

# Football and Netball Lighting Guide



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## Minister's Foreword

Grassroots sport plays an important role in our community. Local sporting clubs are places where people gather with family and friends, offering great opportunities to keep active and mix socially.

With the wonderful opportunities local sport provides, it's not surprising that participation in football and netball is on the rise across Victoria. While it is pleasing to see more and more people becoming active, increased participation also places more demand on local facilities.

In response to this growing demand the Victorian Government developed the *Country Football and Netball Program*. Since 2005, this program has invested more than \$7 million towards over 200 community netball and football projects in regional Victoria.

In addition, the Victorian Government is developing a range of planning guides to assist local sporting clubs, organisations and councils develop sustainable facilities for communities to enjoy long into the future.

The *Football and Netball Lighting Guide* aims to answer key questions local sporting clubs, organisations and councils may face when undertaking new lighting projects. It offers recommendations for planning, design, maintenance and operation of a variety of lighting systems.

The guide also includes great examples of lighting projects across Victoria, which demonstrate innovative and cost effective ways communities and local sporting clubs can maximise the use of their facilities and playing surfaces and encourage more people to get active in sport and recreation.

Good lighting is important for local sport as it provides more opportunities to train and play, supporting year round activity and maximum use of facilities.



A handwritten signature in black ink that reads "James Merlino". The signature is fluid and cursive, with a large initial 'J'.

**James Merlino MP**

Minister for Sport, Recreation  
and Youth Affairs

## Introduction

### *The Purpose of the Football and Netball Lighting Guide*

In 2005/2006, the Victorian Government created a partnership with the Australian Football League and each committed \$2 million to the *Country Football and Netball Program*. Soon after the program commenced, as part of the *Moving Forward – Provincial Victoria Statement* the Victorian Government invested a further \$6 million, resulting in a total of \$10 million to assist rural and regional councils.

The *Country Football and Netball Program* helps country football and netball clubs to develop facilities including:

- football and netball player and umpire facilities
- shared community, club and social facilities
- multi-use facilities
- lighting, and
- surface improvements.

The *Football and Netball Lighting Guide* has been developed to assist clubs and councils to install effective lighting for football and netball facilities.

The *Football and Netball Lighting Guide* aims to answer some of the key questions facing clubs, organisations and councils when considering a lighting project at a local football and/or netball club, including:

- What are the key planning matters that should be considered?
- How to budget.
- What are the relevant lighting design standards for training and competition?
- Pole height.
- Types of lights to use.
- Power supply – how to plan?
- What are the operating and maintenance issues to consider?
- What layout design is best?
- Where to get help?

A range of lighting type projects have been included in this guide, highlighting the illuminance levels of various standards of play (training and/or competition) at country football and netball facilities across Victoria.

These projects are:

- a) Stawell Football and Netball Club – football training only
- b) Learmonth and Cobden Football and Netball Clubs – football competition
- c) North Shore Football and Netball Club – netball training only (dual court)
- d) Apollo Bay Football and Netball Club – netball competition (dual court configuration)

## Definitions

For the purpose of this guide, the definitions below apply

**Watt (W)** – The watt is a unit for measuring electrical power. It defines the rate of energy consumption by an electric device. The power input to a luminaire is usually measured in watts.

**Kilowatt (kW)** – The total power requirements for a series of luminaires – a lighting system – is usually defined in terms of kilowatts. One kilowatt equals 1000 watts.

**Illuminance** – The total amount of visible light illuminating a point on a surface from all directions above the surface. The standard unit for illuminance is Lux (lx). For a lamp or luminaire it normally refers to the total light emitted irrespective of the directions in which it is distributed.

**Floodlight** – A luminaire designed specifically for floodlighting or sports lighting (usually weatherproof).

**Maintained illuminance** – The defined level below which the average illuminance on the reference plane of a lighting system is not allowed to fall.

**NOTES:**

- o It is the minimum illuminance at which maintenance is to be carried out.
- o The term applies to horizontal or vertical illuminance.

**Light loss factor** – The ratio of the illuminance provided by an installation in the average condition of dirtiness and with a lamp of average age expected in service, to the initial illuminance provided by the same installation.

**Metal halide lamp** – A high intensity discharge lamp with high efficiency and good colour rendition. These lamps are used in stadiums, warehouses and industrial settings.

**Horizontal Illuminance** – The measure of brightness from a light source, usually measured in lumens, which is taken through a light meter's sensor at a horizontal position on a horizontal surface.

**Vertical Illuminance** – The measure of brightness from a light source, usually measured in lumens, which is taken through a light meter's sensor at a vertical position on a vertical surface.

**Principal Playing Area** – All portions of all surfaces which the ball or participants may touch and be considered in play in accordance with the rules.

**Glare rating** – A numerical value on a scale of 0 to 100, determined in a specified manner, representing the degree of glare from a lighting system for given observer positions and viewing directions.

**NOTES:**

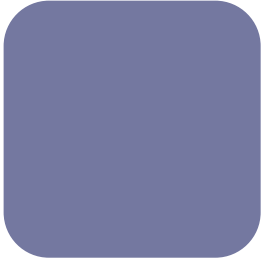
- o Higher values correspond to greater glare from the lighting system.
- o Observer positions and viewing directions are given in **diagram 1, page 18**.


**Colour rendering index** – Measure of the degree to which the colours of objects illuminated by a given lamp conform to those of the same objects under an ideal light source of similar colour appearance. Colour Rendering Index (CRI) range from 0-100. The higher the CRI is, the better the colour rendition appears. An inappropriate colour rendition can deceive the eye and supply it with wrong information.

**Uniformity ratios** – Describes the uniformity of light levels across an area. This may be expressed as a ratio of minimum to average or it may be expressed as a ratio of maximum to minimum level of illumination for a given area.

*Source: Standards Australia, Sports Lighting Part 1: General Principles, volume 2560.1 - 2007*

# Case Studies – Football

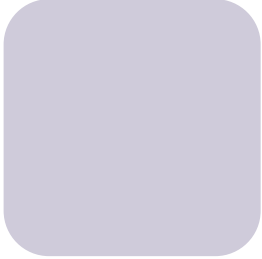


	Club   Stawell Football and Netball Club
	Level of Play   Training
	Average Lux   70
	Project Total   \$70,000
	Year Completed   2002



Football and netball are big business in the small town of Stawell. Michael Bailey, Recreation Officer at the Northern Grampians Shire Council, knows first hand the benefits of having good quality sports facilities available to the local community.

At a total cost of \$70,000, the lights have allowed the club to be more flexible in their program catering for both senior and junior participants. Friday nights are now a popular time to hold Auskick clinics.



As a player in the senior side of the Stawell Football Netball Club located at Central Park, Michael believes the upgraded facilities have opened up the community to new opportunities.

“The lighting and ground upgrades have meant we can increase our membership numbers and by thinking outside of the square we are giving people more opportunities to play, train and get involved,” says Michael.



“Both our netball courts and football oval have recently been upgraded to include new playing surfaces and lighting,” says Michael. “Apart from providing increased playing and training opportunities on the playing surfaces, we have been able to attract a VFL fixture scheduled for later in the year.”

“When we have social events in the club rooms, we’ll often turn the court and oval lights on to make it safer for kids playing outside and people walking to and from the club at night.”

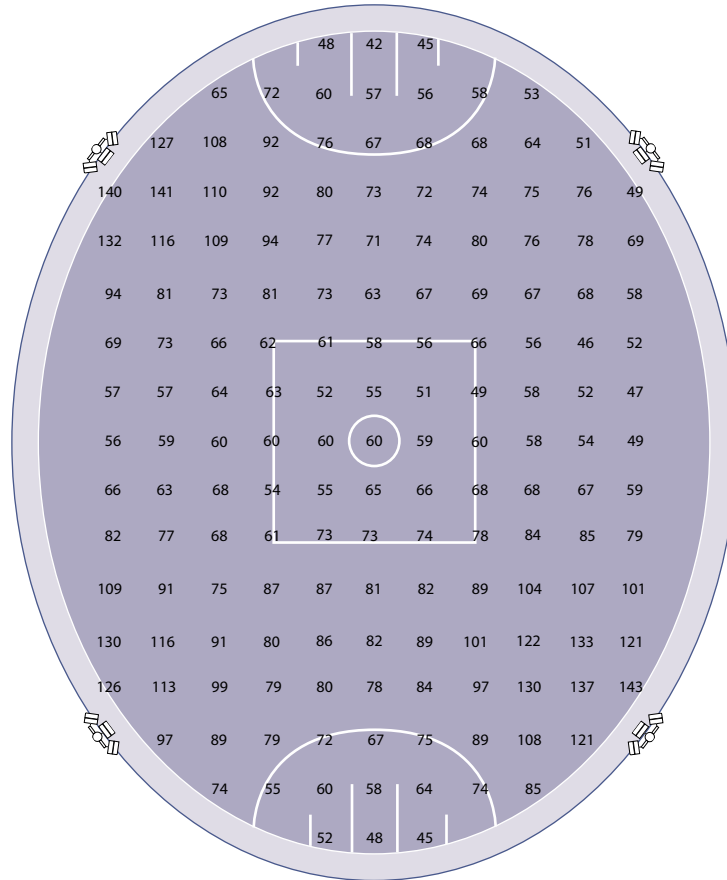
For more information contact Michael Bailey from Northern Grampians Shire Council on (03) 5358 8700.



This event will hopefully attract new players and members to the Stawell Football and Netball Club which can take pride in having arguably the most famous football oval in rural Victoria (home of the Stawell Gift).

# Case Studies – Football (Stawell Football and Netball Club)

**Summary – Lighting design showing the Lux readings across the oval surface.**

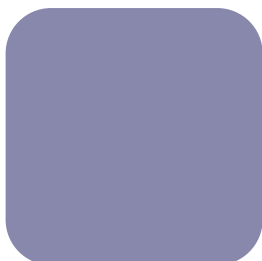
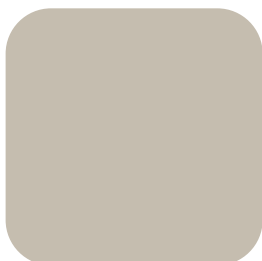


## Design summary

Level of play	Training
Average lux	70
Number of lamps	30
Number of poles	4
Pole height	25 metres
Type of floodlight used	2kW Metal Halide

## Case Studies – Football

Photos appearing on this page are provided by The Standard, Warrnambool



### Tips & Suggestions:

If using second hand poles, ensure that their structural integrity is sound and that their height is sufficient to meet Australian Standards. Refer page 18.

