HARON ROBSON

01 April 2024

Paynter Dixon Constructions
5 Rider Blvd,
Rhodes NSW 2138

Attention: Robert Clarke

RE: PITTWATER RSL CLUB – PICKLEBALL COURTS
OBTRUSIVE LIGHTING REPORT

Please find attached Obtrusive Lighting Report prepared by our in-house lighting design studio lightmatters®, as requested by Paynter Dixon Constructions, for the exterior lighting works associated with the proposed Pickleball Courts to be built on the top level of the existing carpark at the Pittwater RSL Club.

When the design documentation is complete, we will provide this Design Statement certifying that the lighting design complies with the requirements of:

- Australian Standard AS 4282:2019 "Control of the Obtrusive Effects of Outdoor Lighting", and
- Australian Standard AS 2560.2.1-2003 "Lighting For Outdoor Tennis"

Should you have any questions on this matter please do not hesitate to contact the undersigned at this office.

Yours faithfully
HARON ROBSON

Tom Russell
Technical Director

trussell@haronrobson.com.au

Attachment (1) Obtrusive Lighting Report – Pittwater RSL Proposed Pickleball Courts

HARON ROBSON

Obtrusive Lighting Report

For

The Proposed Pickleball Courts at

Pittwater RSL Club Pickleball Courts

Date issued: 01 April 2024

Please direct enquires regarding this document to Tom Russell at this office quoting our document reference no:
P:\14900\14949 - Pittwater RSL Club - Pickleball Courts E240207\D Design Calculations\Lighting\Obtrusive Lighting Report\14949 -Pickleball courts pittwater rsl Obtrusive Lighting Report_Rev 1.docx

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INTRODUCTION

The purpose of this report is to assess and advise on the potential obtrusive effects of the outdoor lighting on neighbouring properties associated with the proposed Pickleball courts at the Pittwater RSL Club.

With any outdoor lighting it will rarely be possible to contain all light within the boundaries of the property on which the lighting system is installed. Some light will inevitably spill outside the property boundaries, either directly or by reflection. The determination of when this spill light becomes obtrusive to others is difficult since both physiological and psychological effects are involved.

Local government plays an important role in controlling the obtrusive effects of outdoor lighting through the approvals process, and in resolving neighbourhood disputes involving residents who experience discomfort or annoyance from nearby outdoor lighting installations. Some local government authorities have applied restrictions on the frequency of use and hours of operation of outdoor lighting, and on the levels of light spill beyond the boundaries of the subject site.

This assessment of the proposed lighting installation has been carried out in accordance with Australian Standard AS 4282 "Control of the Obtrusive Effects of Outdoor Lighting". The Obtrusive Lighting Standard provides a standardised basis for assessment of the likely effects of developments that involve the provision of outdoor lighting. It provides guidelines for maximum permissible levels of spill light and glare.

Australian Standard AS 4282:2019 defines obtrusive light as spill light, which because of quantitative and directional attributes in a given context, gives rise to annoyance, discomfort and distraction. Spill light or stray light is further defined as light emitted by a lighting installation which falls outside the boundaries of the property on which the installation is sited. This standard does not apply to public lighting. However, limits have been included that can be applied when specified by the relevant authority. This was done so that obtrusive light can be controlled in areas where it may be seen as a problem without the need to calculate the impact of every streetlight.

We have classified the area type as A4 in accordance with AS 4282:2019 as Environmental zones and our assessment has been based on the lighting operating during the non-curfew and curfew periods. (For the zones and examples refer to AS 4282 - Table 3.1- Appendix A).

The Tennis Court lighting installation has been assessed in accordance with the requirements of:

- Australian Standard AS 4282-2019 "Control of the Obtrusive Effects of Outdoor Lighting; and
- Australian Standard AS 2560.2.1 "Sports Lighting for Outdoor Tennis".

