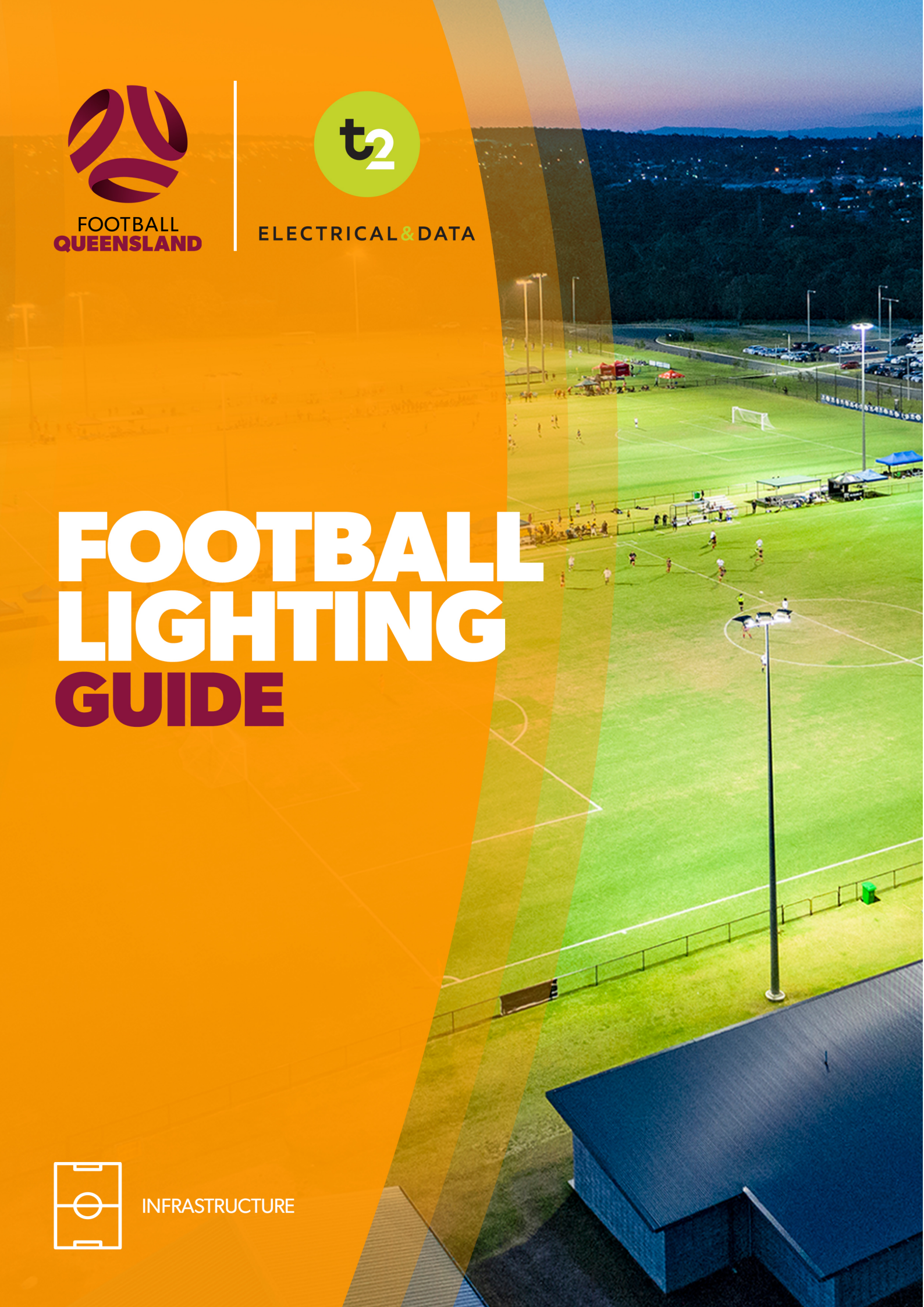
FOOTBALL QUEENSLAND

ELECTRICAL & DATA

FOOTBALL LIGHTING GUIDE



INFRASTRUCTURE

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FOREWORD

Adequate lighting for football fields is now an essential element in the ongoing viability of any venue.

While community football clubs are unlikely to need the standard of lighting required for televised matches, nearly all clubs need to be able to light their grounds, so players of all ages can train safely and effectively at night, or even late afternoon in winter.

Some clubs and associations also want the option of playing games at night and it is important the correct level of lighting is chosen for the particular need of each playing field and consideration is made of the possible future use of the venue.

As the majority of football fields in Football Queensland are controlled by local government it is essential clubs and associations planning to install or update lights liaise closely with their relevant council.

There are many considerations to be made when going through the process such as thorough planning, contract price, life-cycle operating costs, compliance to Australian standards, safety of all users and the impact on nearby residents.

This Guide is made up of two sections for outdoor football:

1. Football Queensland (FQ) Football Lighting Policy & Requirements
2. Football Facility Lighting Design

SECTION 1

Football Queensland (FQ) Football Lighting Policy & Requirements

The requirements detailed below are enforceable under Football Queensland's Rules of Competition (RoC) for each league administered by FQ and should be read in conjunction with the Rules of Competition as published from time to time. The requirements detailed below are mandatory for matches to be played under lights in Queensland and are the minimum required for FQ competitions and zones.

FQ encourages achievement of higher lighting levels where practicable and will work with assisting clubs to achieve compliance by 2023.

The Australian Standard identifies several levels of competition and specifies lighting standards for each.

The levels are:

- Amateur;
- Semi-Professional; and,
- Professional.

These levels align with FQ's Rules of Competition in which only two leagues may employ contracted players and are deemed "semi-professional" for our purposes under the Australian Standard*.

In Queensland, for the purposes of lighting only, these leagues are the National Premier League (NPL & NPLW) and the Football Queensland Premier League (FQPL). The Football Queensland Premier League 2 (FQPL2) and all zone competitions are classified as "amateur".

Some matches may require professional lighting either for television coverage or to host Westfield W-League and A-League teams or other professional teams.

Therefore, based on the Australian Standard, the following table details the minimum requirements for competition lighting, including both minimum lux levels and minimum horizontal uniformities.