	Club	Learmonth Football and Netball Club
	Level of Play	Club competition
	Average Lux	153
	Project Total	\$24,000 (the majority of infrastructure was in place prior to this upgrade)
	Year Completed	2008

The Learmonth FNC lighting project was completed in May 2008 and the club now boasts football oval lighting that meets Australian Standards suitable to host football competition. The upgraded football lighting at Learmonth Recreation Reserve is the realisation of a vision that Paul Ryan (club representative) and the club first identified some 17 years ago.

In 1991 Paul sought advice from lighting and engineering experts as the club was intent on improving lighting at the reserve. Paul placed an ad in the classifieds of the Saturday Age newspaper calling for sports floodlight poles. As luck would have it, he received a call the next day from a scrap metal yard in Melbourne that had salvaged some metal poles from Tullamarine airport.

Paul travelled down to Melbourne to inspect the poles at his next available opportunity. He knew the poles needed to be tall enough and structurally sound to meet both the club's current and future requirements. The poles were 30m long and through Paul's contacts at the University of Ballarat Metallurgy Department, the structural integrity of the poles were tested and passed with flying colours.

Four 30 metre poles were purchased and subsequently installed with two lamps on each pole. Originally the lighting was only suitable for club training, as this was all the club could afford at the time. However, with the infrastructure in place to accommodate additional lighting upgrades, the club was able to increase the level of lux as funds permitted and in line with specialist advice.

The latest lighting upgrade at the Learmonth FNC was completed with funding assistance from the Victorian State Government and brought the lighting levels from an average 120 lux to 153 lux whilst still maintaining Australian Standards.

The lighting upgrade will allow the club to truly take advantage of the opportunity to schedule night football matches and cater for both player and spectator requirements alike.

Paul will look on proudly as Learmonth do battle with their opposition under lights for many years to come. Paul and others in the club will know that if it wasn't for the foresight shown some 17 years ago, the club would not be able to enjoy the benefits that the lighting is providing.

For further information contact the Ballarat City Council on (03) 5320 5500.

### *Cobden Football and Netball Club*

One club who completed a similar lighting project and has been reaping the benefits for several years, is the Cobden Football and Netball Club. In October 1996, work began installing four new 30-metre towers with 12 lights attached to each tower.

The Cobden Football Club first played under the new lights in 1997 and in 1998 a further three lights were installed on each tower bringing the level of oval illumination to an average of 175 lux. Now the Reserve caters for night-time junior and senior football events as well as cricket matches.

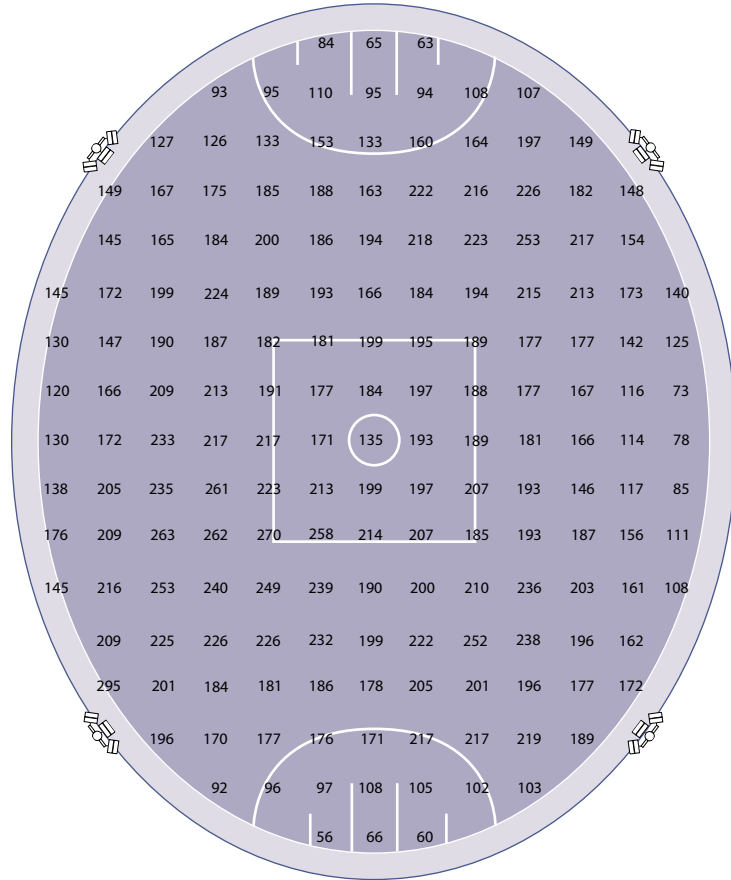
President of the Cobden Recreation Reserve, Chris Walsh, says "thanks to the new lighting, we've had great success attracting new players to the club, particularly at the junior level," Chris said.

Since installing the new lighting, the Cobden Football and Netball Club has doubled its takings at the gate during the winter months.

For further information contact Trevor Greenberger from Corangamite Shire Council on (03) 5593 7100.

# Case Studies – Football (Cobden Football and Netball Club)

**Summary – Lighting design showing the Lux readings across the oval surface.**



## Design summary

Level of play	Club competition
Average lux	175
Number of lamps	48
Number of poles	4
Pole height	30 metres
Type of floodlight used	2kW Metal Halide

## Case Studies – Netball



	<p>Club   North Shore Football and Netball Club Level of Play   Training Average Lux   100 Project Total   \$59,200 (lighting component only) Year Completed   2006</p>
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The North Shore Football Netball Club had been using an old tennis court on which to train and compete.

Thanks to funding of \$50,000 through the Victorian Government's *Country Football and Netball Program* and with assistance from the Geelong City Council, the club was able to construct two new netball courts with lighting, team shelters and fencing.

The new facilities opened in April 2006 and have enabled teams and clubs to train in the evenings, increasing the amount of playing time available on the courts.

With around 70 members, the club is a regular competitor in the Geelong Football Netball leagues, from under 11's through to senior level competition.

"It's great to see improved facilities for our local players, who are all so passionate and committed to their sport and club," said Carolyn Keast, President of the netball club, who is also the C grade netball coach and an A grade netball player.

"We're seeing even more people coming to watch netball matches, which helps create a great atmosphere and is encouraging for the players."

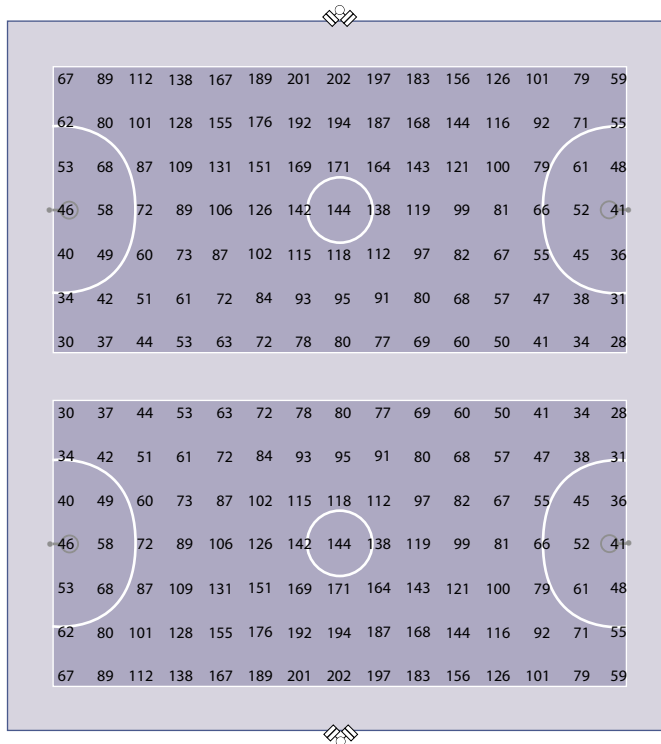
The facilities are also used by other clubs when the home teams are playing away matches, so the benefits of the new facilities are extending beyond the local area.

"I also hope the new facilities encourage more members of the community to get active and involved in the local football netball club," said Carolyn. "It's a great way to meet new people and have some fun."

For more information contact Colin Hutton from Greater Geelong City Council on (03) 5227 0270.

# Case Studies – Netball North Shore Football and Netball Club)

**Summary – Lighting design showing the Lux readings across the court surfaces.**



## Design summary

Level of play	Training
Average lux	100 (per court)
Number of lamps	4
Number of poles	2
Pole height	12 metres
Type of floodlight used	1kW Metal Halide

## Case Studies – Netball



Club	Apollo Bay Football and Netball Club
Level of Play	Club competition
Average Lux	235
Project Total	\$76,900
Year Completed	2006

The upgrade to the Apollo Bay Netball Club isn't just providing better facilities for club members; it's linking the small town to other communities through sport.

Marg Scanlon from the Colac Otway Shire Council said the installation of lights, resurfacing of two netball courts and player shelters has meant more people can play netball, train and get involved in their local community on courts with lighting that is safe and compliant.

"As we are a small community isolated by distance, the netball precinct is used by a range of sports and community groups, including the local school," said Marg. "As the precinct is located within the Apollo Bay Reserve and Camping Grounds, the courts are also used as a gathering place for campers for informal sport and social events."

"The upgrade of the lights and courts has also enabled the Apollo Bay Netball Club to compete in the local league, as the previous lights and courts were not competition standard," said Marg.

"It's great to be able to provide the local community with sporting options, day and night, from juniors through to senior level competition."

The Club project officer, Jackie Carroll said the upgrade has ensured the viability and sustainability of the club, as it has expanded the opportunities available to the community, as highlighted by the Club's recent implementation of Netball Victoria's program, *Net Set Go*, which now has 34 registered participants ranging from five to 10 years old.

