

104-116 REGENT STREET, REDFERN

Light Spill Assessment

Prepared for:

The Trust Company (Australia) Limited ATF WH Redfern Trust
Redfern PBSA

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PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Tenancy 202 Submarine School, Sub Base Platypus, 120 High Street
North Sydney NSW 2060 Australia

T: +61 2 9427 8100
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with The Trust Company (Australia) Limited ATF WH Redfern Trust (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.30265.00000-R03-v1.0	30 November 2021	Peter Hayman	Neihad Al-Khalidy	Neihad Al-Khalidy

EXECUTIVE SUMMARY

SLR Consulting Australia Pty Ltd (SLR) has been engaged by The Trust Company (Australia) Limited ATF WH Redfern Trust to assess the lighting environment around a proposed development at 104-116 Regent Street, Redfern.

The proposed use of the building is for student accommodation and there may be areas where lighting will be used during the curfew hours of 11 pm – 6 am. There are some sensitive receivers close to the site on the east side of Regent Street above the ground floor commercial tenancies.

The light survey of the area showed a low average background light level with some peak areas produced by street lighting.

The design of the proposed building with high walls surrounding the outdoor communal areas and recessed entrances will likely provide shielding to any designed lighting. Large awnings are also used which should be capable of having lighting fixtures recessed into them.

Taking all of the above into account it is SLR's view that assuming that the recommended mitigation measures are implemented, the effects of light spill on all potentially affected sensitive receivers can be managed to be below 4 or 5 lux depending on the use of each property. Also the proposed development will not further increase the amount of light spill on sensitive receivers which may already be above the required limits.

To ensure this is the case further light spill model calculations should be conducted once the detail design is progressed. SLR could also conduct a light survey upon completion of the project to check compliance.

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1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by The Trust Company (Australia) Limited ATF WH Redfern Trust to assess the lighting environment around a proposed development at 104-116 Regent Street, Redfern. This will involve a measurement exercise of the current nighttime light levels in the local area and a qualitative study of the lighting systems to be used in the proposed development and their effect on the surrounding area. This will form part of the Development Application to Sydney City Council

1.1 Site and Surrounds

Figure 1 Aerial Image of Site Location



Image: Nearmap (October 2021)

The proposed site is bounded to the west by William Lane, to the south by Margaret Street and to the east by Regent Street, with a future development proposed to the north and a development to the west currently under construction. The surrounds of the site are predominantly low level buildings, with some higher level development close to the site to the north and west.

1.2 Proposed Development Description

The proposal comprises the redevelopment of the site as summarised below:

- Construction of an 18-storey building comprising a total of 9,562m² gross floor area with a mix of land use activities including:
 - Level 1: 72 m² of retail floorspace, 490m² of communal area for the student accommodation, 102 bicycle parking spaces, loading and waste management facilities and ancillary services and facilities.
 - Upper levels: student accommodation providing a total of 411 beds, including ensuite rooms, studios and two-bedroom configurations, with indoor and outdoor communal spaces on Levels 2, 4 and 16 and additional indoor communal areas on Levels 2 and 4.
- Hard and soft landscaping within the outdoor communal terraces on the roof-top of the podium level and Levels 4 and 16.
- Public domain improvements including provision of a landscaped through-site link connecting William Lane to Margaret Street and associated improvements to the Regent Street and Margaret Street frontages, including awnings and footpath upgrades.