**Australian Standard AS2560.2.3-2007 (2.3 Lighting for Football) contains lighting recommendations and requirements specific to football to ensure that the ball is adequately illuminated at all times while in play*

TABLE 1

COMPETITION		MINIMUM LUX†	MINIMUM HORIZONTAL UNIFORMITIES	
			U_1	U_2
PROFESSIONAL*	Competition	500	0.70	0.50
	Match Practice Training	200	0.60	0.40
SEMI-PROFESSIONAL (NPL & FQPL)	Competition	200	0.60	0.40
	Match Practice Training	100	0.50	0.30
AMATEUR (FQPL2 & All other competitions including zones)	Competition	100	0.50	0.30
	Match Practice Training	100	0.50	0.30

Notes from Table 1

† The minimum Lux refers to the maintained average as actually measured in field audits, not the levels provided for in design documents.

** Certain night fixtures may require professional standard lighting. These may include some televised matches, and FFA Cup finals. In all cases, FQ will notify a club if the minimum lighting requirements are above what its nominated home ground can accommodate.*

NB. The maximum glare rating for all competitions is 50.

To avoid doubt, professional training lighting requirements do not apply to NPL or FQPL.

Lighting installations shall be designed with minimum obtrusive light as per the Australian Standard to ensure that no disturbance or discomfort is caused to neighbouring properties and residents, or spectators.

Stakeholders must consider whether the following may cause disturbance or discomfort and address these issues as soon as practicable.

- Light falling on vertical surfaces or entering a property via windows etc
- The brightness or intensity of the installation from specific observer positions looking toward the installation
- The light emitted upward (above horizontal) from each floodlight. This effect is often referred to as "sky glow".

Process

Where a club wishes to schedule matches at times requiring lighting, the club must ensure that it has certified lighting system in line with the Australian Standard.

Certification is based on an audit* of the lighting system by a suitable consultant.

The club or ground manager must pay the cost of the audit.

Suitable lighting consultants will include but are not limited to members of the Illuminating Engineering Society of Australia and New Zealand Limited (IES - The Lighting Society).

As part of the audit, the lighting consultant must:

- undertake a review of the installed equipment to assess its characteristics and current potential for compliance with the Australian Standard;
- make such calculations as are necessary to assess compliance with the required Glare Rating;
- undertake an on-field audit* using appropriate equipment measuring in accordance with the Australian Standard and assess compliance with the lux levels and their uniformity – noting that for this purpose of certification:
    - the tests must cover the entire field of play within the marked lines – this area is referred to as the Principal Playing Area** (tests across half field only are not acceptable);
- identify any issues of concern regarding the uniformity of vertical illuminance affecting illumination of the ball on medium and high trajectory paths;
- identify any issues of concern relating to the lighting system's reliability, including a check of the switchboard/lighting control systems to confirm that they are able to be fully secured and are in good working order; and
- report to FQ or the relevant Zone on compliance with the Australian Standard or otherwise and any other matters affecting the performance and reliability of the system.

**Refer to the FQ Lighting Audit Report Form – separate document*

***Clause 3.2 of the Australian Standard AS2560.2.3-2007 (2.3 Lighting for Football) defines the Principal playing area (PPA) as "All portions of the playing surface within the boundary lines…but excluding the areas within the goal nets in the case of soccer."*

The lighting consultant's report to FQ or the relevant Zone must include details of the installation, measurements obtained in the on-field audit and the calculation of maintained average lux level and uniformities. This shall include comments on uniformity of vertical illuminance and glare in relation to the existing pole heights, luminaire aiming and total system reliability.

FQ will provide a prescribed form as shown at the back of these guidelines for the lighting consultant to complete which will provide space for the required information. The test readings must be attached to this form. The form must be completed and signed by the lighting consultant.

Certification is subject to satisfactory compliance with the Australian Standard and acceptable reliability.

Once a signed certification by an approved lighting consultant is submitted to FQ or the relevant Zone with all information on the form and with the required attachments, FQ or the relevant Zone will check the certification for completeness and accuracy. If FQ or the relevant zone is satisfied the information and lighting performance meet FQ's requirements, FQ or the relevant Zone will register a venue as compliant for either semi-professional or amateur level matches as appropriate. FQ and the relevant zone reserves the right to seek additional information or testing from the club or lighting consultant, to be provided at the club's cost.

Certification will be accepted by FQ or the relevant Zone for a period of two years if the average lux is above or equal to 110 and uniformity levels are met. Lighting audits that reflect between 100-109 average lux and uniformity levels that are met will be required each year if the club wishes to continue to hold matches at times requiring lighting. FQ and the relevant Zone will not approve fixtures that require lighting without the certification and subsequent FQ or Zone registration of the venue.

TIPS & SUGGESTIONS

FQ or relevant Zone will consider the following when determining when the next audit is due;

- **LUX & uniformity levels**
- **Updates to existing infrastructure**
- **Level of competition**
- **Depreciating lux level**

FQ Ongoing Compliance Requirements

The club is required to ensure that the Australian Standard is always met for night matches.

Where a club becomes aware that lighting for a match is not likely to meet the Australian Standard it must immediately notify FQ or the relevant Zone in writing of that fact, whereby FQ or the relevant Zone will arrange a change of fixture.

Where a referee has made a report in relation to the adequacy of the lighting at a venue or FQ or the relevant Zone has concerns that a venue may not currently meet the Australian Standard, FQ or the relevant Zone may engage a suitable lighting consultant to undertake a field audit to test compliance as detailed above. If the lighting is found to meet the Australian Standard FQ or the relevant Zone will bear the cost of the audit.

If the lighting is not found to meet the Australian Standard, the club is responsible for the costs of the audit and FQ or the relevant Zone's approval for fixtures requiring lighting at the venue will be removed for fixtures requiring lighting at the venue will be removed until the lighting is maintained, repaired or modified to comply with the Australian Standard.

If a match is unable to commence, halted temporarily or abandoned due to the failure of the lighting to meet the Australian Standard or failure to function at all during a match (Lighting Failure), the club must provide evidence to FQ or the relevant Zone as to the causes of such failure.

If the lighting failure was due to circumstances beyond the control of the club, including network system failure, weather, accidental damage or off site equipment failure or any other extraordinary circumstances accepted by FQ or the relevant Zone, no penalty will be imposed and subject to FQ or the relevant Zone being satisfied that the lighting for the club's subsequent night fixtures will meet the Australian Standard, those fixtures will remain as scheduled.