THE REQUIREMENTS OF AS 4282 - THE OBTRUSIVE LIGHTING STANDARD

Australian Standard AS 4282-2019 places limits on three factors that are of primary concern to the limitation of the obtrusive effects of outdoor lighting:

1 Stray light illuminance (lux/spill light).

2 Luminous intensity (cd/glare).

3 Threshold increment (TI/disability glare).

4 Upward light ratio (Upward spill light to sky)

AS 4282 applies to lighting installations operating from dusk to an 11.00pm curfew and within curfew hours from 11.00pm to 6.00am nominally.

The first factor is concerned with spill or stray light where spill light illuminance (lux) is measured or calculated in a vertical plane. Under pre-curfew conditions this factor limits the amount of stray light incident on a relevant property vertical boundary. During curfew hours this factor limits the amount of stray light incident on a relevant property in the plane of the dwelling windows. The maximum permissible illuminance values are assessed with regard to the location of the development and the zoning of the relevant properties corresponding to environmental zones. For the environmental zoning refer to AS 4282 - Appendix A - Table 3.1. The recommended maximum illuminance values are highest in town and city centres and other commercial areas and residential areas abutting commercial areas. The recommended maximum illuminance values are significantly lower for inhabited rural and semi-rural areas. For the recommended maximum illuminance values refer to AS 4282 - Appendix A - Table 3.2.

The second factor is concerned with luminous intensity emitted by the luminaires or put more simply, the glaring effects of the lighting equipment. This factor is assessed in terms of units of light intensity called candelas. This factor is more difficult to assess and requires analysis of the photometric distribution of light from the luminaires in question. The luminous intensity limits are also subject to non-curfew L1, non-curfew L2 and curfew hours limitations, where level 1 (L1) shall apply for all new installations and level 2 (L2) limits shall apply to upgraded/modified installations where the reuse of the existing infrastructure does not permit L1 control. Additionally, where L2 limits are applied it shall be demonstrated that control of the obtrusive effects of the new scheme are equal to or better than the previous. For the recommended maximum luminous intensities values per luminaire for each zone refer to AS 4282 - Appendix A - Table 3.3.

The third factor relates to threshold increment, which is a measure of visibility dependant on the disability glare caused by the luminaire in question and the adaptation of the viewer. These limits only apply to users of transport systems, e.g., where lighting is near road, railway, waterway and air transport, etc. The threshold increment is dependent on the adaptation level of the viewer according to the environmental zoning of the area. For the recommended maximum threshold increment refer to AS 4282 - Appendix A - Table 3.2.

The fourth and final relates to upward light ratio is the percentage of luminaire flux of a lighting installation that is emitted above the horizontal, where all the light fittings are considered in their actual installed position to limit direct spill to the sky. (For the recommended maximum threshold increment refer to AS 4282 - Appendix A - Table 3.2). The relevant authority may further reduce the upward light by applying limits to the luminous output at different times. Refer to Appendix B.1 for the selection of the fittings to comply with this technical lighting parameter.

PROPOSED INSTALLATION

The new lighting installation at the Pittwater RSL Club is proposed to illuminate the new Pickleball Courts located on the upper deck of the existing carpark structure. The installation will be provided with low glare cut-off area luminaires with a horizontal light-emitting face supported on 6m poles (refer to Luminaire Details in see appendix C).

We have classified the installation in accordance with AS 4282 Table 3.1 as A4 high district brightness (see appendix A) for operation within non-curfew hours (dusk to 11.00pm). This classification therefore requires a maximum illuminance of 25 lux in the vertical property boundary of nearby residential properties and a maximum luminous intensity 25,000cd for each luminaire, in the principle plane, for all angles at and above the control direction.