The upgraded lights and courts are not only an asset to the club and players, but to the whole Apollo Bay community as social tennis is also played on the courts. A competitive tennis competition also operates for six months of the year providing active participation for six to eight teams. With the assistance of \$29,000 from the Victorian Government's *Country Football and Netball Program*, the removal of the old light poles and the upgraded court surface has lifted the standard of tennis.

This project was a community collaboration with the Apollo Bay Kennett River Reserves Committee of Management, the Club, the League and Council taking responsibility for elements of the project to ensure a quality outcome. You only have to see the courts on a Saturday to realise how important they are to the local community.

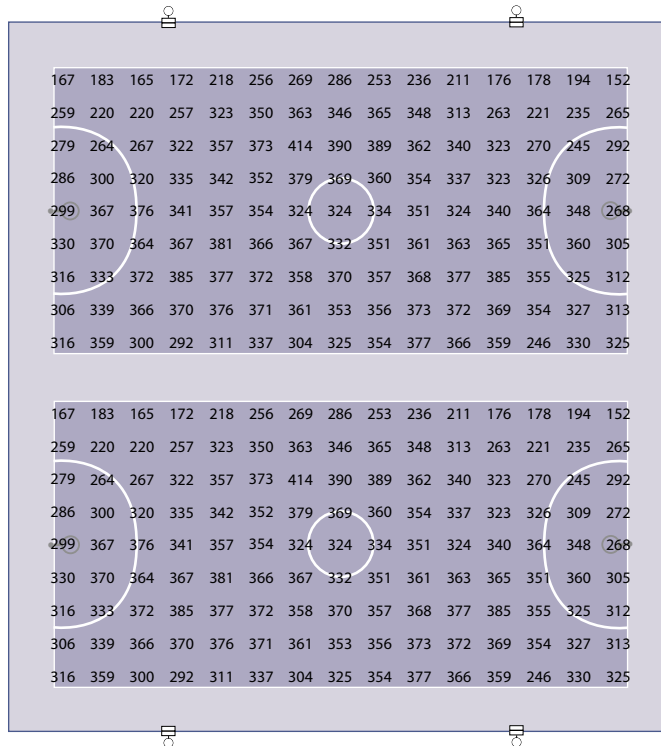
"This project has had fantastic outcomes resulting from joint planning, on-site meetings and discussion and ongoing consultation of all parties during each stage of the project," said Jackie.

Gary McPike, General Manager, of the Committee of Management who is responsible for the reserve and the courts says it has been a fantastic outcome. "We have gone from a facility with sub-standard court size and surface to one of the best facilities in the Shire. It has been a great partnership that has delivered a project with real benefits to many users groups."

For more information contact Marg Scanlon from Colac Otway Shire Council on (03) 5232 9400.

# Case Studies – Netball (Apollo Bay Football and Netball Club)

## Summary – Lighting design showing the Lux readings across the court surfaces.



### Design summary

Level of play	Club competition
Average lux	235 (per court)
Number of lamps	4
Number of poles	4
Pole height	15 metres
Type of floodlight used	2kW Metal Halide

## Installing Lights – The Planning Process

### *Planning Approach*

Local government statutory planners will be able to provide advice on property development and land use proposals in accordance with the *Planning and Environment (Planning Schemes) Act 1996*.

Planning schemes set out policies and provisions for the use, development and protection of land for an area. Each municipality in Victoria is covered by a planning scheme. Zones reflect the primary character of land, such as residential, recreational, industrial or rural, and indicate the type of use which may be appropriate in that zone. A planning permit is a legal document that allows a certain use or development to proceed on a specified parcel of land.

### *Planning Permits*

A planning permit is a statement that a particular use or development (subdivision, buildings, and works) may proceed on a specified parcel of land. Sometimes a permit is specific to a nominated person or operator. It is always subject to a time limit and will expire under specified circumstances. The responsible authority is entitled to impose conditions when granting a permit.

If you propose to use or develop land, first discuss the proposal in detail with your local council planning officer. Early discussion will confirm whether a planning permit is necessary and highlight likely requirements.

The planning permit process may also include consultation with surrounding residents and other stakeholders.

It is important not to confuse planning permits with building permits. Building permits relate to the method of construction of a building or development. A planning permit does not remove the need to obtain a building permit.

The best way to find out whether you need a planning permit is to contact the planning department of your local council, as the council is typically the responsible authority for deciding permit applications.

When applying for a planning permit, applicants should use the *Planning Permit Application* form and include the prescribed permit application fee (refer to the *Planning and Environment (Fees) Regulations 2000*), and all necessary supporting information, such as accurate plans, reports and photographs.

### *Building Permits*

Many light pole installations will require a building permit, irrespective of whether a planning permit is also required. The *Building Regulations 2006* indicate that for poles not attached to a building, a permit is required when they are over eight metres in height. Further information about the building permit process can be obtained from the building department of your local council.

### *Budget*

The budget table in **Attachment A** provides an indicative breakdown of costs expected for a new lighting installation as per the sample layouts included on **pages 22-24** (football) and **pages 29-32** (netball). This is current at the time of printing and annual cost escalations should be taken into account.

There are a number of factors that will have a bearing on probable costing to establish new or upgrade lighting facilities. It's recommended the budget be used as a guide only as a number of site specific factors and implementation aspects will vary between projects.

Upgrading existing installations can result in different cost considerations. Questions regarding suitability of the existing equipment to be integrated as part of an upgraded scheme need to be carefully considered to ensure they comply with the Australian Standards.

# Australian Rules Football Lighting

## Standards

A basic requirement for illumination of a football field is that the ball is adequately illuminated at all times while in play<sup>1</sup>.

The Australian Standards (series 2560.2.3) contains recommendations and requirements specific to the lighting of Australian Rules football. The standard deals with training and competition levels of play, and takes into consideration spectator viewing requirements.

The Standard contains information highlighting the maintained horizontal illuminance (lux) required for training and club competition at a recreational, amateur, semi-professional and professional level for Australian Rules football. The following table uses information from the Australian Standards and requirements from the AFL to articulate the minimum average lux required for varying levels of play.

Level of Play	Typical activity	Examples	Maintained Horizontal illuminance (lux)
Recreational level	Skills training	Touch and tag football.	50
Amateur level	Training	Suitable for training at a local club level.	50
	Competition/ Match practice	Minimum requirement suitable for competition at a local club level. Provides minimal viewing distances for specators.*	100*
Semi-professional	Training	Suitable for training at a semi-professional (VFL) level.	100
	Competition/ Match practice	Minimum suitable for competition at a semi-professional level.	200
Professional	Match practice/ Competition (non-televised)	Minimum suitable level for professional (AFL) match practice.	500

**\*NB:** If a club, league or council is looking to develop a showpiece club night football venue, a minimum of 150 lux should be considered if it wishes to take contemporary viewing expectations of spectators into account. Where possible, it is recommended that clubs/councils inspect sites detailed in the guide to increase their understanding of the impact of different lighting levels.

<sup>1</sup> Australian Standard, Sports Lighting Part 2.3: Specific applications – Lighting for football (all codes), Standards Australia International, 2007.

# Australian Rules Football Lighting

The information outlined below is technical in nature. The information is provided to make the reader aware of the standards and to be passed on to qualified lighting designers/contractors who will be able to then plan for your project proposal's needs.

## Illuminance Requirements

The maintained average horizontal illuminance and horizontal uniformities within the Principal Playing Area of Australian Rules football is to comply with the appropriate values specified in Table 1.

Level of play	Maintained average horizontal illuminance (lux)	Minimum horizontal uniformities		Maximum glare rating	Minimum colour rendering index	Maximum uniformity gradient
		(U <sub>1</sub> )	(U <sub>2</sub> )			
<b>Recreational level</b>						
Touch and tag	50	0.3	N/A	N/A	65	N/A
<b>Amateur level</b>						
Ball and physical training	50	0.3	N/A	N/A	65	N/A
Club competition and match practice	100	0.5	0.3	50	65	N/A
<b>Semi-professional level</b>						
Ball and physical training	50	0.3	N/A	N/A	65	N/A
Match practice	100	0.5	0.3	50	65	N/A
Semi-professional competition	200	0.6	0.4	50	65	N/A
<b>Professional level</b>						
Ball and physical training	100	0.5	0.3	50	65	N/A
Match practice	200	0.6	0.4	50	65	N/A
Professional competition	500	0.7	0.5	50	65	20% per 5m

Table 1 – Lighting Criteria (source Standards Australia, Sports lighting Part 2.3: Specific applications – Lighting for football (all codes))

Uniformity ratios are an important part of a complete set of lighting criteria and can have a positive effect on the quality of lighting installations. An adequate level of uniformity is required to create balanced lighting conditions so that people's eyes do not have to continually adapt to a different light level. The Minimum Horizontal Uniformities are given in two ratios, each providing a numerical representation of the uniformity of illuminance over a given area.

This may be expressed as a ratio of minimum to average (U<sub>1</sub>) or it may be expressed as a ratio of minimum to maximum (U<sub>2</sub>) level of illumination for a given area. For example, (U<sub>1</sub>) Club competition and match play minimum uniformity equals 0.5. The lowest level of illumination should be not less than 50% of average (U<sub>1</sub>) or 30% (U<sub>2</sub>) of the maximum level of illumination.

# Australian Rules Football Lighting

## Note:

\* Recreation level is considered to differ from match practice because the ball and physical training is more controlled, involves fewer participants and the movement of the ball is more predictable than in a match practice environment.

# If future upgrading to a level suitable for television broadcasting is intended or likely, the selection of light sources with  $R_a > 90$  should be considered.

The above values are chosen to be adequate to provide for the safety of the participants and the level of visual tasks anticipated. Factors such as large crowds (e.g. more than 10,000) with consequent longer viewing distances, might require higher values to be chosen than initially indicated above<sup>2</sup>.

## Equipment

Lighting should be designed and installed so that the visual task can be comfortably performed by the participants, officials and spectators.

Consideration should be given at the outset of the installation for what the intended purpose of play is; training, club-competition or semi-professional play as making provision for such (in pole sizes, cabling etc.) can significantly reduce the cost of the future upgrading.

## Types of Floodlights

The 2kW Metal Halide Luminaire is a standard floodlight for football sports lighting. It provides a versatile, robust design solution with good colour rendering properties and average lamp life of 6,000 hours.