Figure 2 Site Plan (Ground Floor)

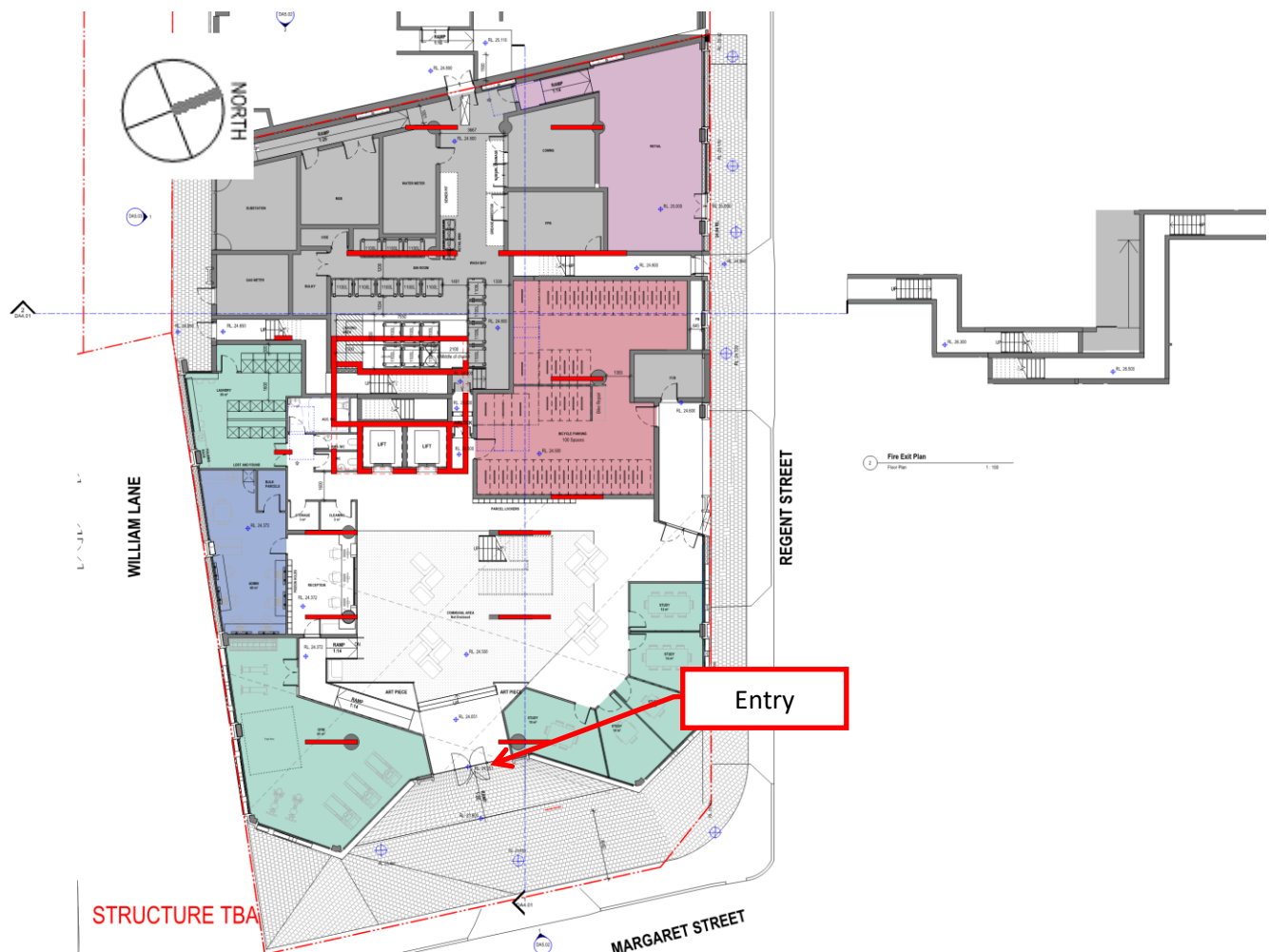