The pickleball court illumination levels shall be designed to comply with the following requirements:

Pickleball Courts lighting levels:

1. Illumination Lighting Levels as per AS 2560.2.1 "Sports Lighting – Lighting for Outdoor Tennis".

   As the Australian Standard for sports lighting does not have a specific reference to the new sport of Pickleball we have for the purposes of this report relied on the standard used for outdoor tennis court lighting. The table below outlines the lighting parameters for tennis court lighting for recreational and residential play level as described in the Australian Standard for Sports Lighting for Outdoor Tennis, (refer to Table 2 from AS 2560.2.1 - see Appendix A).

Level of Play Club Completion	Average Maintained Horizontal Illuminance in Lux	U,1min (U-uniformity illumination)	U,2min (U-uniformity illumination)
Principal Playing Area (PPA)	350	0.60	0.40

2. Obtrusive Lighting Levels as per AS 4282-2019 "Control of the Obtrusive Effects of Outdoor";

   The maximum calculated vertical spill light illumination on the property boundary is 25 lux. The proposed lighting installation illumination level shall be designed below the permitted maximum of 25 lux.

   The luminaires selected for this project are a cut-off type and shall emit less than the allowable limit of luminous intensity of 25,000cd per luminaire, in the principal plane, for all angles at and above the control direction.

   It is proposed that the lighting installation shall be automatically switched off at 9:30pm each night

Based on the information provided and our assessment of the proposed design and installation of the outdoor lighting at the Pittwater RSL Pickleball Courts it is considered opinion that it shall comply with AS 4282 - 2019 to control the obtrusive effects of outdoor lighting.

The proposed new lighting installation to the Pickleball courts will be designed to will illuminate the playing courts. This installation will utilise low glare full cut-off area luminaires with a horizontal light-emitting face and appropriate shielding supported on 6m poles (refer to Typical Full Cut-Off Tennis Court Lighting Poles and Luminaires - see Appendix B).

Under the standard, we have nominated the property as a A3 environmental zone as seen below. The parameters set for the relevant zone need to be complied with to pass the obtrusive test.

TABLE 1 LIGHTING PARAMETERS FOR THE NIGHTTIME ENVIRONMENT ZONE (RESIDENTIAL)					
Environmental Zone	Maximum vertical illuminance levels (Ev)		Threshold Increments (TI)		Description
	Non-Curfew	Curfew	%	(Lad)	
A0	0	0	0	0	Intrinsically dark, observatories, no roading lighting
A1	2	0.1	0	0	Dark, e.g., relatively uninhabited rural areas. No road lighting
A2	5	1	20%	0.2	Low district brightness, e.g., sparsely inhabited rural and semi-rural areas
A3	10	2	20%	1	Medium district brightness, e.g., suburban areas in towns and cities
A4	25	5	20%	5	High district brightness, e.g., town and city centres, commercial areas, and residential areas abutting commercial areas

We have classified the installation in accordance with AS 4282 Table 3.2 and Table 3.3 as at the boundary of each environmental zoning area to be A4 (see Appendix A Table 3.2 and Table 3.3) for operation within **curfew hours** (11.00pm to 6.00am AEST). The hours might vary subject to local government regulations. This classification therefore requires a maximum illuminance of 5 lux in the vertical plane of nearby residential properties and a maximum luminous intensity of 2,500cd towards residential viewers.

We have classified the installation in accordance with AS 4282 Table 3.2 and Table 3.3 as at the boundary of each environmental zoning area to be A4 (see Appendix A Table 3.2 and Table 3.3) for operation within **non-curfew hours** (dusk to 11.00pm AEST). The hours might vary subject to local government regulations. This classification therefore requires a maximum illuminance of 25 lux in the vertical property boundary of nearby residential properties and a maximum luminous intensity of 25,000cd (L1) for each luminaire, in the principle plane, for all angles at and above the control direction.

The luminaires selected for this project shall be of the full cut-off type and shall emit less than 25,000cd during non-curfew hours for each luminaire, in the principal plane, for all angles at and above the control direction under the L1 category (as it is a new installation).

The lighting control system will be capable of being programmed to automatically dim down (or turn off) sections of the court lighting during the curfew hours (after 11 pm) to ensure the lighting level is below the maximum vertical illumination level of 5 lux as allowed during curfew hours (see AS4282-2019 table 2.2 col 3).