Lighting constructed with an International Protection rating of 'IP6x' classification leads to improved maintenance benefits and helps reduce costs.

The beam characteristics of floodlights to illuminate a particular playing field will depend on the size of the playing field and the number and location of lighting poles available.

For competition play it may be necessary to use a combination of the full range of beam types described in Australian Standards (series 2560.1), in order to achieve the required illuminance and uniformity over the playing area. For training, floodlighting types A, B or C (see below) will generally be suitable to achieve the required illuminance and uniformity<sup>3</sup>.

The pictured floodlights are commonly used in four pole arrangements (see page 20) for lighting playing surfaces.



(a) Type A floodlight giving a symmetrical beam



(b) Type B floodlight giving a fan-shaped beam



(c) Type C floodlight giving a fan-shaped beam with asymmetric distribution in the vertical plane

In the design of football ground lighting installations, careful consideration should be given to visual requirements relating to the comfort of the participants and spectators. The selection of suitable floodlights should be the responsibility of the lighting designer who will have access to detailed photometric information and the means to apply it.

<sup>2</sup> ibid

<sup>3</sup> ibid

# Australian Rules Football Lighting

## Tips & Suggestions

- Do not rely on nominal designs without seeking advice from qualified persons concerning the site specific installation issues, for example glare, light spill and identifying the need for any special measures.
- Gain an understanding about the underlying assumptions, for example what 'light loss factor' allowance has been made for light depreciation with age and dirt accumulation on light fittings?
- Consider whether the lighting performance depends on use of special lamps with high light output and what restrictions this will impose
- Use a consistent make and model of floodlight for ease of design, routine maintenance and re-aiming in future. Consider designs having an 'IP6x' classification to improve 'light loss factor' i.e. permit use of a higher factor.

## Height and Type of Poles

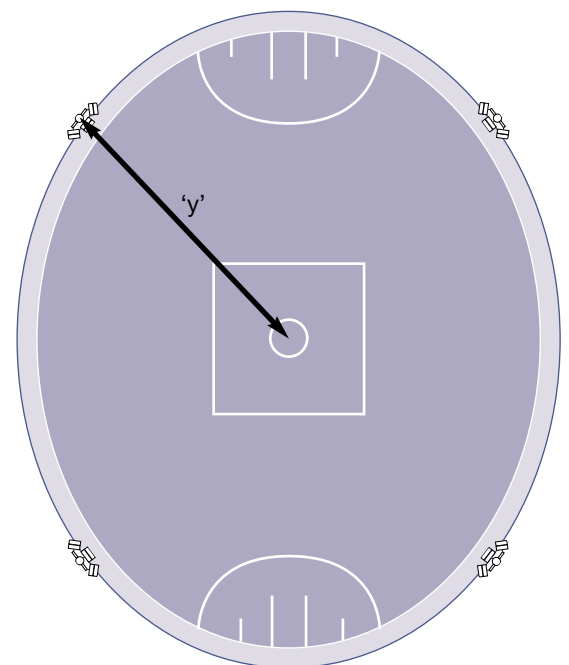
Guidelines for pole height are given in the Australian Standard (series 2560.2.3).

Minimum pole height depends on the distance from the centre of the ground to the base of the pole location. For non-professional competition, the distance can be calculated by  $0.36 \times 'y'$  (the distance to proposed pole location from the centre of the ground) – see diagram below. For most grounds this will result in pole heights of 25-30 metres.

Poles required for Australian Rules are often a fixed design due to increased costs associated in obtaining poles which have inbuilt climbing structures or facilities to lower poles or headframes. In most cases, this requires crane access to reach the lights for maintenance. The crane access and clearances for safe working should be considered at the outset.

It is important to consider the highest level of play proposed at a venue prior to the installation. Higher levels of play require more floodlights, longer poles, which require a larger headframe to support the floodlights. This may result in an increase in foundation costs.

The budget table in **Attachment B** provides indicative pole supply costings.



# Australian Rules Football Lighting

## Tips & Suggestions

- a) Refer to Australian Standards (series 2560.2.3) for recommended pole heights and locations. **Pages 22-24** also provide an overview of requirements.
- b) Manage the risk. Check relevant 'conditions of use' and insurance matters before proceeding to install poles of inadequate height which are destined not to comply with the Australian Standard.
- c) Establish the highest level of play that the facility should be designed for and select poles to accommodate this higher play level incorporating the required structural capacity, electrical supply configuration and headframe facilities to mount future floodlights.
- d) Consider that efficient well designed floodlights can help reduce pole costs through lower quantities, less surface area, lower headframe mass and reduced foundation requirements.
- e) Consider how the light fittings will be maintained and ensure safe access can be obtained for routine lamp maintenance.
- f) Minimum pole height depends on the distance from the centre of the ground to the base of the pole location. For non-professional competition, the distance can be calculated by  $0.36 \times$  the distance to proposed pole location from the centre of the ground. For most grounds this will result in pole heights of 25-30 metres.

## Layout and Pole Locations

The recommended zones for the location of poles are available in AS 2560.2.3. The standard identifies placements for four and six pole designs.

As a general rule, it is recommended that when standing at the centre of the ground no poles are located within 20 degrees either side of the goal to goal line i.e. to avoid lights in the vicinity of the goals.

To minimise the risk of injury to players, poles should be located behind the boundary fence, if any, or set back at least five metres outside the limits of the playing area. **Diagram 1 (page 20) – Football Light Pole Arrangement** shows the recommended luminaire location zones for Australian Rules football.

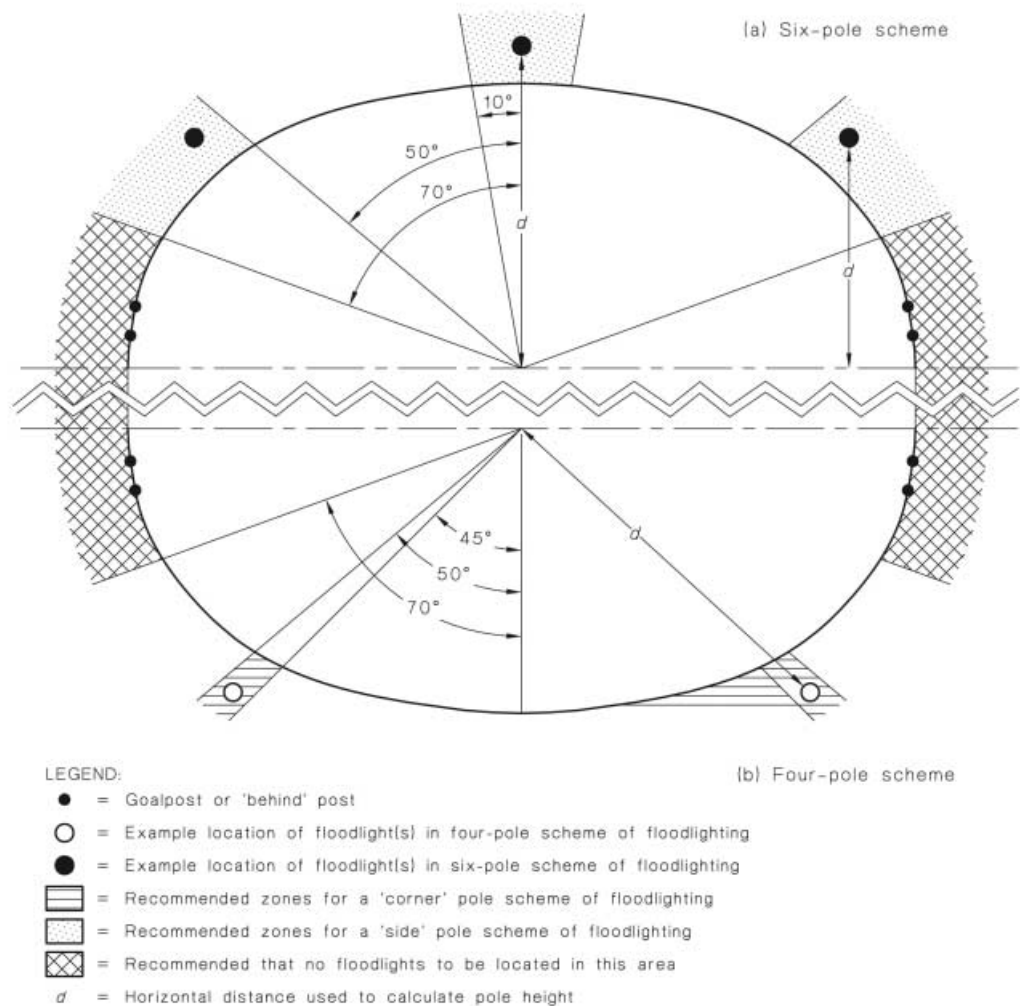
## Tips & Suggestions

- a) Consult the Australian Standard (series 2560.2.3) to locate poles in the correct zones for play. **Pages 22-24** also provide an overview of requirements.
- b) Be aware of the minimum five metre obstruction clearances set out in the Standard from the edge of the principal playing area i.e. line marked boundary when planning the Ground Lighting Layout and pole positions.
- c) Consider the need for Geotechnical advice at light pole locations to establish proper foundation requirements. This will help flag increased foundations costs at problem sites at an early stage.

# Australian Rules Football Lighting

**Diagram 1: Football light pole arrangement**

AS 2560.2.3—2007



Sourced from Australian Standards AS 2560.2.3 – 2007

## Power Supply – How to Plan?

When planning any floodlight installation, contact the local electrical company as early as possible to organise power to the ground.

Consider who will be paying for the power used. Options include providing a separate metered account, installing a check meter or payment assessed on an agreed time of use.

A single Australian Rules football ground will vary in its power demand requirements depending on the illumination level and may range from 16-24 kilowatt (kW) for training up to 96kW for semi-professional competition.

In addition, many floodlights have a higher demand at start up and this also needs to be carefully considered when sizing the electrical supply and cable reticulation.

Early discussions concerning power supply requirements should be made when planning a facility upgrade to ensure the supply requirement can be met and any operational restrictions are understood.

Power supply to each pole can come from either; the clubroom main switchboard (in the case for training level requirements) or a dedicated floodlighting switchboard and submain supply system for each pole (competition level lighting). If using an existing switchboard, ensure that it has the capacity to cope with the additional requirements.