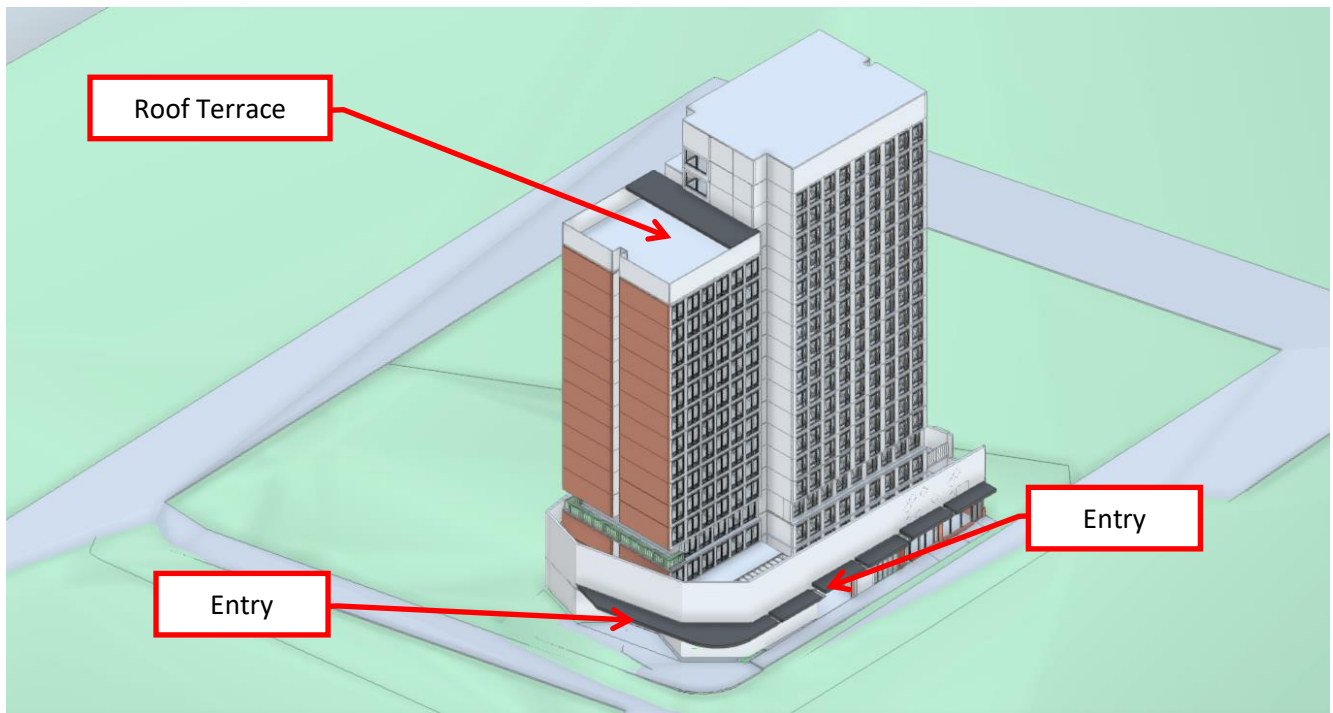