CONCLUSION

The lighting installation at the Pittwater RSL Club Pickleball Courts shall be designed to limit the impact of spill light and visible glare. The Tennis Court lighting installation has been assessed by Haron Robson and has been found to be in accordance with AS 4282 - 2019 - table 3.1 (zone A4) during non-curfew period. Therefore, provided the lighting is operational during the non-curfew period of sunset to 11.00pm. then there should be no basis for objection to the installation and operation of the proposed lighting scheme.

The lighting installation proposed for the proposed Pickleball Courts at the Pittwater RSL Club, is designed to limit the impact of spill light and visible glare. Provided operational hours are adhered to then there should be no basis for objection to the installation and operation of the proposed lighting scheme.

The Pickleball court lighting levels complies with the non-curfew hours recommended maximum values of spill light and glare for residential areas, in accordance with AS 4282-2019 “Control of the Obtrusive Effects of Outdoor Lighting”.

Should you have any questions on this matter please do not hesitate to contact the undersigned at this office.

Yours faithfully
HARON ROBSON

Tom Russell
Technical Director - Electrical

APPENDIX A - AUSTRALIAN STANDARD LIGHTING TECHNICAL PARAMETERS

1 Extract from Australian Standards AS 4282:

- Table 3.1: Environmental Zones and the ambient light conditions for determining limiting values for light technical parameters
- Table 3.2: Recommended Maximum Values of Light Technical Parameters for the Control of Obtrusive Light
- Table 3.3 : Maximum Luminous Intensity per Luminaire for non-Curfew and Curfew Operating Times

2 Extract from Australian Standards AS 2560.2.1:

- Table 1: Lighting Criteria for Sports Lighting – Lighting for Outdoor Tennis.

A.1.1 Environmental Zones and the ambient light conditions for determining limiting values for light technical parameters

TABLE 3.1

ENVIRONMENTAL ZONES

Zones	Description	Examples
A0	Intrinsically dark	UNESCO Starlight Reserve. IDA Dark Sky Parks. Major optical observatories No road lighting -unless specifically required by the road controlling authority
A1	Dark	Relatively uninhabited rural areas No road lighting - unless specifically required by the road controlling authority
A2	Low district brightness	Sparsely inhabited rural and semi-rural areas
A3	Medium district brightness	Suburban areas in towns and cities
A4	High district brightness	Town and city centres and other commercial areas Residential areas abutting commercial areas
TV	High district brightness	Vicinity of major sports stadium during TV broadcasts
V	Residences near traffic routes	Refer AS/NZS1158.1.1
R1	Residences near local roads with significant setback	Refer AS/NZS 1158.3.1
R2	Residences near local roads	Refer AS/NZS 1158.3.1
R3	Residences near a roundabout or local area traffic management device	Refer AS/NZS 1158.3.1
RX	Residences near a pedestrian crossing	Refer AS/NZS 1158.4

NOTE: Recreational areas are not considered commercial.

A.1.2 Recommended Maximum Values of Light Technical Parameters for the Control of Obtrusive Light

TABLE 3.2

MAXIMUM VALUES OF LIGHT TECHNICAL PARAMETERS

Zones	Vertical illuminance levels (E_v) lx		Threshold increment (TI)		Sky glow
	Non-curfew	Curfew	%	Default adaptation level (L_{ad})	Upward light ratio
A0	See Note 1	0	N/A	N/A	0
A1	2	0.1	N/A	N/A	0
A2	5	1	20%	0.2	0.01
A3	10	2	20%	1	0.02
A4	25	5	20%	5	0.03
TV	See Table 3.4	N/A	20%	10	0.08
V	N/A	4	Note 2	Note 2	Note 2
R1	N/A	1	20%	0.1	Note 3
R2	N/A	2	20%	0.1	Note 3
R3	N/A	4	20%	0.1	Note 3
RX	N/A	4	20%	5	Note 4