## Australian Rules Football Lighting

### *Control Supply – How Should Lights be Controlled?*

Training level lighting is often controlled directly through manual switches.

Club competition level lighting can also be controlled in a similar way on a per pole basis using an electrical contactor, as the load is too high for a standard switch.

Manual control on a per pole basis via a switch at a convenient central location or at the base of each pole is generally used.

Access to the ground light switches is usually limited to authorised persons. Switches should be either operated by key, in a lockable enclosure or locked in a controlled area accessible to authorised persons only.

**Environmental tip:** Configure the control of competition lighting in set groups (banks) to enable lower lighting levels to suit training use. This will save energy and reduce running cost.

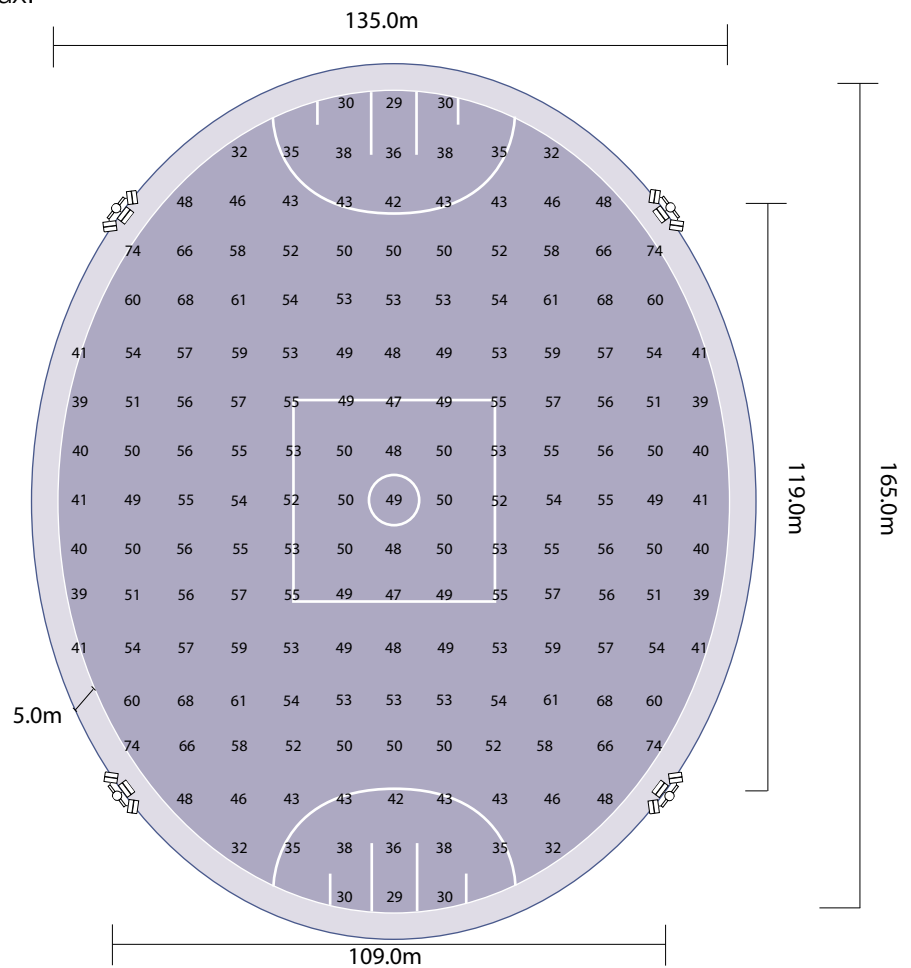
A useful and inexpensive additional measure is to fit an hours run indicator, to log operating hours. This allows a club to keep track of energy use (= hours x total rated wattage of lights) and provides a log for repair and maintenance purposes.

# Australian Rules Football Lighting

## Football lighting plan example 1

### Training level – 50 lux

Diagram 2 represents the site design layout for training at an amateur level of play of 50 lux.



### Design summary

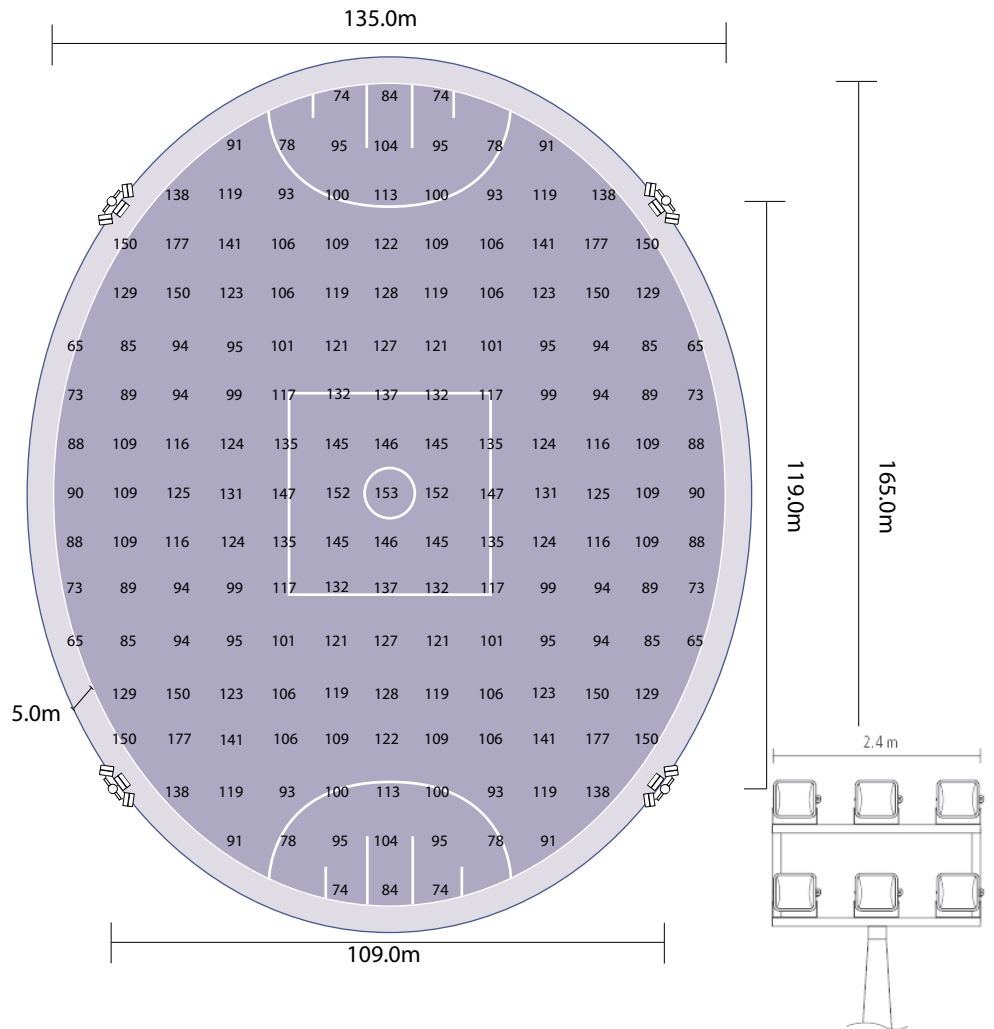
Level of play	Training amateur level
Average lux	50
Number of lamps	12
Number of poles	4
Pole height	29m
Type of floodlight used	2kW fan-shaped beam

# Australian Rules Football Lighting

## Football lighting plan example 2

### Competition – 100 lux

Diagram 3 represents the site design layout for club competition level of 100 lux.



### Design summary

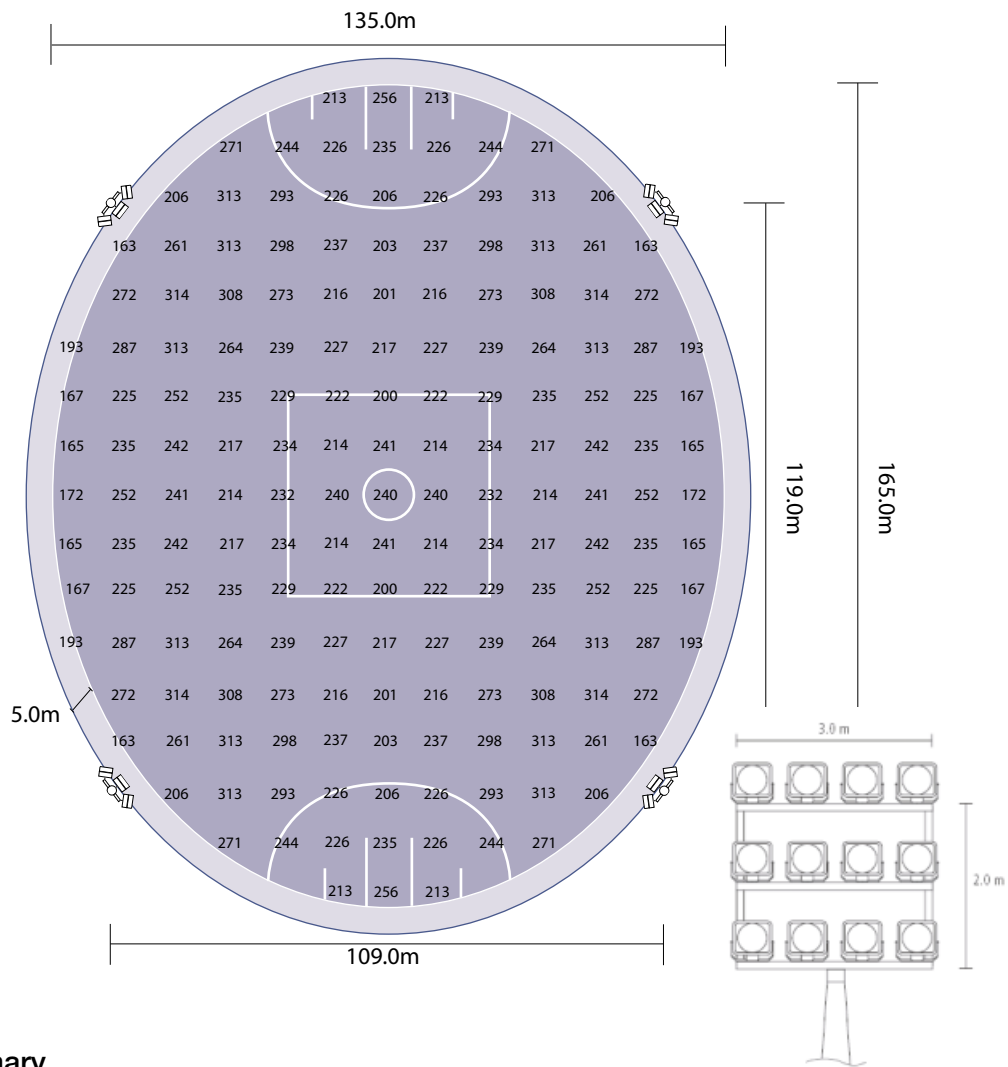
Level of play	Club competition
Average lux	113
Number of lamps	24
Number of poles	4
Pole height	29m
Type of floodlight used	2kW fan-shaped beam

# Australian Rules Football Lighting

## Football lighting plan example 3

### Semi-professional – 200 lux

Diagram 4 represents the site design layout for semi-professional competition level of 200 lux.