Figure 3 3D View from the Southeast



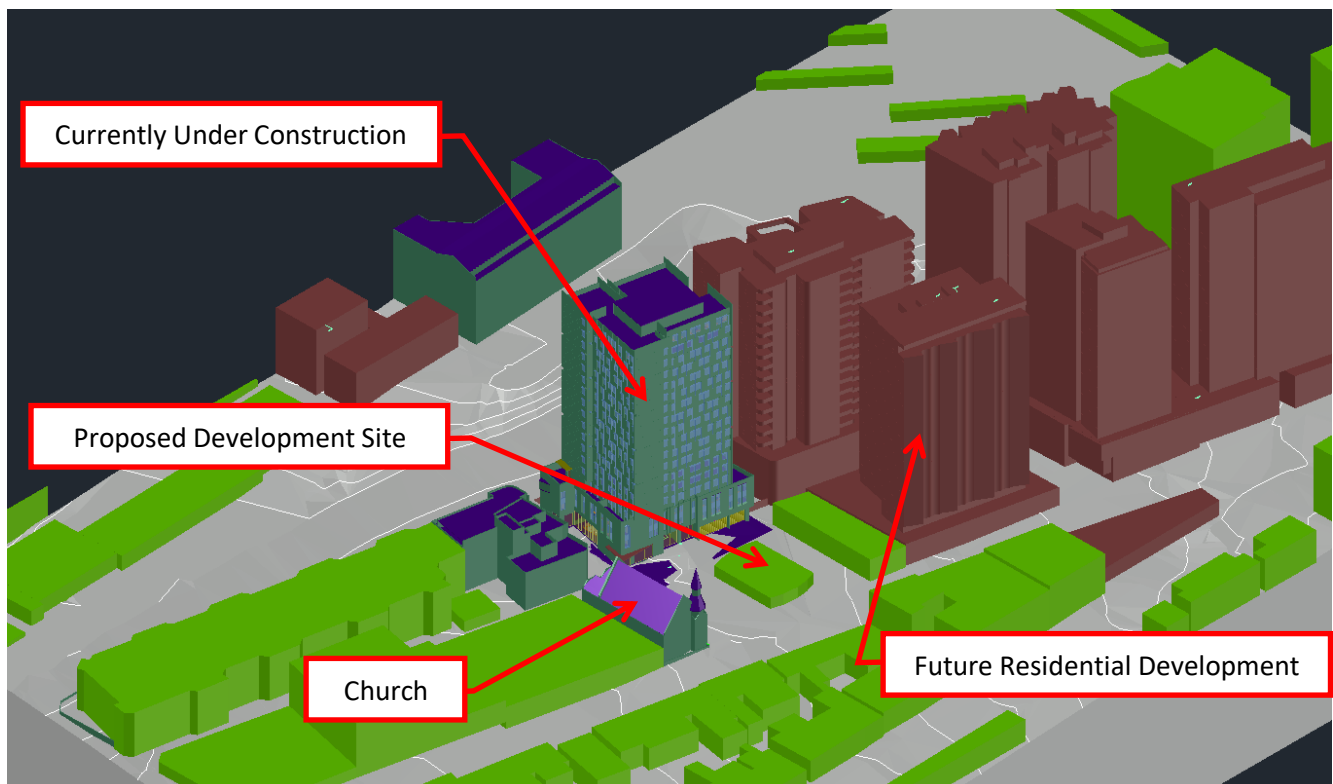
2 Light Spill

2.1 Background

SLR has been asked to measure the background light levels in the local area and qualitatively assess light spill from the proposed development on to the surrounding streetscape. There are a number of areas within the proposed development that are likely to be lit artificially. The site is surrounded by a number of different land uses such as:

- St Luke's Presbyterian Church to the south.
- A planned residential tower to the north.
- A currently under construction student accommodation tower to the west
- Ground level retail tenancies with dwellings above on the east side of Regent Street. Generally around three storeys

Figure 4 3D View of Proposed Development and the Surroundings



2.2 Lighting Terminology

A description of the common terminology used for the lighting study, taken from *AS 4282: Control of the Obtrusive Effects of Outdoor Lighting*, is shown in **Table 1**

Table 1 Lighting Terminology (Consistent with AS4282)

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, eg: traffic lights.
Spill light	Light emitted by a lighting installation which falls outside the boundaries of the property on which the installation is sited.
Residential property	Land upon which a dwelling exist or may be developed, eg: land zoned for residential development.
Dwelling	A building in which people normally reside, especially during the hours of darkness, eg house, hotel, motel, hospital.
Illuminance	The luminous flux arriving at a surface divided by the area of the illuminated surface. Unit: lux(lx); 1 lx = 1 lm/m ²
Luminous intensity	The concentration of luminous flux emitted in a specific direction. Unit: candela (cd).
Luminous flux	The measure of the quantity of light. For a lamp or luminaire it normally refers to the total light emitted irrespective of the directions in which it is distributed. Unit: lumen (lm).
Luminaire	Apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except for the lamps themselves, all the parts necessary for fixing and protecting the lamps and, where necessary circuit auxiliaries together with the means for connecting them to the electrical supply.
Glare	Condition of vision in which there is a discomfort or a reduction in the ability to see, or both, caused by an unsuitable distribution or range of luminance, or to extreme contrast in the field of vision (a) Disability Glare – Glare that impairs the visibility of objects without necessarily causing discomfort. (b) Discomfort Glare – Glare that causes discomfort without necessarily impairing the visibility of objects.