If the lighting failure was due to any other reason, including deliberate interference, the club may be penalised subject to FQ or the relevant Zone's discretion. *Refer to FQ and the relevant Zone Rules of Competition for further information on penalties.*

TIPS & SUGGESTIONS

- **It is the club's responsibility to ensure a safe on-field environment for its players when training and during competition.**
- **The club should ensure that the floodlighting at its facility continually meets the standards as set out in this Guide.**
- **If the club or the facility owner (eg local Council) suspect a deterioration in the floodlighting, then an audit and subsequent repair should be carried out.**

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SECTION 2

Football Facility Lighting Design

This section of the *Facility Lighting Guide* for football has been developed to assist clubs and councils to install effective lighting for their facilities.

Some components in this guide are technical in nature and are therefore predominantly provided to inform clubs and councils in their discussions with qualified lighting experts.

This guide covers key topics that councils and clubs will need to consider when planning a sports lighting project. These include:

- Planning process
- Planning the power supply
- Maintenance and operation
- Environmentally sustainable design
- Types of lighting
- Pole height and location
- Design standards for training and competition
- Where to get further assistance

This Guide covers general information to plan a lighting project and a range of useful tips have been provided throughout the guide to highlight a number of planning considerations for local clubs and councils.

Key Lighting Terminology

Floodlight:

A lamp designed specifically for floodlighting or sports lighting (usually weatherproof).

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. Higher values correspond to greater glare from the lighting system.

Illuminance (Lux):

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 it normally refers to the total light emitted irrespective of the directions in which it is distributed.

Kilowatt (kW):

The total power requirements for a series of lamps – a lighting system – are usually defined in terms of kilowatts. One kilowatt equals 1000 watts.

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 lamp rendition. These lamps are used in stadiums, warehouses and industrial settings.

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.

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.

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 lamp is usually measured in watts.

Source: Standards Australia

Sports Lighting Part 1: General Principles,

Volume 2560.1 – 2007

www.standards.org.au

The Planning Process

This section assumes the appropriate pre-planning has been undertaken to ascertain that a football lighting project is needed.

New or amended football lighting installations will need to consider obtaining statutory planning consent and other appropriate approvals.

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 (usually local council) 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 and recreation departments. Early discussion will confirm whether a planning permit is necessary and highlight likely conditions. Typically, sports lighting upgrades do not require a permit.

The planning permit process may require consultation with surrounding residents and other stakeholders. Organisations should consider undertaking community consultation prior to seeking a planning permit to help address any community concerns.

It is important not to confuse planning permits with building permits.

Building permits relate to the method of construction of a building or development to ensure it complies with relevant standards.

A planning permit does not remove the need to obtain a building permit.

When applying for a planning permit, applicants should use their local council's *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.

Spill Light

As residential properties are often in close proximity to sporting fields, spill light issues (i.e. light that falls outside the area intended to be lit) need to be considered in the planning process. Planning permits often require verification of obtrusive lighting provisions (i.e. calculation of spill light to nearby residences). There may also be special traffic and aviation spill lighting requirements that apply to your area.

Building Permits

Many light pole installations will require a building permit, irrespective of whether a planning permit is also required. In many instances local council is the landowner and needs to grant permission for any works to be carried out on its land. 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.

TIPS & SUGGESTIONS

- **If planning permits require verification of Obtrusive Lighting Provisions (i.e. calculation of spill light to nearby residences or other sensitive locations), include this into your project design brief and be aware that additional design time may be required.**
- **Establish the proximity and orientation of any nearby residential areas at the time of planning the site design layout. Simple matters like field/court orientation and set out can help limit spill light to residential areas. Typically, greater than 20m distance from a property boundary will likely see less light spill.**
- **Identify any particularly sensitive locations that may be impacted by proposed sports lighting e.g. main roads and/or intersections.**
- **Consider proximity to airports and ensure civil aviation requirements for screening of sports lights are addressed. Restrictions typically exist up to 6kms away from airport runways.**

Equipment

Lighting should be designed and installed so that the football being conducted can be comfortably performed by the participants and officials and viewed by spectators.

Lighting should be designed and installed so that the football being conducted can be comfortably performed by the participants and officials and viewed by spectators.

Before installation, consideration should be given to determine what the intended purpose of play is; training, club-competition or semi-professional play. Making provision for upgrades (e.g. pole size and cabling) can significantly reduce the cost of upgrades in the future.

The decision to install football lighting should be made following consultation between the user groups, council and peak sporting bodies. Visiting sites with different levels of lighting also provides project proponents with a practical understanding of what various lux levels actually mean.

The football lighting installations can also serve to intentionally illuminate the areas where spectators gather. Poles can be used to mount other lights to illuminate perimeter areas. This needs to be considered when specifying poles and allowing the provision to mount such lighting (usually at lower levels on the poles), using separate electrical cabling infrastructure. This will allow operation of the lights for different times and requirements, such as public lighting.

NOTES FROM AS 2560.2.3 – 2007

- **To minimise the risk of injury to players, poles should be located behind the boundary fence, if any, or set back at least 5m outside the limits of the PPA (principle playing area).**

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Planning Power and Electrical Supply

Contact your local electricity company early in the process to organise power to the facility. Consider who is paying for the power use. Options include providing a separate metered account, installing a check meter which logs hours of use or payments based on typical usage patterns.

Power supply requirements should be discussed early in the planning process to ensure supply requirements can be met for both immediate and future lux levels.

A field of play will vary in its power demand requirements depending on the illumination level. Competition level lighting power demands are often greater than the rest of the facility's demand combined.

In addition, many sports lights have a higher demand during start up and this demand needs to be carefully considered when selecting the electrical supply and cable reticulation.

Power supply to each pole can come from either the clubroom main switchboard (for training level) or a dedicated floodlighting switchboard and submain supply system for each pole (for competitive level). Ensure existing switchboards have the capacity to cope with additional requirements.

HEALTH & SAFETY TIP

The 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'.

TIPS & SUGGESTIONS

- **Establish what method will be used to meter/record lighting use, particularly for the purposes of attributing power bill payments and maintenance.**
- **Determine the power supply required to meet immediate and future levels of play. Ascertain whether the supply required is readily available and any potential costs.**

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 pole-by-pole basis. Pole switches can be located at a central location or at the base of each pole.

Switches should be either operated by key, in a lockable enclosure or locked in a controlled area accessible to authorised persons only. Accessibility should be considered when locating lighting controls.

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

There are systems available that enable SMS and web control of lighting systems on council-controlled football fields. Instead of issuing keys to lighting boxes, council registers mobile phone numbers for sporting club representatives (and council staff) so that the clubs simply SMS the lights to turn them on and off.

