
4/ 414 Bourke St
Surry Hills, NSW 2010

australia@electrolight.com
www.electrolight.com

T +61 2 9267 4777

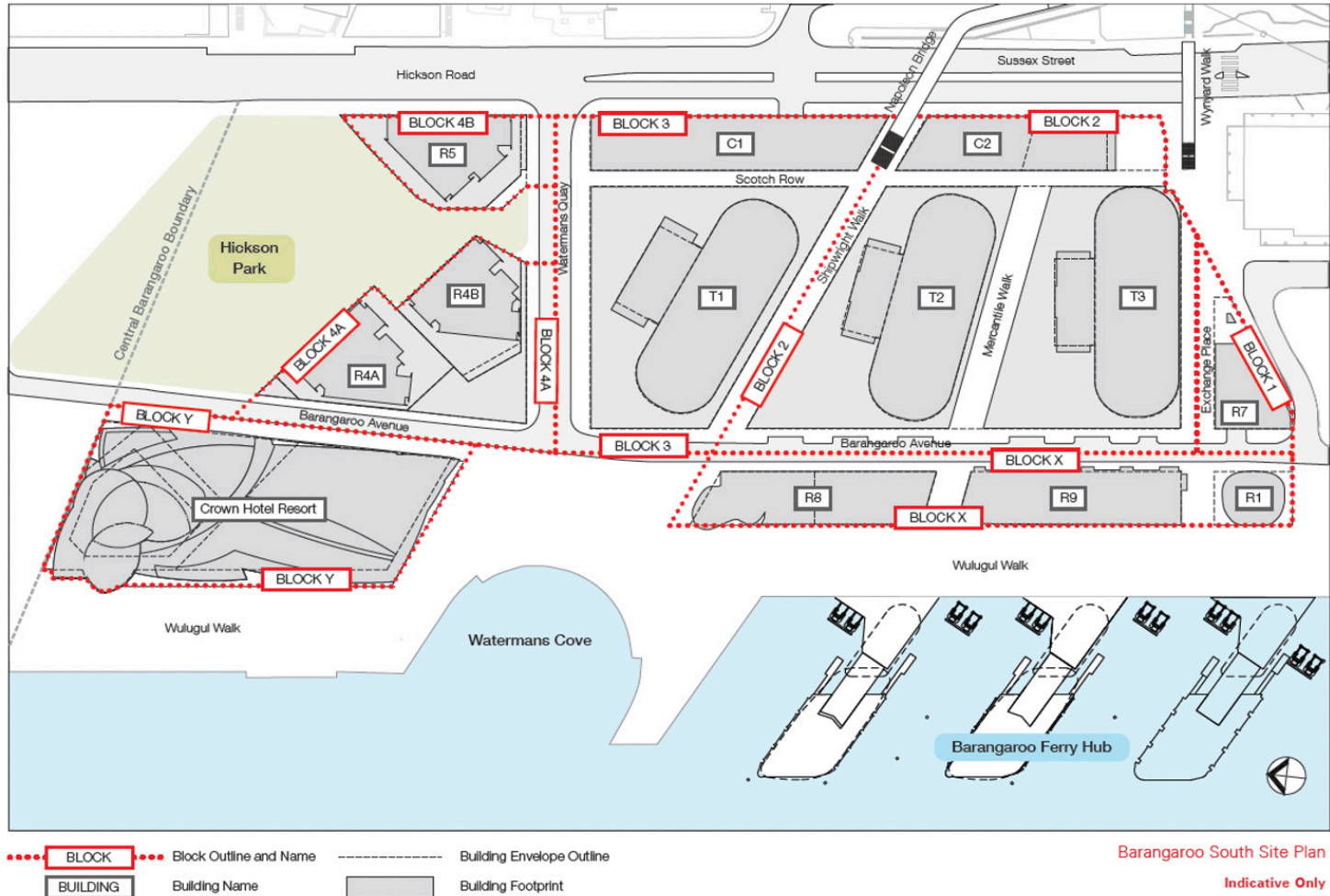


LIGHT SPILL MITIGATION STRATEGY

CONTENTS



1. Introduction & Scope	3
2. Spill Lighting Mitigation - Key Design Principles	4
3. External Lighting Design Strategies	5
4. Design Standards & Assessment	6
5. Summary & Conclusions	7