2.3 Light Spill Criteria

The effect of light spill from outdoor lighting impacting on residents, transport users, transport signalling systems and astronomical observations is governed by the Australian Standard: *AS 4282-2019 Control of the Obtrusive Effect of Outdoor Lighting*.

The obtrusive effects of light spill are due both to an increase in general illuminance that can lead to sleep deprivation, and from the direct view of the light source that can cause glare issues.

The adverse effects of light spill from outdoor lighting are influenced by a number of factors:

- The topology of the area. Light spill is more likely to be perceived as obtrusive if the lighting installation is located higher up than the observer. Lighting installations are usually directed towards the ground and an observer would hence have a direct view of the luminaire.

- The surrounding area. Hills, trees, buildings, fences and general vegetation have a positive effect by shielding the observer from the light installation.
- Pre-existing lighting in the area. Light from a particular light source is seen as less obtrusive if it is located in an area where the lighting levels are already high, eg in cities. The same lighting installation would be seen as far more bothersome in a dark residential area.
- The zoning of the area. A residential area is seen as more sensitive compared to commercial areas where high lighting levels are seen as more acceptable.

Typical illuminance levels for a variety of circumstances are given in **Table 2** for comparison.

Table 2 Typical Illuminance Levels for Various Scenarios

Lighting Scenario	Horizontal Illuminance (lux)
Moonless overcast night	0.0001
Quarter Moon	0.01
Full Moon	0.1
Twilight	10
Indoor office	300
Overcast day	1,000
Indirect sunlight clear day	10,000-20,000
Direct sunlight	100,000-130,000

2.4 Time of Operation

The applicable limits for adverse spill light depend on the time of operation for the lighting installation. Operation taking place during *pre-curfew hours*, between 6am and 11pm, is less likely to give cause to complaints from adjacent residential properties, while a more restrictive limit is applicable to *curfew hours*.

It is possible that lights could be used late at night and some exterior lighting will likely be on all night. Therefore the limits for curfew hours will be used.

2.5 Requirements

To determine the limiting values the environmental zone of the area needs to be defined. These can be found in Table 3.1 of AS 4282:2019.

Due to its central location in Sydney and the proximity of surrounding commercial premises it is SLR's opinion that the site and surrounding area fall into Zone A4 which is defined as having high district brightness and applying to town and city centres and other commercial areas.

Surrounding residences are close to the traffic route and will come under Zone V.

The curfew limits for these zones are given in Table 3.2 of the standard and are 5 lux for Zone A4 and 4 lux for Zone V. as per Table 3.3 of the standard the allowable luminous intensity per luminaire for Zone A4 is 2,500 candela.

Table 3 Recommended Maximum Values of Light Technical Parameters (AS4282-2019)

Light Technical Parameter	Time of Operation	Zone "A4"	Zone "A3"	Zone "A2"	Zone "A1"	Zone "A0"
Illuminance in vertical plane (E_v)	Pre-curfew hours	25 lx	10 lx	5 lx	2 lx	Alarp ¹
	Curfew hours	5 lx	2 lx	1 lx	0.1 lx	1 lx
Luminous Intensity emitted by luminaires (I)	Pre-curfew hours	25,000 Cd	12,500 Cd	7,500 Cd	2,500 Cd	Alarp ¹
	Curfew hours	2,500 Cd	2,500 Cd	1,000 Cd	500 Cd	0 Cd
Zone A0	"Intrinsically Dark", eg UNESCO Starlight Reserve; IDA Dark Sky Parks; major optical observatories; no road lighting, unless specifically required by the relevant road controlling authority					
Zone A1	"Dark", eg relatively uninhabited rural areas; no road lighting, unless specifically required by the relevant road controlling authority					
Zone A2	"Low District Brightness", eg sparsely inhabited rural and semi-rural areas					
Zone A3	"Medium District Brightness", eg suburban areas in towns and cities					
Zone A4	"High District Brightness", eg town and city centres and other commercial areas; residential areas abutting commercial areas					