ENVIRONMENTAL TIP

The configuration of competition lighting in set groups (banks) enables the provision of lower lighting levels to suit training use. This will save energy, reduce running costs and increase the life cycle of the lamps.

Operation and Maintenance

Sports lights are usually operated manually. Curfew timers can, however, offer a simple inexpensive energy saving measure to ensure sports lights do not burn excessively if they are accidentally left on. Curfew timers can also ensure that sports lights are not run past a set 'curfew' time that have been set in agreement with local residents or council policy. N.B. Curfew timers are not appropriate if the lighting could be used by emergency services.

Operation and maintenance manuals

Operation and maintenance manuals provide guidance on the correct operation and maintenance of floodlights. Developing an operation and maintenance manual at the time of the sports lighting installation will assist with the longevity and performance of lights.

Section 4 in AS 2560.1-2002 (www.standards.com.au) contains useful details concerning 'Maintenance of Outdoor Lighting Equipment' which should be used when developing a maintenance manual.

The operation and maintenance manual should identify a policy for lamp replacement and should specify how regularly lights are cleaned. Manufacturer's advice should be sought regarding cleaning procedures and any other maintenance recommendations.

Labelling each light with a unique reference and cross referencing this in the operation and maintenance manual assists with future maintenance and record keeping. Information from hours-run indicators and curfew timers (devices that automatically record the hours of lighting usage) should be recorded in the operation and maintenance manual to assist with further maintenance scheduling.

Usage Patterns

Lamp manufacturers determine the average life of lamps according to expected usage patterns. Therefore, more frequent 'switching on' of the lights will shorten their life and reduce performance.

Manufacturers typically base the average life of lamps on a three hour 'on' operation. Discuss potential implications with manufacturers if your lighting's usage patterns are expected to differ from this.

Be aware that some manufacturers base average life of lamps on a ten hour 'on' operation which is not consistent with practical use in a club setting.

There are number of factors that affect the life of a lamp. These include:

- Lamp lumen depreciation (light output drops off with age).
- Lamp dirt depreciation (light output will reduce as dirt accumulates on the lamps).

Aiming has a major impact on performance. A common factor in poor light performance is lamps which are not aimed correctly at installation.

Sports Light Aiming and Commissioning

It is important that sports light aiming is completed by a professional under the supervision of the lighting designer or floodlight supplier. The aiming should be undertaken using specifically designed equipment and not 'by eye'. The set aiming positions should be recorded in case it is necessary to re-aim errant lights in the future.

Make provision for a commissioning lighting measurement test, preferably by an independent party, to verify that the aiming has indeed achieved the design outcome.

Generally, this involves taking lighting measurements on a 10m grid of points and should be directly compared with the lighting design. It is important to allow reasonable tolerances which the lighting design usually states (10% is commonly used).

The test should also form a necessary component of proof that the contractor has delivered the project properly and evidence of this may be required by funding partners. It is worth noting that the test may also be a requirement of the competition/league administrator if night matches intend to be held.

Light Loss Factor (previously known as Maintenance Factor)

To compensate for the progressive deterioration of a lighting system as it ages, an overall compensating factor referred to as 'Light Loss Factor' must be included in the design. For average outdoor conditions, a light loss factor of 0.8 to 0.7 should be included in the design calculation. If air pollution is heavy (e.g. in a heavy industrial area) or regular maintenance is not planned, factors of 0.65 or even 0.55 should be used to offset the increased light loss.

TIPS & SUGGESTIONS

- **Have the contractor develop an operation and maintenance manual at the time of commissioning the new or upgraded sports lighting. The manual should include lamp replacement and cleaning intervals to assist sports light performance being maintained throughout their life.**
- **Aiming is a relatively small component of many installations but has a major impact on performance. Have it done professionally.**
- **Record the final aiming position of floodlights in the operation and maintenance manual along with any on site adjustments made during commissioning.**
- **Install hours-run indicators to automatically record hours of use to assist with maintenance scheduling.**
- **Consider including curfew timers as an energy saving device or to comply with planning restrictions.**

Environmentally Sustainable Design

Several facets of design require consideration to optimise environmental sustainability.

Sports Light Quantity

More floodlights equals more power. Designs which minimise sports light quantity will therefore also help minimise power use. Lighting installations should seek to use the most efficient floodlights possible with the highest practical light loss factor (e.g. 0.8).

Control Gear Wattage

Control gear is required to operate sports lights which itself consumes energy. The amount of energy depends on the make and model of lamp but typically 50-150W is consumed on top of the lamp power. Therefore, a 2000W lamp may actually consume 2000 + 150 = 2150 Watts or close to 10% more power.

Control gear systems are available to optimise the energy consumption of lamps throughout their life. This reduces energy consumption and lowers maintenance costs as lamps need less frequent replacement. Sometimes called 'lumen maintenance' strategies, the control gear systems operate the lamps to obtain a more consistent light output, rather than having high light output at the beginning and diminished output as lamps age.

Duration - Hours of Use

Energy is power (watts) multiplied by time. Measures to limit the time lights are in use (e.g. curfew timers or key switch controls permitting access to authorised persons only) are relatively inexpensive to install. Costs are typically $300-500 to supply or retrofit. Such measures return the expense quite quickly (typically 3-5 years).

TIPS & SUGGESTIONS

- Consider energy and maintenance costs over the life of the installation (not just the initial capital outlay) and budget accordingly.
- Have an appropriately qualified professional review lighting quotes prior to acceptance to provide advice on efficiency and performance.

Football Lighting Standards

Key Standards

AS 2560.1 – 2002 Sports lighting Part 1: General Principles

AS 2560.2.3 – 2007 Specific Applications – Lighting for football (all codes)

AS 4282 – 1997 Control of the obtrusive effects of outdoor lighting

See www.standards.org.au

The Australian Standard (series 2560.2.3) contains lighting recommendations and requirements specific to football to ensure that the ball is adequately illuminated at all times while in play.

The standard deals with training and competition and takes into consideration spectator viewing requirements.

The standards contain information about maintained horizontal luminance (lux), minimum horizontal uniformities (U1 & U2) and maximum glare rating. These properties vary depending on whether the level of play is recreational, amateur or semi – professional.

Football Queensland has adopted the Australian Standard (series 2560.2.3) as the basis for match lighting requirements by football for affiliated competitions.

See the beginning of this guide for more information.

Illuminance Requirements

The information outlined in this section is technical in nature. It is provided to make the reader aware of the standards and qualified lighting designers/contractors will then be able to plan your project.