### Design summary

Level of play	Semi professional
Average lux	240
Number of lamps	48
Number of poles	4 – 6
Pole height	29m
Type of floodlight used	2kW fan-shaped beam

# Outdoor Netball Lighting

## Standards

The Australian Standards (series 2560.4) contains recommendations and requirements specific to the lighting of outdoor netball and basketball. The standard deals with training and competition levels of play.

The Standard contains information highlighting the maintained horizontal illuminance levels required for 'training' and 'competition' play for netball. The following table represents the minimum lux required for varying standards of play.

Level of play	Typical activity	Examples	Maintained horizontal illuminance (lux)
Training	Skills training	Passing and shooting drills	100
Club Competition	Match play	Simulating game or parts thereof	200

## Equipment

Lighting should be designed and installed so that the visual task can be comfortably performed by the participants, officials and spectators.

The nature of netball is fast paced with players moving around the court in all directions. During play the ball may be thrown to heights of eight metres. It is important that players are able to follow the flight of the ball and the actions of other players over the entire court.

Consideration should be given at the beginning of installation for what the intended purpose of play is; training or competition as making provision for such (in pole sizes, cabling etc.) can significantly reduce the cost of the future upgrading.

### Tips & Suggestions

- Identify whether the installation is to be planned for upgrade to competition level either now or in the future. Plan for the ultimate design to minimise the future upgrade cost. **Pages 23 and 24** show sample layouts for each level of play, while **Appendix A** provides some indicative costings.

## Outdoor Netball Lighting

### Types of Floodlights

The 1000 watt Metal Halide Lamp is the preferred floodlight for netball court lighting. In comparison to a standard 1500 watt Tungsten Halogen Lamp the 1000 watt Metal Halide provides a more efficient light output and has a longer lamp life, lasting up to 6000 hours compared with 2000 hours of use.

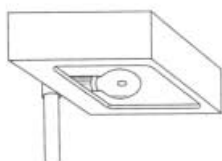
The pictured floodlights are commonly used for outdoor courts.



(a) Type B floodlight giving a fan-shaped beam



(b) Type B floodlight giving a fan-shaped beam with asymmetric distribution in the vertical plane



(c) Type C floodlight giving a fan-shaped beam with asymmetric distribution in the vertical plane

The floodlight proposed should consider the nature of play and take into consideration the current court numbers and the development of additional courts.

In the design of netball court lighting installations, careful consideration should be given to visual requirements to ensure the comfort of the participants and spectators. The selection of suitable floodlights should be the responsibility of the lighting designer who will have access to detailed information and the means to apply it.

Be aware that all lights lose output from initial switch on over a period of time due to age and the accumulation of dirt. To allow for this, a 'light loss factor' should be factored into the design to compensate for the progressive deterioration.

### Tips & Suggestions

- Consider use of high efficiency longer lasting Metal Halide Lamps particularly for larger installations of multiple courts and competition level.
- Do not rely on nominal designs without seeking advice from qualified persons concerning the site specific installation issues.
- Gain an understanding about the underlying assumptions, for example what 'light loss factor' allowance has been made for light depreciation relating to age and dirt accumulation on light fittings?
- Consider whether the lighting performance depends on use of special lamps with high light output and what restrictions this will impose.
- Use a consistent make and model of floodlight for ease of design, routine maintenance and re-aiming in future.

## Outdoor Netball Lighting

### *Height and Type of Poles*

Minimum pole heights are recommended for single courts of eight metres through to 12 metres and for multiple courts 12-15 metres depending on the light output of the floodlight. Therefore, the level of play should be considered at the outset before selecting a pole height.

Poles required for netball are often a fixed design requiring maintenance access through an elevated work platform. It is important that poles be checked for structural adequacy complete with light fittings and any brackets required to suit the recommended mounting heights.

The budget table in **Attachment B** provides indicative pole supply costings.

### *Layout and Pole Locations*

The number of courts proposed for lighting should be established at the outset of designing a netball facility.

The Australian Standards (series 2560.2.4), recommends pole locations for single and multiple courts. These recommended pole locations should be considered when planning the court layout. Also see **page 29-32**.

'General area lighting' allows fewer poles and is more economical for an area with many courts, where all or a majority of courts are likely to be used at the same time.

**Economic tip:** A side lighting system should be used for outdoor courts for single and multipurpose complexes, located on the perimeters parallel with court sides. Side lighting gives better control of light and is more economical for one or two courts. As seen on **pages 29 and 31**.

Where only a limited number of courts will be in use at the one time, it may be preferable to light the courts individually or in pairs to allow for selective switching of the lighting for those courts which are in use<sup>4</sup>.

**Diagrams 6 to 9** demonstrate pole arrangements for a single netball court and a multi court configuration. For other multi-court arrangements, advice from a specialised lighting designer should be considered.

### **Tips & Suggestions**

- a) Consult the Australian Standard (series 2560.2.4) before agreeing upon the layouts of the netball courts to optimise lighting to recommended pole locations. **Pages 29-32** show court layouts.
- b) Take specific advice for multiple courts to determine optimum pole locations.
- c) Be aware of the minimum obstruction clearances (run-off areas) set out in the Standard from the edge of court when planning the court layouts and pole positions.
- d) Avoid light poles on the perimeter behind the goal.
- e) Identify multipurpose use (for example tennis) at the outset as lighting standards may vary.
- e) Light the court from at least two pole locations.

<sup>4</sup> Australian Standard, Sports Lighting Part 2.4: Lighting for outdoor netball and basketball, Standards Australia International, 1999

## Outdoor Netball Lighting

### *Power Supply – How to Plan?*

When planning any floodlight installation, contact the electrical company in your area as early as possible to organise power to the site.

The power demand associated with netball court lighting is in the range of 2-8 kW for single and dual courts and higher for multiple court competition.

Early discussions concerning power supply requirements should be made when planning a facility upgrade to ensure the supply requirement can be met and any operational restrictions are understood.

**Health and Safety tip:** Power supply to each pole can come from the clubroom main switchboard. While not mandatory, control via a suitable Residual Current Device is recommended. The Residual Current Device is designed to disconnect the power supply to prevent an 'electrical leak' which can cause fatal injury through an 'electric shock'.

Consider who will be paying for the power used. An hour run check meter is simple to install, it logs hours of operation, gives a good estimate of energy used and helps log intervals between maintenance. Alternatively payment assessed on an agreed basis related to approximate hours of use may be considered.

As a final check, consider whether future supply will be required for any proposed upgrading or additional courts.

### **Tips & Suggestions**

- a) Establish method of payment for power and include required metering / hours run recording to track lighting usage of the netball courts.
- b) Establish the power supply required to suit immediate and future levels of play and plan for both.

### *Control Supply – How Should Lights be Controlled?*

It is recommended that single courts use one to two circuits to supply the lighting poles. Often a simple manual switch is sufficient to operate the court lights.

Access to court light switches should be limited to authorised personnel. Switches may either be operated by key at individual poles (as shown in **diagram 5**) or at a central secure location i.e, netball club rooms.

Avoid switching the lights on and off repeatedly as this can reduce the hours of use. Light bulbs should be given enough time to cool down before switching back on to minimise the potential of lights bulbs blowing.

**Diagram 5 –**  
*The pole is permanently wired from the club switchboard. A key switch at the base of the pole provides lighting control of a court.*

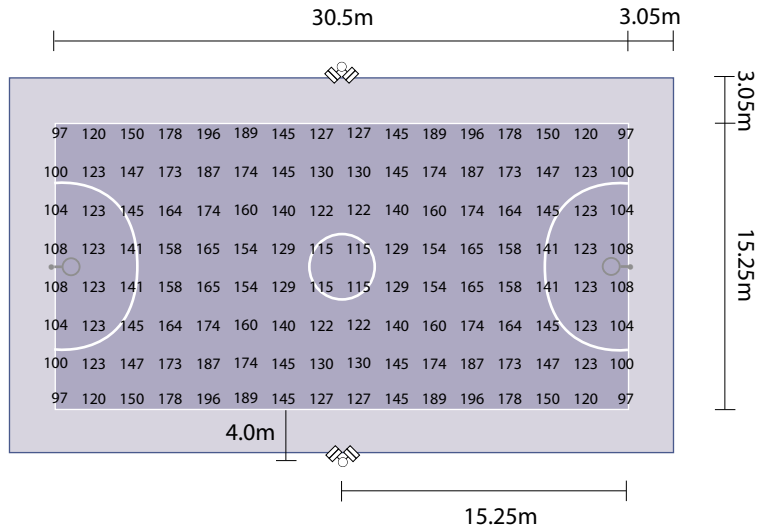


# Outdoor Netball Lighting

*Netball Lighting Court Lighting plan example*

## Netball single court lighting guide

**Training – 100 lux**



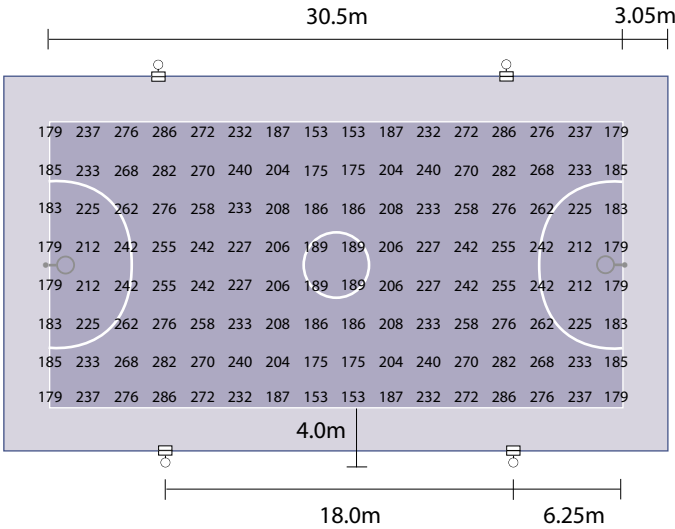
## Design summary

Level of play	Training
Average lux	144
Number of lamps	4
Number of poles	2
Pole height	10m
Type of floodlight used	1kW symmetrical beam