NOTES:

1 For A0, E_v shall be as close to zero as practicable without impacting safety considerations.

2 Refer to AS/NZS 1158.1.1.

3 Refer to AS/NZS 1158.3.1.

4 Refer to AS/NZS 1158.4.

5 N/A means 'Not Applicable'.

6 For an internally illuminated sign in an A2 zone, $L_{ad} \leq 0.25$ cd/m^2.

A.1.3 Maximum Luminous Intensity per Luminaire for non-Curfew and Curfew Operating Times

TABLE 3.3

MAXIMUM LUMINOUS INTENSITIES PER LUMINAIRE

Zone	Luminous intensity (*I*), cd		
	Non-curfew L1	Non-curfew L2	Curfew
A0	See Note	See Note	0
A1	2 500	5 000	500
A2	7 500	12 500	1 000
A3	12 500	25 000	2 500
A4	25 000	50 000	2 500
TV	100 000	150 000	0

NOTE: For A0, *I* shall be as close to zero as practicable without impacting safety considerations.

2.1 Lighting for Outdoor Tennis

TABLE 1

LIGHTING CRITERIA

Level of play	Maintained horizontal illuminance* $E_{h\ maint}$		Minimum horizontal uniformities†				Maximum Glare rating GR_{max}	Minimum Colour Rendering Index $R_{a\ min}$
			PPA		TPA			
	PPA	TPA	U_{1min}	U_{2min}	U_{1min}	U_{2min}		
Recreational and residential ‡	250	150	0.6	0.3	0.2	0.1	50	20
Club competition and commercial	350	250	0.6	0.4	0.3	0.2	50	65
International and national	1000	800	0.7	0.5	0.5	0.3	50	65

* Values of illuminance measured at the time of commissioning an installation (i.e. initial or close to) should be higher than the maintained illuminance values (see Clause 6.2)

† Being ratios, U_1 and U_2 can be calculated with equal accuracy by using either all initial or all maintained values.

‡ For residential tennis courts used for any form of competition, the performance criteria for club competition should be used.

NOTES:

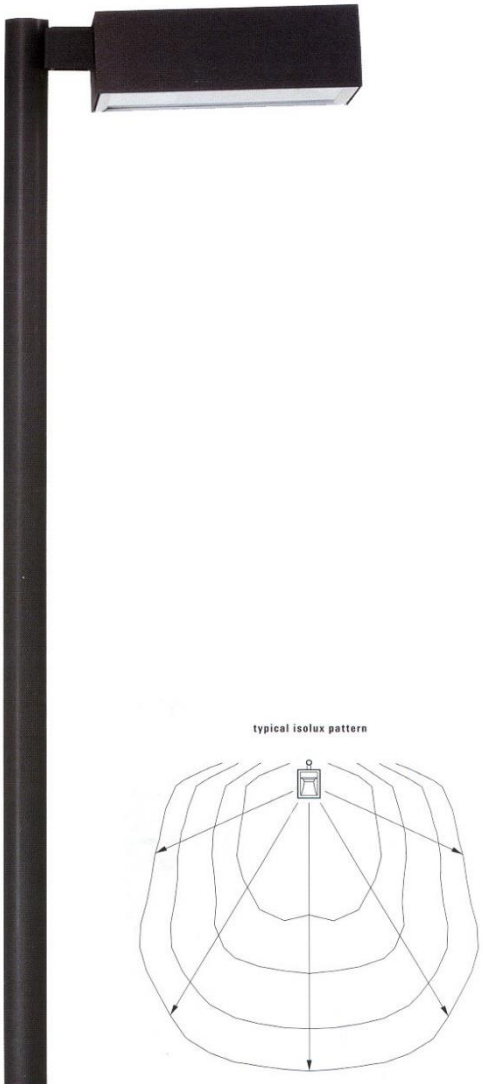
1 The figures in this Table assume good background contrasts.