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. Adequate 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 (U1) or it may be expressed as a ratio of minimum to maximum (U2) level of illumination for a given area. For example, (U1) club

competition and match play minimum uniformity equals 0.5. The lowest level of illumination should not be less than 50% of average (U1) or 30% (U2) of the maximum level of illumination.

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

TIPS & SUGGESTIONS

- **Making provisions for future upgrades (e.g. pole size and cabling) can significantly reduce the cost in the long term. Plan for the ultimate design.**
- **Consider design flexibility to allow running of fewer floodlights for training purposes. Use of all floodlights in a system may only be required during competition.**
- **Where it is intended that a pitch be used for night competition the lighting needs to be planned and delivered to meet Football Queensland requirements.**

Types of Floodlights

There are now two key options for floodlights in community facilities, as show below:

Metal Halide:

The 2kW (2000W) Metal Halide lamp 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 3-5,000 hours.

Many existing grounds where there are no issues with light spillage use standard 2kW Metal Halide lamps with an 'open face' design. Use of floodlights with an 'open face' design is limited as they do not have any screening mechanisms and therefore are more likely to produce spill light.

LED lights:

LED lights are now becoming as popular as metal halide lights for new grounds, with many quality lighting companies offering lights with a guaranteed 25-30,000 hours, which is ten times that of a typical metal halide. With reduced operational costs, greater flexibility for lighting variations, which can

be pre-programmed, including warm up and warm down levels to encourage users to leave. Over the past two years the capital cost is now more aligned between both options and the cost differential is now around 10%.

Major lighting suppliers have standard designs for various levels of play which can prove quite helpful. Caution should be exercised before adopting an indicative layout as site specific issues such as spill light and glare-to-light sensitive locations are not usually considered with such designs.

Be aware that all lights lose brightness over time due to the gradual reduction in lamp efficiency and the accumulation of dirt and dust on fittings. A 'light loss factor' should be incorporated into designs to compensate for this.

Lighting constructed with an Ingress Protection rating of 'IP6x' results in improved maintenance benefits and helps reduce costs through the ability to apply higher 'light loss factor' allowances. Increased performance is also sometimes claimed through the use of special lamps or lamps with higher light output. It is important that factors such as cost and potential lamp availability limitations are carefully weighed against other claimed benefits of the lamps. It is best that a consistent make and model of lamp is chosen for ease of maintenance and re-aiming at a later date.

TIPS & SUGGESTIONS

- **Avoid relying on standard designs without seeking advice from qualified persons concerning site specific issues such as spill light and glare to light sensitive locations.**
- **Ensure a 'light loss factor' is incorporated into designs to compensate for a loss of lamp brightness over time.**
- **Use a consistent lamp make and model for ease of maintenance and re-aiming at a later date. Consider designs having an IP6x classification to improve 'light loss factor' i.e. permit use of a higher factor.**

Pole Height

Guidelines for Pole Height and Location are given in the Australian Standard (AS2560.2.3).

Minimum pole heights depend on whether a side pole or corner pole design is being used. The height depends on the distance from centre of the pitch to the base of the pole location. For amateur competition, required pole height can be estimated by multiplying 0.36 by the distance from centre of ground to the base of the pole location.

Layout and Pole Locations

The recommended zones for the location of floodlight poles are available in the standards (AS 2560.2.3). The standard identifies placements for corner and side pole designs with four and six pole designs.

The standard recommends a side pole system with a minimum of two poles per side. The standard also recommends that for side pole systems no poles be located behind the goals or within the arc 10 degrees front and back of the goal line i.e. to avoid lights in the vicinity of the corners of the play area.

Similar considerations apply to corner pole designs. Refer to the Australian Standards for further information and diagrams. The standard requires poles to be located behind the boundary fence, where one exists, or at least 5m outside the Principal Playing Area.

Pole location and height is also affected if multiple adjoining pitches require lighting and where pitches will be multi-use (i.e. sharing with cricket or Australian Rules).

Access and clearances to reach the lights for maintenance purposes (e.g. by crane) should also be considered when planning the pole locations. Start with an accurate survey plan. This will ensure pole locations can be accurately positioned.

TIPS & SUGGESTIONS

- **Consult the Australian Lighting Standard AS 2560.2.3 for recommended zones for the location of poles.**
- **Be aware of the minimum 5m clearances set out in the Australian Standards from the edge of the principal playing area (i.e. line marked boundary) when planning the ground lighting layout and pole positions.**
- **Geotechnical advice should be sought at light pole locations to establish correct foundation requirements. This will help flag increased foundation costs at the planning stage of the project.**

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Side Pole Design

Consider a football pitch 105m long x 68m wide with a 5m run-off zone. The closest position for poles at the side of the pitch to ground centre (goal to goal centre line) allowing for foundations (say 1m minimum) = 68/2 (half the pitch width) + 5m (Runoff) + Foundation (1m) = 40m. 40m x 0.36 = 14.4m.

Therefore, a 15m pole could be used in theory, but in practice poles at 18m are encouraged for side pole designs as a general minimum to address other technical criteria such as the uniformity and glare rating requirements of the standard.

Corner Pole Design

Consider the same football pitch 105m long x 68m wide with a 5m minimum runoff zone. With the corner poles located as per the Australian Standard, the nearest location a pole can be situated is 15 degrees back from the goal line (angle from centre goal) and 5 degrees back from the sideline (angle back from halfway line).

Calculation indicates this distance to be a minimum of 77.6m. At this distance the pole would be well clear of the run off clearances and so could be a minimum practical distance.