Note 1 Alarp = as low as reasonably practical (as close to zero as possible)

The vertical illuminance limits for *curfew hours* apply in the plane of the windows of habitable room or dwelling on nearby residential properties. The vertical illuminance criteria for *pre-curfew hours* apply at the boundary of nearby residential properties in a vertical plane parallel to the boundary. Values given are for the direct component of illuminance, ie: no reflected light is taken into account.

3 Lighting Measurements

SLR completed light measurements around the site area on the 18th November 2021 from 10 pm onwards. The lux meter used for the measurements was a Mavolux Compact IC-M502C which is capable of covering a broad range of lighting types including LEDs. The measurement locations are shown below. Measurements were made in the horizontal plane with the light meter pointing upward normal to the ground and in the vertical plane where the light meter was aimed toward the site to gain an idea of the light that is currently coming from that direction. Measurement results are shown in Table 4.

Figure 5 Measurement Locations



Table 4 Measurement Values (Lux)

Location	Horizontal	Vertical	Location	Horizontal	Vertical	Location	Horizontal	Vertical
1	5	12	14	5	4	27	32	13
2	0.3	0.7	15	4	9	28	14	17
3	40	33	16	0.5	1	29	12	3
4	25	9	17	4	4	30	1	2
5	2	1	18	1	1	31	2	2
6	2	2	19	19	13	32	1	1
7	18	25	20	3	5	33	5	2
8	2	1	21	6	1	34	1	3
9	1	3	22	6	2	35	3	4
10	2	4	23	18	4	36	4	4
11	10	2	24	2	4	37	6	5
12	4	1	25	2	4			
13	3	2	26	10	12			

Across all the measurement the horizontal average is 7.5 Lux and the vertical average is 5.8 lux. However this is greatly skewed by measurements which were taken directly under or close to streetlights such as locations 3, 4, 7 and 19. If these are removed the general background light level for both the horizontal and vertical cases is approximately 3.4 lux. This seems quite reasonable and is below the required limits previously stated.

4 Qualitative Assessment

4.1 Ground Level

There will likely be lighting fixtures for pedestrian movement around the exterior of the site.

The awning along the south and east sides will help to contain any upward light spill toward the upper residential apartments to the east and the church to the south. Any required lighting around the Margaret or Regent Street entrances could also be placed under the awning. If lighting fixtures are placed and oriented correctly there will be no light spill above the required limits at surrounding sensitive receivers.

4.2 Level 2 Outdoor Common Area

The common area extends around the east, south and west sides of the building will likely have lighting for safe movement and increased lighting around the BBQ area on the south side of the building. Lighting fixtures can appear to be more obtrusive when higher than the observer. This area is surrounded by a 7.4 metre outer wall which will contain any light from fixtures in this area.

4.3 Level 16 Outdoor Common Area

Similarly to the Level 2 outdoor area this area will also require lighting. Lighting should be placed so that it faces away from any surrounding buildings that may have a view of this area. The balustrade around this area is 2.8 metres high which will help to contain any light spill. There is also a larger distance to neighbouring buildings on the east and south sides of the site. This will ensure there is no light spill above the required limits.

5 Recommendations

The lighting design should aim to mitigate any light spill from the proposed development. In order to achieve the best performance outcome for the building's use while having a minimal impact on the surrounding properties the following recommendations are given.