This report supports a State Significant Development Application (SSD 6966) submitted to the Department of Planning, Infrastructure and Environment (DPIE) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

This Strategy report is intended to outline to key stakeholders (including the Sydney Observatory) the lighting design approach and associated mitigation strategies that will be incorporated in the final design in order to minimise the impact of light spill on the surrounding environment.

Barangaroo is located on the north western edge of the Sydney Central Business District (CBD), bounded by Sydney Harbour to the west and north, the historic precinct of Millers Point (for the northern half), The Rocks and the Sydney Harbour Bridge approach to the east; and bounded to the south by a range of new development containing large CBD commercial tenants.

Upon completion of the design, a further detailed Lighting Impact Assessment Report (with supporting calculations) will be submitted to stakeholders to demonstrate compliance with the design approach, mitigation strategies and relevant standards contained within this report.

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park (Barangaroo Reserve), Barangaroo Central and Barangaroo South. The Residential Building R5 site is located within Barangaroo South. The site of this proposed DA is located on land generally known and identified in the approved Concept Plan (as modified) as Block 4B, as shown in the Figure 1 on the left of the page

Electrolight were engaged by Lendlease to undertake the external lighting design of the front of house spaces for the R5 Building at Barangaroo South, including:

- Ground floor external perimeter, including awnings and entry
- Level 2 “Key Worker” Terrace
- Level 32 “On Market” Terrace
- Typical Apartment Wintergardens

While detailed design of the external lighting is yet to be finalised, the design has progressed sufficiently to enable us to provide a Preliminary Light Spill Strategy, as required in the SSD Development Application for Building R5 at Barangaroo South.

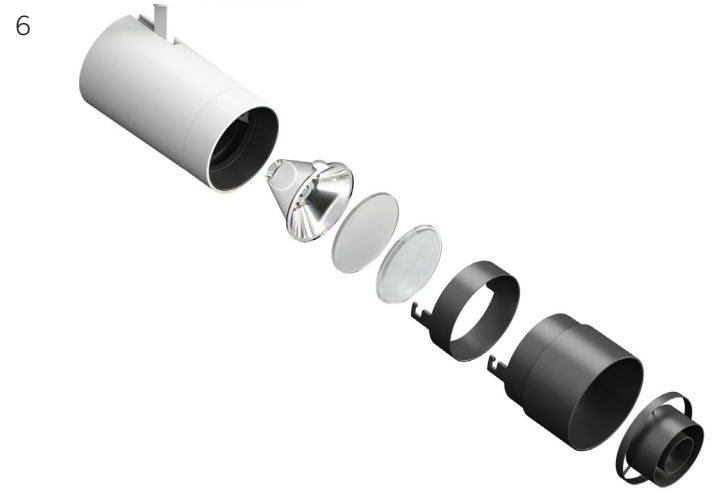
2. SPILL LIGHTING MITIGATION KEY PRINCIPLES



The design aspirations of Building R5 at Barangaroo South are to provide a relaxing and comfortable residential oasis in the heart of the city. These aspirations are well aligned to the key design principles for spill lighting mitigation, namely:

- Low target lighting levels for external environments to create an intimate and comfortable atmosphere, whilst still meeting safety and security requirements. This avoids over-lighting of spaces and minimises emission of waste light into the atmosphere through indirect reflection off surfaces.
- Use of latest technology luminaires with precise optical and glare control, including full cut-off (zero uplight) lighting distribution where fittings face the sky.
- Use of an advanced digital lighting control system to dim luminaires, both to prevent initial over-lighting and to adjust illumination levels based on occupancy, including time based control strategies.
- Use of warm colour temperature light sources (correlated colour temperature 2700K) to minimise the scattering of light in the atmosphere from shorter light wavelengths (ie blue light).
- Designed in accordance with relevant Standards and Guidelines, including *AS4282: Control of the obtrusive effects of outdoor lighting* - refer Section 4.