TIPS & SUGGESTIONS

- **Refer to AS 2560.2.3 for recommended pole heights.**
- **Manage the Risk. Check relevant 'conditions of use' and insurance matters before proceeding to install poles of inadequate height which may not to comply with the Australian Standard.**
- **Establish the highest level of play that the facility will be used 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.**
- **Consider how the light fittings will be maintained. Be aware that a higher pole height may result in a higher cost of hiring equipment to undertake cleaning and maintenance. Ensure safe access can be obtained for routine lamp maintenance.**
- **Typically, allow 3-4 months for pole supply and delivery.**

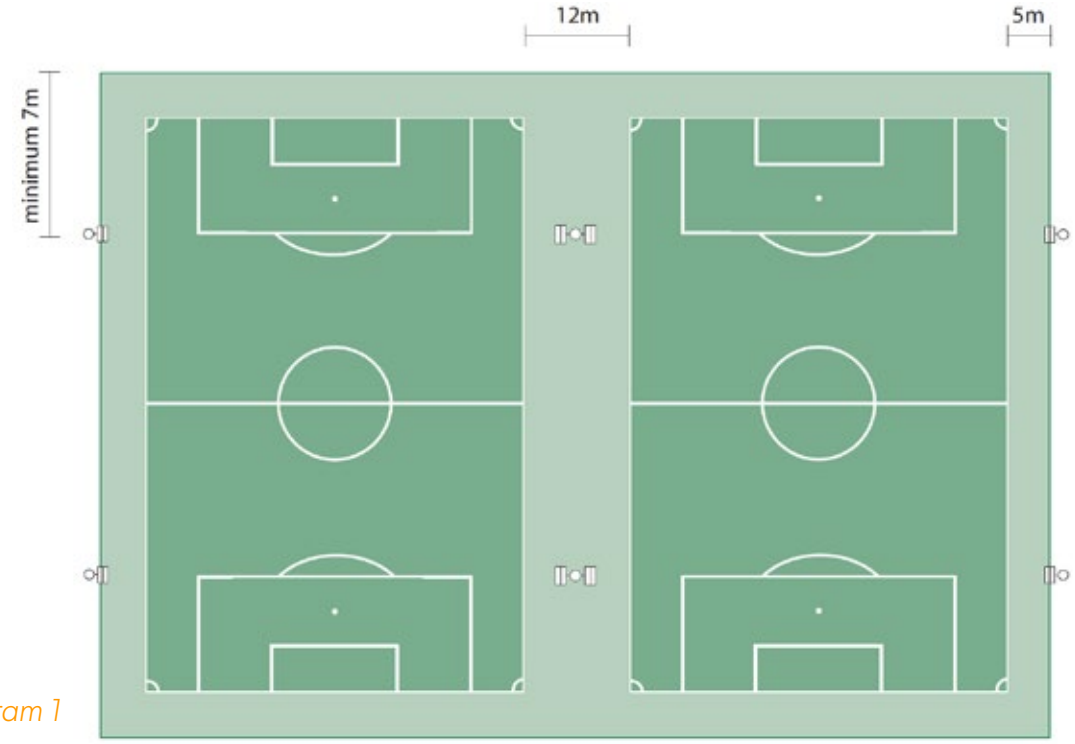

Diagram 1

Pole height then becomes 77.6m x 0.36 = 27.9m. Therefore, a 28m pole would be the minimum for this size ground.

Many clubs funding new floodlighting installations are tempted to install lower height poles than those recommended in the Australian Standard to reduce cost. Often side poles can be seen in the range of 12-15m instead of the 18m+ height recommended. This approach may not comply with the Australian Standard (AS 2560) as the uniformity and illuminance standards are not met with the lower pole heights.

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 and higher poles which require a larger headframe to support the floodlights. This may result in increased foundation costs.

Multiple Pitches

New venues often seek to establish more than one soccer pitch on a site. The Australian Standard does not consider this aspect specifically and so the following considerations are highlighted.

Pole infrastructure is a major component of lighting costs. Consideration of lighting implications when planning for multiple pitches may minimise the number of poles required and therefore the costs. Diagram 1 shows a side by side pitch arrangement.

This example shows a 5m run off from each pitch's Principle Playing Area and an additional 2m between pitches for placement of light poles.

Aligning the pitches side by side allows optimal placement of four poles in a side lighting design. The two centre poles are common to both pitches given they are correctly placed to light front and back to each pitch.

If a second pitch will be installed sometime in the future, infrastructure capacity (i.e. additional floodlights and cabling) and placement of poles to serve a second pitch should be considered when lighting the first pitch. At semi-professional competition levels this may also result in additional electrical control gear cabinets needing installation next to the centre poles.

Offsetting of Pitches

In order to gain the best use of land on a site, pitches are sometimes offset along their side line as per Figure 2 & 3.