2 Refer to Clause 6.3 for the height at which these values apply.

APPENDIX B - TYPICAL FLOODLIGHTING LUMINAIRES

1 Typical Tennis Court Lighting Poole with and full cut-off area lighting luminaire with glare control.

B.1 Typical Light Pole and Full Cut-Off Area Lighting Luminaire - with Good Glare Control



Type	Typical appearance	General description	Characteristic beam shape	Characteristic cartesian intensity distribution
A		Rotationally symmetrical projector giving a circular shaped beam with a typical beam angle of 5°–40°. The peak intensity is generally normal to the light emitting surface. The light emitting surface may be tilted from 45°–70° in normal application		
B		Bi-symmetric floodlight giving a rectangular shaped beam. The beam angle may be similar in the vertical and horizontal planes, or may be narrower in the vertical plane ('letterbox'). Beam angles may be 50°–70° horizontally, and 15°–40° vertically. The peak intensity is normal to the light emitting surface. The light emitting surface may be tilted from 45°–70° in normal application		
C		Asymmetrical in the vertical plane giving a fan shaped beam. The peak intensity is typically 30°–40° above the normal to the light emitting surface. The light emitting surface may be tilted from 0°–40° in normal application. There is some 'run-back' of intensity above the peak intensity		
C cut-off		Asymmetrical in the vertical plane giving a fan shaped beam. The peak intensity is typically 60° to the normal to the light emitting surface. The light emitting surface may be tilted from 0°–10° in normal application. There is rapid 'run-back' of intensity above the peak intensity		
D		Asymmetrical in the vertical plane giving a fan shaped beam. The peak intensity is typically 30°–65° above the normal to the light emitting surface. The luminaire is non-aimable and light emitting surface is fixed at 0° in normal application (it may be set at up to 20° with appropriate fixings). There is rapid 'run-back' of intensity above the peak intensity		

FIGURE A3 CLASSIFICATION OF EXTERNAL FLOODLIGHTS

A3.2 Selection of luminaires

The selection of luminaires can have a significant effect on the ability to control the light that is emitted outside the boundaries of the properties.

It is important that the selected luminaire has a light distribution that is appropriate not only for the overall lighting task but also to minimize obtrusive light. As a general principal lighting installations that control obtrusive light well will be generally more efficient at lighting the task.

Figure A1 gives simplified indication of the different types of luminaires and the impact that it has on obtrusive light. It shows preferred and non-preferred luminaire light distributions.

Figure A2 indicates how the distribution of the luminaire can affect the ability to control obtrusive light. Avoid the use of luminaires that have wide distributions and do not have the ability to limit or shield the spread of the light.

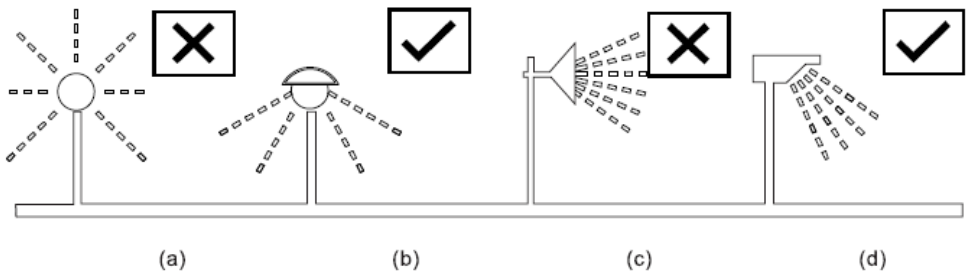


FIGURE A1 SIMPLIFIED LIGHTING TYPES AND THEIR ABILITY TO CONTROL OBTRUSIVE LIGHT

APPENDIX C - TYPICAL TENNIS COURT FLOODLIGHTING LUMINAIRES

Tennis Court floodlight and Glare shield luminaire data sheets.