- 1 - Intimate residential terrace environment with selective application of light
- 2 - Low level general lighting to external landscape areas (full cutoff)
- 3 - Low level task lighting to external tables (full cutoff)
- 4 - Landscape lighting (full cutoff)
- 5 - Low level floor wash lights for general circulation
- 6 - Modern luminaires with advanced optics and glare control



As the external lighting design of the R5 Tower progresses from concept through to detailed design, lighting calculations and modelling will be undertaken of all areas to determine the potential spill lighting impacts to the neighbouring properties (including the observatory). This will help inform final luminaire selections and the associated lighting control philosophy, in order to minimise obtrusive lighting effects.

The Key Design Strategies to minimise obtrusive lighting effects to the surrounding environment include:

- A design process based upon deliberate and selective application of light on target objects/surfaces to create light and shadow, rather than blanket even illumination of all areas. This avoids over-lighting spaces and reduces associated spill light into the environment.
- A design process that seeks to create an intimate and atmospheric residential environment, with lighting levels that are on the lower end of the acceptable range, but which still satisfy safety and CPTED requirements. This minimises spill lighting into the environment, including from indirect reflection off illuminated surfaces.
- Not floodlighting the building facades through direct application of light. Activation of the building envelope comes from the internal illumination of the apartments and communal spaces as seen through the windows of the facades. This provides a far more sympathetic and minimal lighting impact upon neighbouring properties.
- A design process that encourages and enables transparency and views from the R5 tower to the surrounding environment. This limits the use and selection of luminaires at the perimeter edge of the building which may cause veiling lighting effects (or be directly visible from outside of the building), which in turn reduces the potential light spill into the surrounding environment.

3. EXTERNAL LIGHTING DESIGN DESIGN STRATEGIES

- Selecting modern luminaires that have precision optics and are full cut-off (zero uplight) when mounted outside. Utilisation of glare shields, louvres and baffles on luminaires where required to reduce or eliminate spill light leaving the site.
- Use of warm white 2700K light sources for all external luminaires to minimise light scattering in the atmosphere from blue light.
- For the level 2 & 32 terrace spaces, a preference for low level mounted luminaires that provide targeted illumination to the task surface, rather than high mounted pole tops or floodlights.
- Use of a digital lighting control system which enables individual dimming of each luminaire to allow fine tuning of the installation at initial commissioning stage to prevent over-lighting of the spaces. This shall be combined with timeclock controls that will switch off non-essential lighting during after hours operation.
- Design shall be assessed and designed in accordance with *AS4282:1997 Control of the obtrusive effects of outdoor lighting* (as outlined in Condition B40 of SSD 6966) and a detailed Lighting Impact Assessment report will be provided. This report will address the impacts upon the neighbouring properties, including the Sydney Observatory.

4. DESIGN STANDARDS & ASSESSMENT

The lighting design for Building R5 at Barangaroo South references the following design standards and guidelines:

- *AS/NZS 4282 – Control of the Obtrusive Effects of Outdoor Lighting (1997)*
- *AS1158.3.1 Lighting for Roads and public Spaces (1999)*

AS4282 provides design limits to minimise obtrusive lighting effects to nearby residents, transport systems and astronomical observations. The metrics in the standard to assess these impacts are:

- Vertical Illuminance (the amount of light entering residential dwellings)
- Luminous Intensity (brightness caused by viewing a light source directly)
- Threshold Increment (glare to road users caused by bright light sources)