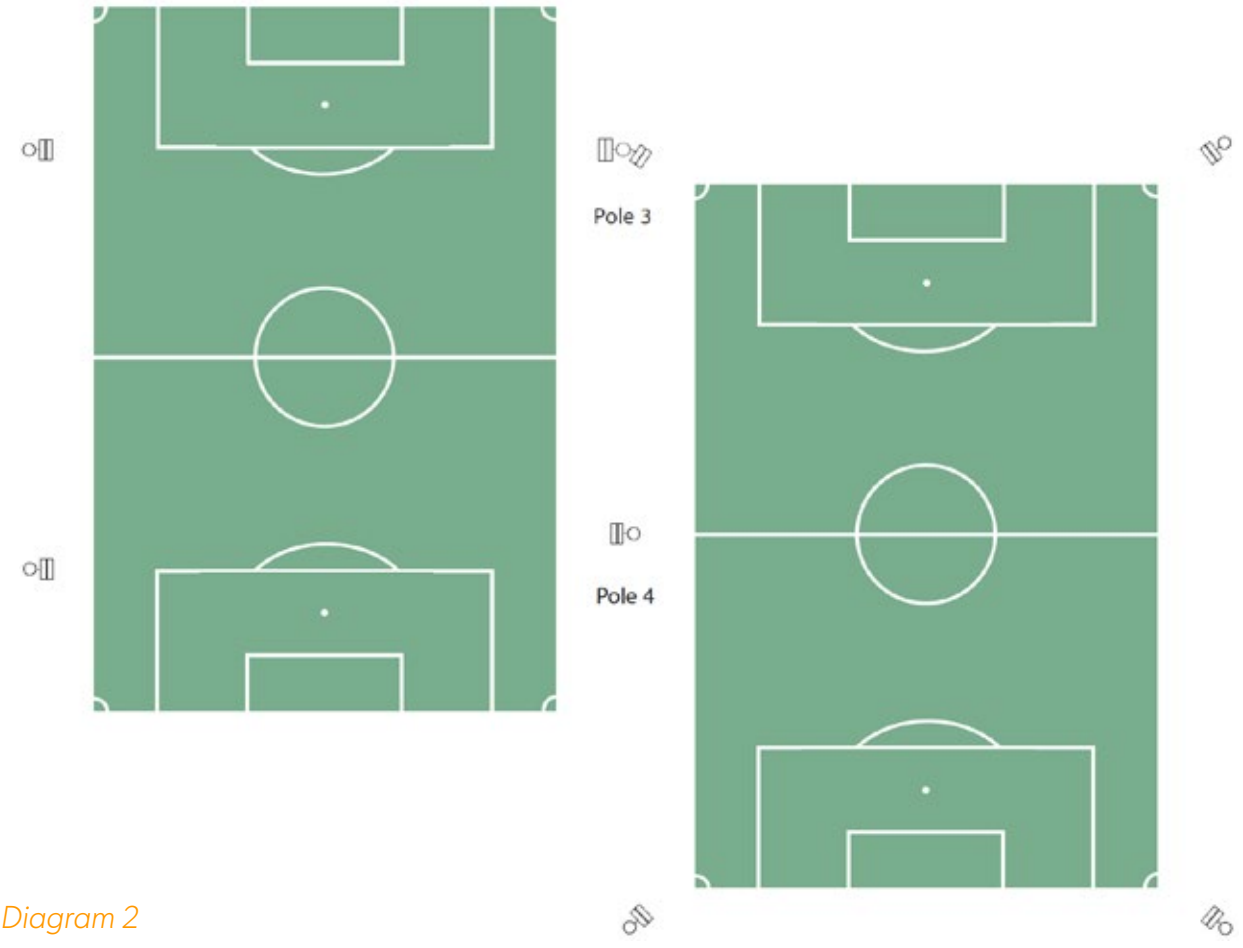

Diagram 2

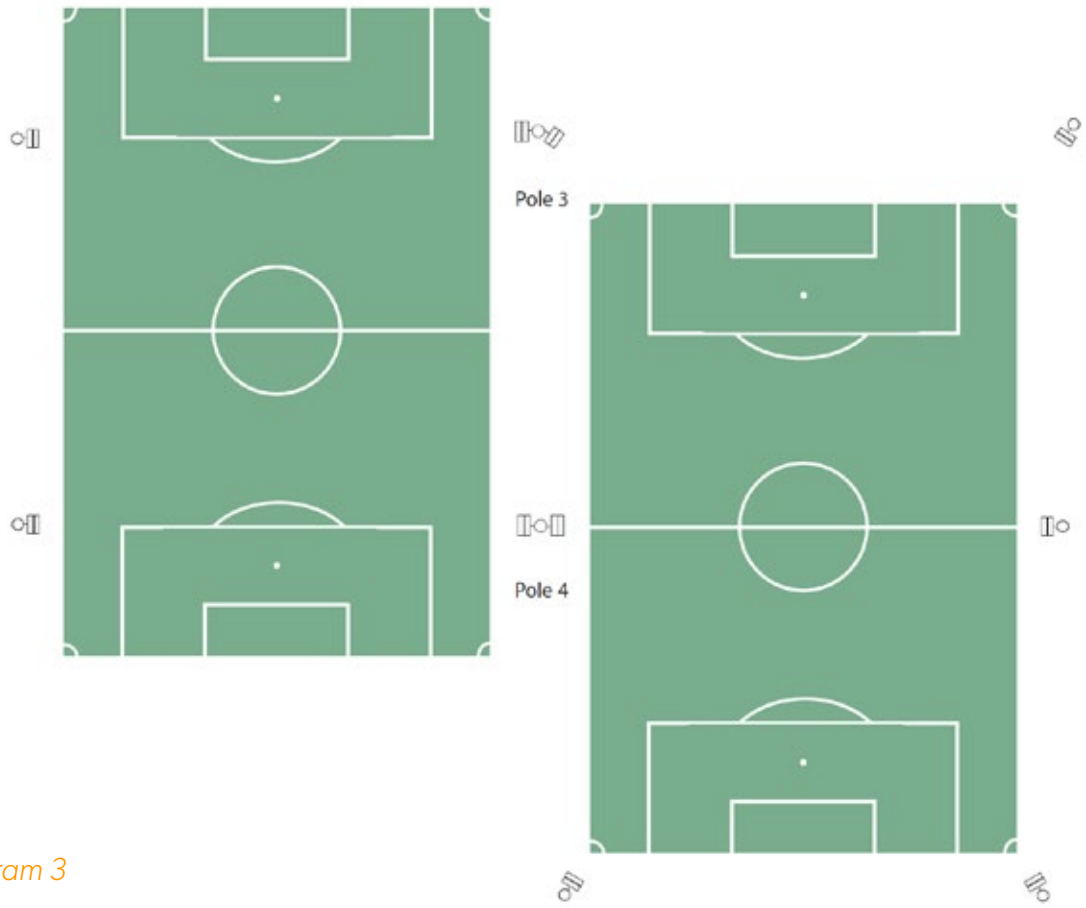

Diagram 3

For floodlighting efficiency, offsetting of pitches is optimal where the offset is no more than 7m. This is because a four-pole side light design will generally look to position poles between 35-42m either side of the halfway line.

Offsetting pitches by more than 7m means an alternative layout for one of the pitches resulting in additional poles. Depending on the offset between pitches solutions could include:

a) Pitch one - A four pole side lighting design and

   Pitch two – A four pole corner design

   This is shown in Diagram 2. Pole three is the only pole utilised to light both pitches.

b) Pitch one – A four pole side lighting design and

   Pitch two – A six pole side lighting design

   This is shown in Diagram 3. Poles three and four are utilised to light both pitches.

Other viable arrangements tailored to the site may be possible, particularly where existing poles are integrated into the layout. Expert advice should always be sought to determine the best approach.

Diagram 2 only requires one extra pole. Care is required to ensure pole three is not placed too close to the corner of pitch two. It should be noted that where pitch one and pitch two are the same size the corner poles for pitch two will need to be higher than the side poles for pitch one.

The design in Diagram 3 appears to have no advantage over Diagram 2 as it requires two extra poles. However, its main advantage is that all poles in this design could be kept to the same, and lower, height for both pitches. This may be preferred for design appearance.

TIPS & SUGGESTIONS

- **Keep multiple pitches aligned where possible.**
- **Allow space between pitches additional to the run off zones for pole placement and ensure sufficient room for maintenance access.**
- **If a second pitch is likely to be developed in the future, ensure the poles placed closest to the future pitch are suitable for the floodlights and electrical supply for the current and future pitch.**
- **If offsetting pitches, try to minimise the offset. Less than 7m is best.**
- **Consider the relative merits of four pole corner and six pole side lighting designs.**

Multi-use Sports Field

Multi-use sports fields are becoming more common when there is limited opportunity to build new pitches due to available open space and/or budget restrictions. They provide an opportunity to maximise use of the facility along with associated infrastructure such as lighting.