# Outdoor Netball Lighting

## Netball single court lighting guide

### Competition – 200 lux



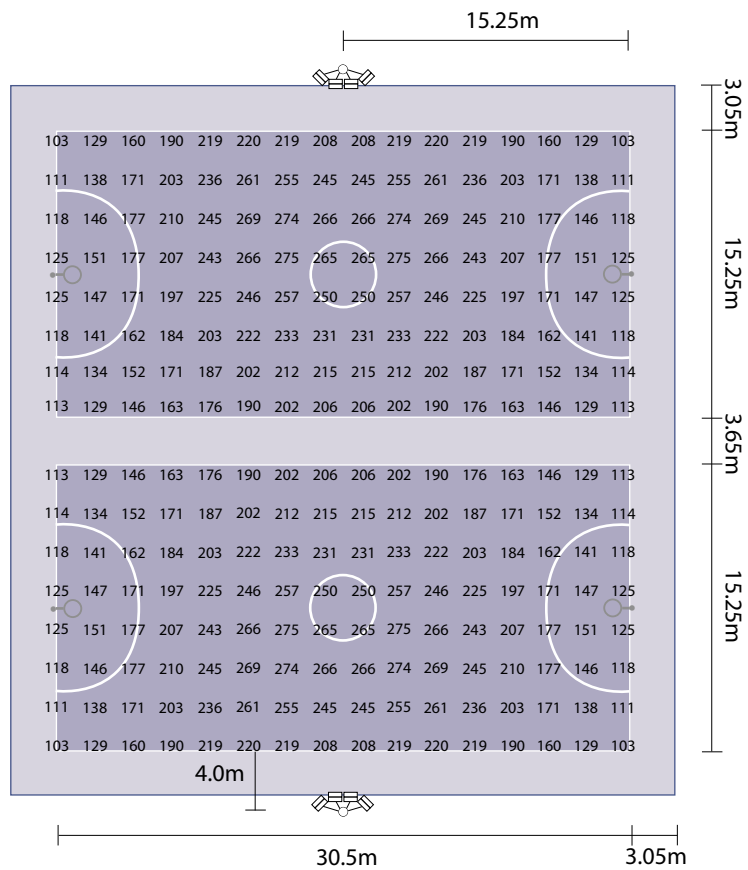
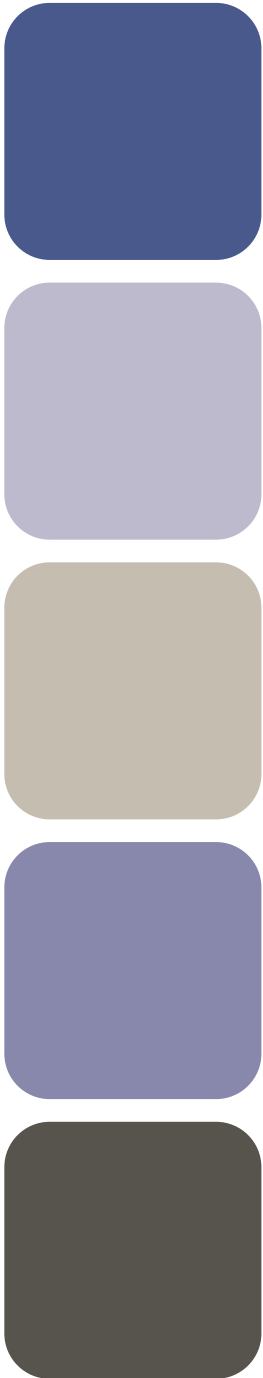
### Design summary

Level of play	Competition
Average lux	227
Number of lamps	4
Number of poles	4
Pole height	12m
Type of floodlight used	1kW symmetrical beam

# Outdoor Netball Lighting

## Netball twin court lighting guide

### Training – 100 lux



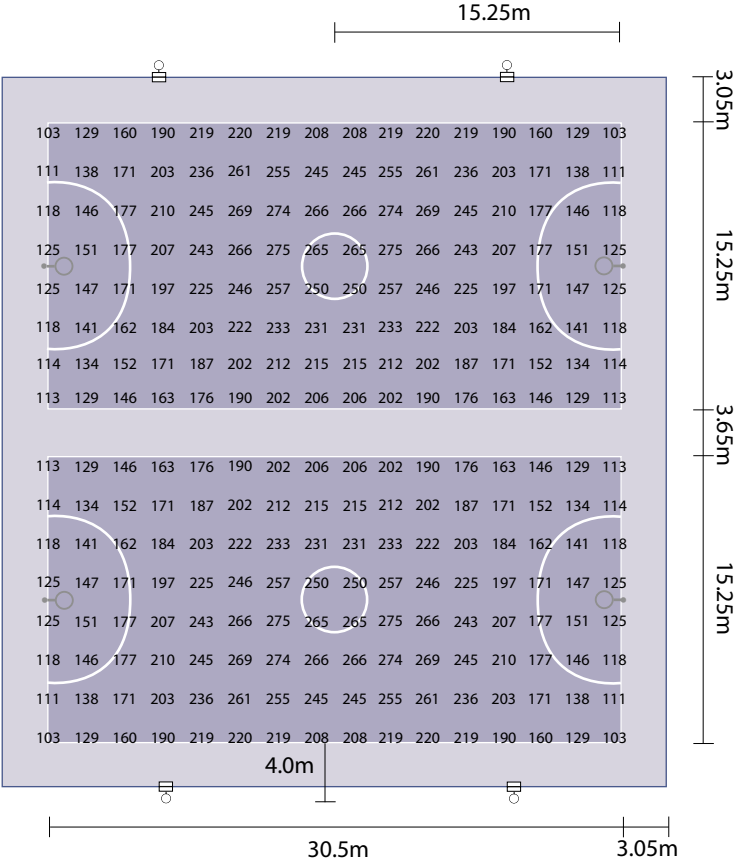
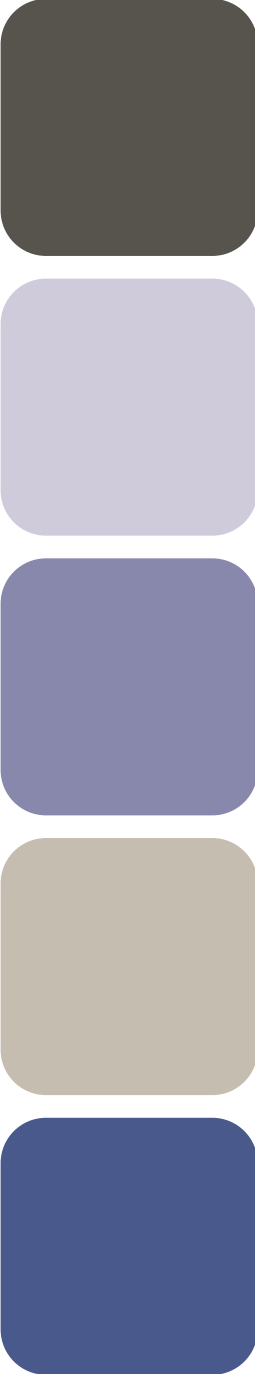
### Design summary

Level of play	Training
Average lux	190
Number of lamps	8
Number of poles	2
Pole height	12m
Type of floodlight used	1kW symmetrical beam

# Outdoor Netball Lighting

## Netball twin court lighting guide

### Competition – 200 lux



### Design summary

Level of play	Competition
Average lux	208
Number of lamps	8
Number of poles	4
Pole height	12m
Type of floodlight used	1kW symmetrical beam

## Common Provisions



### *Visual Requirements of the Participants*

The visual requirements of the participants and officials will vary depending on the nature of the sport and level of play. The layout of the playing area and the positions of the participants will determine the best locations for luminaries to minimise glare.



### *Visual Requirements of the Spectators*

It is important, particularly at the more advanced levels of play, that the visual requirements of the spectators, i.e. ability to see the action clearly and comfortably, are met by the lighting installation. These requirements also vary with the sport and the size of the playing area.



### *Allowance for Depreciation of Illuminance*

Be aware that all lights lose output from initial switch on over a period of time because lamps reduce their light output as they age and light fittings accumulate dirt over time.

To allow for this light “drop off” over time a ‘light loss factor’ should be factored into the design to compensate for progressive deterioration between periods when lamps are changed and lights are cleaned.

### *Maintenance*

Maintenance inspections of the installation should include a check of luminaire aiming and screening to ensure that the installation continues to comply with the objectives of the design, including environmental criteria.

A maintenance manual should be prepared at the time of designing the lighting installation, detailing; floodlight type, replacement and cleaning intervals to ensure longevity and best performance of the installation. A qualified lighting specialist may assist in preparing this.

The lifetime of the installation will be improved if the manufacturer’s recommendations regarding switch on-and-off cycle are observed as well as general lamp replacement and light fixture maintenance.

Where luminaires are mounted in groups on high towers and are difficult to reach, the option of replacing all lamps at the same time should be considered. The frequency of group replacement will depend on the type of lamp and duration and conditions of use. Manufacturers will provide lamp data to facilitate this decision.

Setting up an installation record for the correct operating and maintenance at the outset will ensure the longevity and best performance of the installation.