The design limits of the above are dependent on the area the lighting is situated in. Under the Standard, the development is located in a Commercial area (or at a boundary of commercial and residential areas), meaning the following design limits apply:

Pre Curfew Periods (6am to 11pm)

- Illuminance - 25 lux at relevant residential boundary
- Luminous Intensity - 7500 cd
- Threshold Increment - 20% (adaptation luminance 10cd/m2)

Curfew Periods (11pm to 6am)

- Illuminance - 4 lux at relevant residential boundary
- Luminous Intensity - 2500 cd
- Threshold Increment - 20% (adaptation luminance 10cd/m2).

The final external lighting design for R5 Tower will not exceed the values outlined above in order to comply with the requirements of the Standard. Detailed calculations will be provided to demonstrate compliance with the limits above in a latter design stage.

Astronomical Assessment - Sydney Observatory

The effects of light spill on astronomical observations can be broken down into two main categories: direct light from the installation falling directly on to the Telescope/s and a lightening of the night sky caused by scattering of stray light in the atmosphere ie “Sky glow”. The nearest Observatory is Sydney Observatory at Observatory Hill, approximately 350m away from the site and will form the basis of the assessment.

AS4282 states that if the installation complies with the limits under the standard, then the effects of direct lighting falling on to the Telescope/s will be mitigated. As the final lighting design will comply with the AS4282 limits, it can be inferred that no direct light will detrimentally affect the Observatory.

Sky glow is common in urban areas and is less readily controlled. Any light source visible in the environment, including light from buildings, street lights, car head lights etc will cause sky glow. As observatories desire the lowest possible amount of sky glow, and urban environments (such as the Sydney CBD) by their very nature produce large amounts of sky glow, the question becomes one of what is deemed reasonable by both parties. The growth and development of Sydney City cannot be expected to be unreasonably constrained by the requirements of an observatory, nor should individual urban developments significantly impact upon the successful operation of an observatory.

The proposed external lighting design of R5 Tower is intimate, restrained and utilises fully shielded light sources of low intensity as outlined in Section 3. Furthermore, there is no decorative lighting proposed for the facades of the building. The amount of light emitted from this development can be viewed as small when compared to other commercial towers located nearby (particularly those with facade lighting). Given the existing ambient night time lighting environment of the CBD, it is unlikely that the impact of any potential spill light from the proposed facade lighting would be detrimental to the Sydney Observatory. The final external lighting design will employ all of the mitigation strategies outlined in this report to ensure the impact to the Sydney Observatory is minimised as far as practicable.

CASA Manual of Standards Part 139 – Aerodromes

The lighting design for Building R5 at Barangaroo South has been assessed against CASA Manual of Standards Part 139 – Aerodromes - Section 9.21 to determine the impact on nearby airports and associated incoming and outgoing aircraft, if any. Since the development lies outside of the 6 km radius of the nearest airport (Sydney Airport), it is deemed to have no impact on the airport or aircraft.

AS1158 - R5 Building Perimeter - Ground Plane

The lighting to the perimeter ground plane of R5 has been designed in accordance with Lighting Subcategory “P8” of AS1158.3.1 (1999) as outlined in the Barangaroo Lighting Masterplan developed by Spiers and Major. External building perimeter lighting will be dimmed to ensure that this minimum illumination level is not significantly exceeded, to reduce the obtrusive lighting impact to neighbouring properties.



The detailed design of the external lighting for Building R5 at Barangaroo South is yet to be finalised, however this Preliminary Light Spill Mitigation Strategy Report outlines the necessary principles and design strategies that will be adopted to ensure that obtrusive lighting effects to the surrounding properties (including the Sydney Observatory) are minimised.

Upon implementation of the outlined strategies, we are confident that the final lighting design will comply with the necessary Standards and minimise light spill to the local environment. This will be demonstrated by a further detailed Lighting Impact Assessment Report (with supporting calculations).

electrolight.com