Designing to accommodate multi-use is therefore expected to factor increasingly into future designs. Common examples include football pitches being overlayed onto ovals used for other sports, most commonly Australian Rules and cricket. An increasingly common application is the location of two side by side pitches onto an Australian Rules or cricket oval. This layout is shown in Diagram 4.

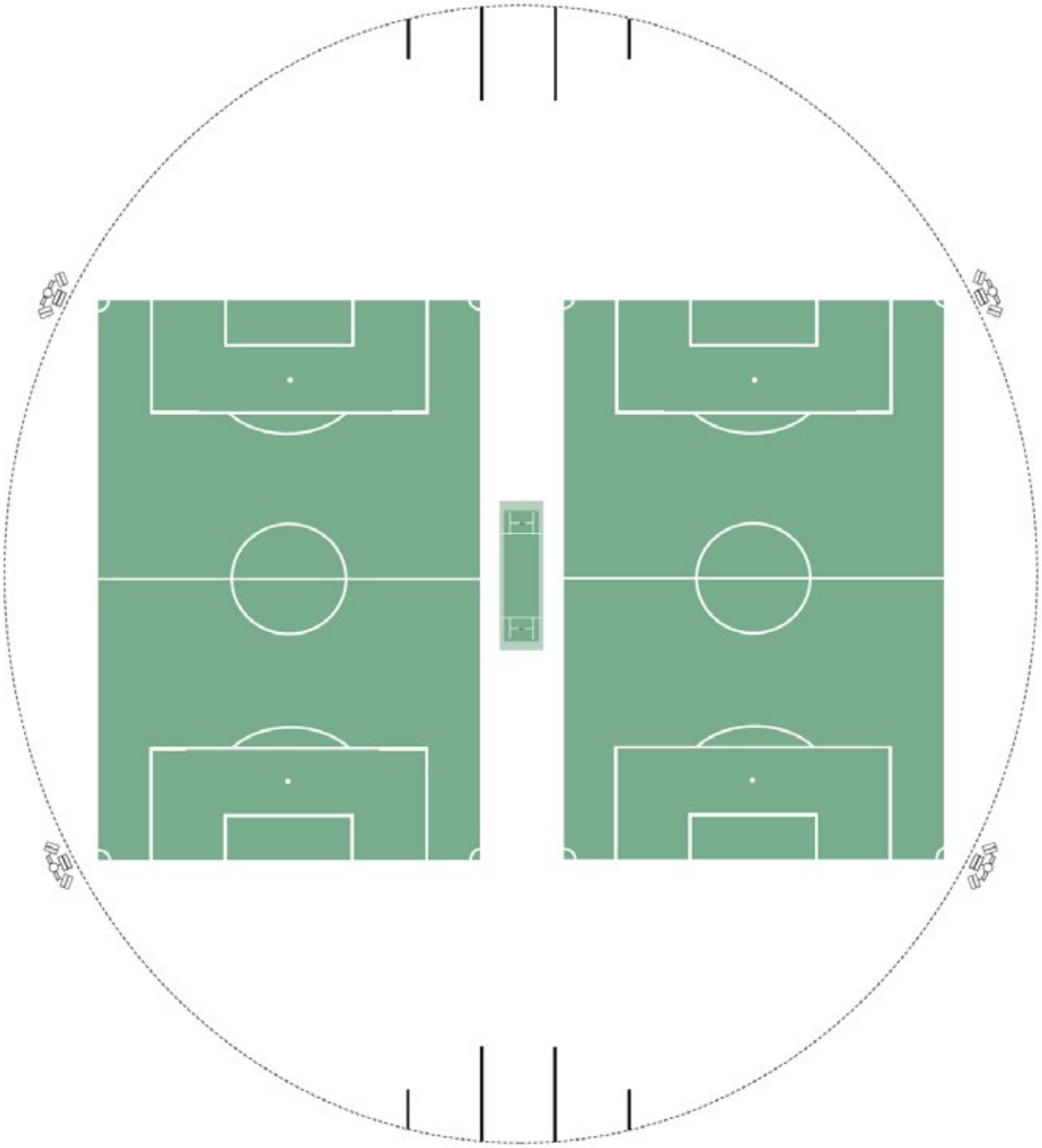

Diagram 4

The following issues should be considered during the design process:

a) Reconciling the pole locations to suit both codes. Field sizes vary so there are no uniform rules. Often pole locations for Australian Rules can be reconciled at or near the corresponding locations required for soccer using a standard four pole Australian Rules lighting design as shown in Diagram 4.

b) Due to the multi-use nature of the field, poles cannot be located in between pitches. Therefore, a corner pole design will more commonly be used and poles will typically be the same height as those used for Australian Rules (i.e. typically 25 - 30m).

c) The increased pole height and greater floodlight quantities associated with lighting an Australian Rules oval compared to a football pitch should be considered. This is due to the larger Principle Playing Area for Australian Rules.

d) It is not possible to light only one of the soccer pitches as is the case when poles are positioned between pitches. Newer venues accommodating the growth of rugby codes will also see multi-use lighting opportunities with football having virtually the same lighting standards, levels and pitch sizes.

TIPS & SUGGESTIONS

- **Design to incorporate multi-use where possible (e.g. football and cricket, Australian rules and rugby codes.**

FOOTBALL QUEENSLAND

Checklist

Prior to undertaking a football lighting project, ensure that you:

- ❑ Discuss the project proposal in detail with your local council planning and recreation departments and your state sporting association/peak sporting body.
- ❑ Agree on the intended purpose of the lights with all user groups including the anticipated costs and maintenance considerations.
- ❑ Select the appropriate type of floodlight for the intended purpose now and in the future. Consider if it is for training or competition and at what level.
- ❑ Seek advice from qualified persons concerning any site-specific installation issues and advice on designs and quotes.
- ❑ Obtain the necessary planning and building permits (where applicable).
- ❑ Approach the electrical company in your area responsible for providing power to the site. Ensure power supply is sufficient for lighting requirements.
- ❑ Identify appropriate height, type and location of poles with consideration of lighting additional fields in the future.
- ❑ Consider how the light fittings will be controlled, maintained and ensure safe access can be obtained for routine lamp maintenance.
- ❑ Consider whole-of-life costing including operation, maintenance and replacement.

Reference and Links

Australian Standard – Sports Lighting AS 2560.2.3 – 2007

Football Queensland: www.footballqueensland.com.au

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