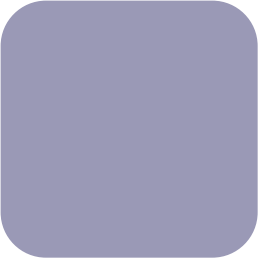
It should be noted that frequent switch on-and-off will shorten the life of the lamps. A consistent make and model of light fitting should be employed for ease of maintenance, servicing and re-aiming at a later date.

## Common Provisions


### *Where to get Further Help?*



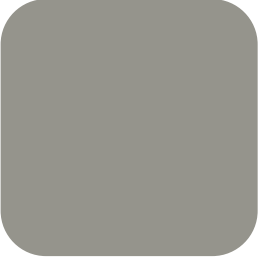
Independent consultant engineers with a background in sports lighting and electrical design should be contacted to assist in the design of sports lighting facilities.



A list of qualified persons can be found by contacting the Illuminating Engineering Society of Australia and New Zealand at [www.iesanz.org](http://www.iesanz.org) and requesting the names of members experienced in the design of sports lighting.




Australian Standards can be sourced at the following website [www.standards.org.au](http://www.standards.org.au).



Qualified electrical engineers and structural engineers with Chartered Member status in the institution of Engineers Australia and relevant experience in planning of sports lighting are qualified to advise with engineering matters in their respective field, i.e, electrical and/or structural engineering.

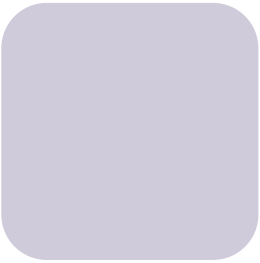


Council's and State Sporting Organisations such as the Victorian Country Football League ([www.vcfl.com.au](http://www.vcfl.com.au)), AFL Victoria ([www.aflvic.com.au](http://www.aflvic.com.au)) and/or Netball Victoria ([www.netballvic.com.au](http://www.netballvic.com.au)) should be consulted prior to the installation of football and/or netball lighting to ensure playing dimensions are adhered to.




For information on funding opportunities for lighting projects, visit [www.sport.vic.gov.au](http://www.sport.vic.gov.au)

## Checklist



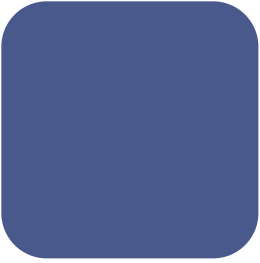
Prior to undertaking a lighting project at a local football and/or netball club, please ensure that you have:

Discussed the project proposal in detail with your local council planning officer.

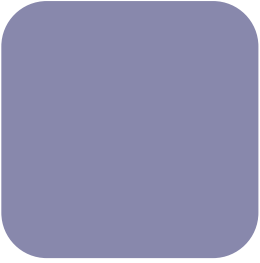


Agreed on the intended purpose of play with all user groups including the anticipated costs and maintenance considerations.


Obtained the necessary planning and building permits (where applicable).



Approached the electrical company in your area responsible for providing power to the site. Ensure power supply is sufficient for lighting requirements.



Selected the appropriate type of floodlight for the intended purpose. Consider if it is for training or competition and at what level. Consider spectator requirements.

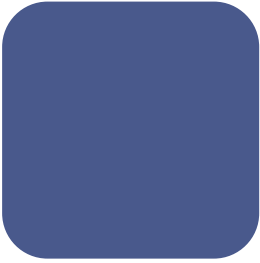


Seek advice from qualified persons concerning any site specific installation issues.

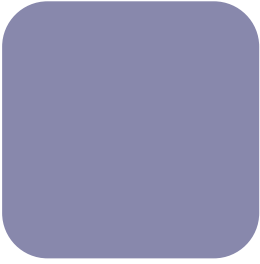
Identified appropriate height, type and location of poles.

Considered how the light fittings will be controlled, maintained and ensure safe access can be obtained for routine lamp maintenance.

## Acknowledgements



Sport and Recreation Victoria (SRV) engaged Martin Butcher Lighting Design to provide technical observations for case studies to highlight the lighting capacity at football and netball facilities in regional Victoria.



The *Football and Netball Lighting Guide* has been developed in collaboration with a number of stakeholders. In particular, the contribution of the following organisations is gratefully acknowledged:

- 
- 
- 
- Department of Sustainability and Environment
  - Standards Australia
  - Australian Football League (AFL)
  - AFL Victoria
  - Victorian Country Football League
  - Netball Victoria
  - Northern Grampians Shire Council
  - Ballarat City Council
  - Corangamite Shire Council
  - Greater Geelong City Council
  - Colac Otway Shire Council
  - Learmonth Football and Netball Club
  - Cobden Football and Netball Club
  - Apollo Bay Football and Netball Club
  - North Shore Football and Netball Club
  - Stawell Football and Netball Club
  - Eye Lighting
  - Pierlite Lighting (Philips)
  - Rexel Lighting (Impel)
  - Sylvania Lighting Australia

# Attachments

## Attachment A

### Budget

The attached budget table should be used as a **guide only**. Costs will vary between manufacturers and will also depend on quantity and quality of floodlights proposed for use. Estimates should be used when planning the development of a new lighting facility. Current as at April 2008.

INDICATIVE COSTS	Netball Single Court Training (100 Lux)	Netball Single Court Competition (200 Lux)	Football Training Level (50 Lux)	Football Club Competition (100 Lux)	Football Semi- Professional Competition (200 Lux)
<b>Capital – Initial Cost</b>					
Geotech (Soil) Report	\$1,000	\$2,000	\$2,500	\$2,500	\$2,500
Floodlights Supply	\$3,200	\$3,200	\$16,500	\$33,000	\$66,000
Floodlights Install	\$600	\$600	\$2,400	\$4,800	\$9,600
Poles Supply	\$3,450	\$6,850	\$44,000	\$60,000	\$66,000
Poles Install	\$900	\$1,800	\$9,000	\$10,000	\$10,000
Foundations	\$1,700	\$3,400	\$11,500	\$13,000	\$13,000
Lifting/Cranage	\$750	\$750	\$2,500	\$5,000	\$7,500
Power Supply	\$300	\$300	\$8,500	\$23,000	\$33,000
Floodlighting Distribution Boards	\$1,500	\$1,500	\$4,500	\$21,000	\$31,000
Lighting Controls	\$300	\$600	\$1,000	\$2,000	\$4,000
Cabling	\$650	\$1,100	\$12,000	\$22,100	\$34,700
Underground Works eg Pits & Conduits	\$2,650	\$4,150	\$20,000	\$23,800	\$23,800
Test, Aim & Commission	\$1,500	\$2,050	\$1,900	\$3,800	\$4,800
Maintenance Records	\$500	\$500	\$750	\$1,000	\$1,500
Design & Project Management (15%)	\$2,850	\$4,300	\$18,950	\$33,000	\$45,600
<b>Total</b>	<b>\$21,850</b>	<b>\$33,100</b>	<b>\$156,000</b>	<b>\$258,000</b>	<b>\$353,000</b>
Energy Avg pa	\$35	\$70	\$415	\$830	\$1,660
Maintenance Avg pa	\$215	\$310	\$1,425	\$2,850	\$5,300
<b>TOTAL 10 YEAR COST</b>	<b>\$24,350</b>	<b>\$36,900</b>	<b>\$174,400</b>	<b>294,800</b>	<b>\$422,600</b>

*Note: Energy costs have been estimated using a 'typical pattern' for country football and netball clubs; 6 hours per week x 24 weeks = 144 hours per annum. Energy costs on average have been estimated at \$0.12 /kWhr.*

*Estimates have been provided assuming works are for a new project on a green field site. The figures have not taken into account cost estimates to upgrade lighting infrastructure.*

# Attachments

## Attachment B

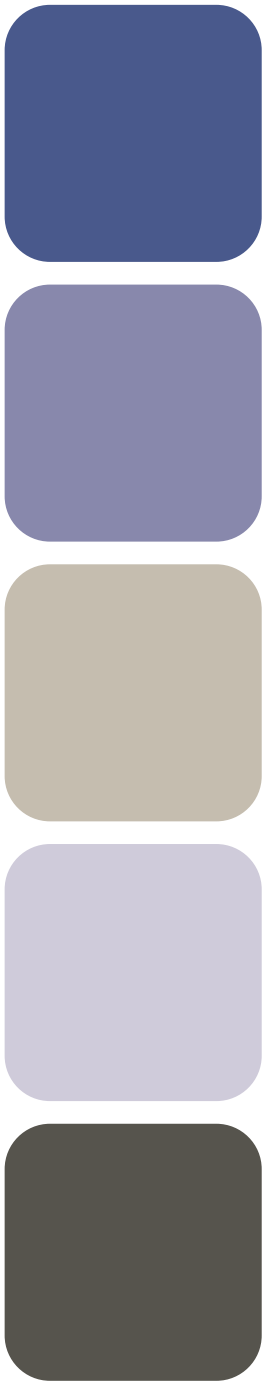
### Football Pole Height and Budget

Pole Height (Fixed Galv Steel)	Pole Supply Indicative Cost / Pole (*)
27m (Training Level)	\$10,000 + GST
27m (Club Competition–Dual Crossarm)	\$11,000+GST
27m (Semi-Professional-Tri-Crossarm)	\$12,000+GST
30m (Club Competition–Dual Crossarm)	\$11,000 + GST
30m (Semi-Professional-Tri-Crossarm)	\$13,000 +GST)
+ Include Total Freight to Country Location	Approx. \$ 2,000

### Netball Pole Height and Budget

Pole Height (Galv Steel)	Pole Supply Indicative Cost / Pole (*)
8m	\$800 +GST
10m	\$1,000 + GST
12m	\$1,200 + GST
15m	\$2,500 + GST
+ Include Total Freight to Country Location	Approx. \$ 1,000

*(\*Indicative Costs – Courtesy of Vicpole Pty Ltd for Typical Fixed Galv Steel Poles. Add Installation, Foundation and Floodlight costs separately. Note costs will vary between manufacturers and will also depend on the weight and number of floodlights proposed for use. These can vary between suppliers and depends on their light output performance for a given size and weight of floodlight design. Current as at April 2008.*



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