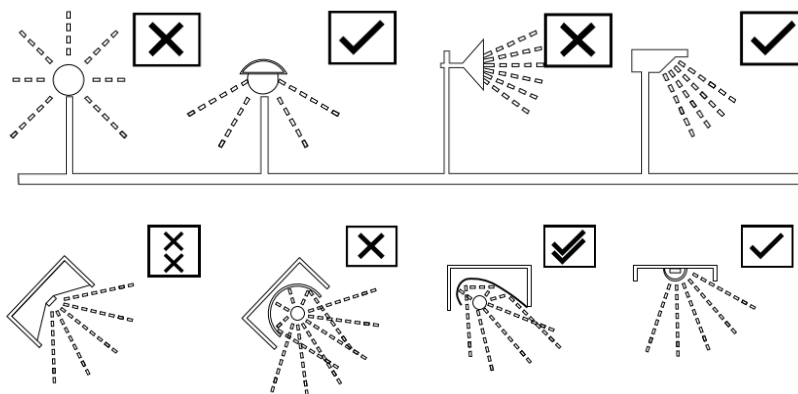
5.1 General Mitigation

The following general mitigation methods should be incorporated into the detail design.

AS4282-2019 Control of the Obtrusive Effect of Outdoor Lighting sets out general principles that should be applied when designing outdoor light to minimise any adverse effect of the light installation.

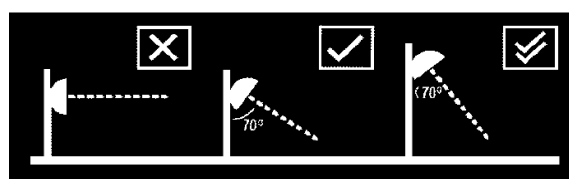
- Direct lights downward as much as possible.
- Use luminaires that are aimed to minimise light spill, e.g. full cut off luminaires where no light is emitted above the horizontal plane. Less spill light means that more of the light output can be used to illuminate the area and a lower power output can be used. The energy consumption for the fitting can thus be reduced without decreasing the illuminance of the area. Refer **Figure 6**.

Figure 6 Minimise Light Spill



- Do not waste energy and increase light pollution by over-lighting.
- Keep glare to a minimum by keeping the main beam angle less than 70°. Refer **Figure 7**.
- Wherever possible use floodlights with asymmetric beams that permit the front glazing to be kept at or near parallel to the surface being lit

Figure 7 Minimise Glare



- Use floodlights with asymmetric beam where possible.
- Direct the site lighting away from sensitive locations such as residential properties.

-
- Where possible position site lighting as far away from site boundaries as possible

5.2 Site Specific Recommendations

- Ground level lights should be aimed downward as much as possible and be shielded to prevent light escaping above the horizontal plane or off the site. Light fixtures could also be recessed into the awnings.
- Lights placed on the outside of the building should be kept as low as possible and correctly aimed to prevent light spilling on to areas where it is not needed.
- Lights for outdoor communal areas should be kept lower than the surrounding balustrade height if possible.

6 Conclusion

The implantation of the recommended mitigation measures will ensure the proposed development achieves the desired outcome where there is no unmanageable light spill impact above the required limits at the surrounding sensitive receivers.

ASIA PACIFIC OFFICES

ADELAIDE

60 Halifax Street
Adelaide SA 5000
Australia
T: +61 431 516 449

BRISBANE

Level 16, 175 Eagle Street
Brisbane QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CAIRNS

Level 1 Suite 1.06
Boland's Centre
14 Spence Street
Cairns QLD 4870
Australia
T: +61 7 4722 8090

CANBERRA

GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN

Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST

Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY

21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE

Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE CBD

Suite 2B, 125 Bull Street
Newcastle West NSW 2302
Australia
T: +61 2 4940 0442

NEWCASTLE

10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH

Grd Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY

Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE

12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG

Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000

AUCKLAND

Level 4, 12 O'Connell Street
Auckland 1010
New Zealand
T: 0800 757 695

NELSON

6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628

WELLINGTON

12A Waterloo Quay
Wellington 6011
New Zealand
T: +64 2181 7186

SINGAPORE

39b Craig Road
Singapore 089677
T: +65 6822 2203