From inception to installation
– Guidance notes for clubs considering artificial lighting for football.

Introduction

Floodlighting plays an important role in the delivery of football across several key areas of the game. It is a key requirement for clubs within the National League System and is also essential on Artificial Grass Pitches to ensure extended community use which allows for increased hours of play and football outcomes. This in turn assists in increasing revenues and improving sustainability of the facility. The purpose of this document is to guide clubs on the successful installation of artificial lighting for football. There are some key issues with regards to the development of sites with floodlights and these include planning, health and safety, costs – both installation and running costs, maintenance and achieving the required lux levels for the planned activities. This document highlights the main issues in relation to floodlighting for football, identifying key areas for floodlight implementation. The document contains a process chart outlining the key areas that will need to be considered when developing a project involving floodlights. It discusses the appointment of lighting consultants, design and technical considerations, maintenance and potential issues relating to planning. Indicative costs are included as an outline guide for organisations when undertaking an early assessment of the financial viability of a floodlighting scheme.

Grass Pitches – Competitive matches

Clubs wishing to compete in FA competitions and in the National League System must achieve the required standard relevant to the level of competition. They must obtain an approved Floodlighting Survey Chart and a Floodlighting Inspection Report in order for a club to be accepted for entry into a competition. See Maintenance & Testing section. Leagues sanctioned by The Football Association or County Football Association may also operate a floodlighting standard. If a League sets a standard below that set by The Football Association, Clubs must still comply with The Football Association's minimum standards if they are to be accepted into FA Competitions. Similarly, if a League sets a standard higher, then the Club must comply with the League requirement.

A club should check the required floodlighting standard with the league and process required for acceptance to play in that league. As a general guide the table below shows the minimum standards that apply to non- league clubs in the pyramid:

		2010 onwards		
	Ground Grade / Step	Eave	Emin	Emin / Emax
Conference	Grade A (Step 1)	250 lux	100 lux	0.25
Conference N & S	Grade B (Step 2)	180 lux	100 lux	0.25
	Grade C (Step 3)	120 lux / 180 lux (new)*	n/a	0.25
	Grade D (Step 4)	120 lux / 180 lux (new)*		
	Grade E (Step 5 – 4)	120 lux / 180 lux (new)*	n/a	0.25
	Grade F (Step 5)	120 lux / 180 lux (new)*	n/a	0.25
	Grade G (Step 6)	120 lux / 180 lux (new)*	n/a	0.25

*120 lux refers to existing systems, any upgrades or new installations should achieve 180 lux

Please click here for FA Competition criteria for the current season.

Please note lighting for clubs in the professional game or for televised matches are not covered in this guidance brief.

Grass Community Pitches & Training

Installation of floodlights on Community grass pitches tends to result in overuse and subsequently pitches that are not fit for purpose. As such floodlight installations on community grass pitches are not encouraged. On average, a well maintained grass pitch should have a carrying capacity of about five to six hours of weekly use, depending on local conditions. The implementation of floodlights on such pitches will in most cases have a detrimental affect on the playing qualities of the pitch surface. This will require increased maintenance and therefore additional expense. It is therefore vital that organisations assess the intended use of the proposed pitch and assess the cost of implementing

floodlights against any increase in outputs/income from the site when reviewed against available budgets for additional maintenance.

However it is recognised that not all clubs have access to appropriate artificial grass pitches and that in some cases the use of floodlights for training on separate training areas can help reduce the pressure on the main playing pitches. The recommended lux levels for a training pitch is 120 lux.

Artificial Grass Pitches

Artificial Grass Pitches (AGP) are designed to accommodate extended usage often up to 85 hours a week. This is the minimum for project funded by The Football Foundation. However local planning restrictions may affect these timings. Projects involving AGP construction generally incorporate floodlights as part of the design for the overall project since floodlighting is required to maximise the use and improve the economic sustainability of artificial grass pitches. Lighting of full size pitches is normally achieved by 2 or 3 lamps mounted onto normally an 8 column system which is positioned along the side of the pitch and outside of the fence-line. Typically 8 columns, fifteen or sixteen metres high, are used. These should be switchable so that segments of the pitch can be lit independently. As many league and cup competitions specify the minimum level of lighting they require, it will be necessary to determine the competitions that the teams using the pitch will compete in and alter the design accordingly. Where no requirements are stated the minimum levels of performance should be in accordance with FIFA's Class II which for 11 a side football is a minimum maintained average illumination of 200 lux. To minimise running costs and for flexibility of use, the lighting system should allow part illumination of the pitch (half pitch and/or thirds) and a lower level of lighting for training which is a minimum maintained average illumination of 120 lux. Typically artificial grass pitches are designed for multi sport use and so do consider the needs of all priority sports users.

Project Process for Floodlighting Installation – (consider funding and planning issues)

Stage	Actions
Stage 1 **Project Inception**	• Scope out project brief and demonstrate the need for floodlights • Consult with key stakeholders (league, proposed users, local authority planners, County FA) • Determine floodlighting standards required for level of competition • Identify planned use, time and hours of use per week.

	• Engage with lighting specialist for initial consultation and determine outline feasibility • Outline Budget (capital & revenue) • Risks – Unsecured finance, planning challenges

Stage 2 **Feasibility**	• Appoint an accredited lighting consultant • Conduct electrical surveys to assess power supply (your appointed lighting consultant can provide assistance) • Hold informal talks with LA planning department • Design feasibility –explore viable options (advantages/disadvantages)

Stage 3 **Outline proposals & Scheme Design**	• Engage with lighting specialist to produce schematics, layouts and specification • Actively engage and consult with local residents, particularly those most affected by the scheme • Obtain budget estimates, review funding • Submit Planning application

Stage 4 **Procurement**	• Select & appoint contractors (where required & appropriate)

Stage 5 **Construction plans**	• Site preparation • Supply and installation of floodlights • Testing
Stage 6 **Completion**	• Sign off • Illumination & electrical certification

Stage 7 **Maintenance**	• Annual general maintenance (in accordance with manufacturer guidelines) • Bi annual electrical & illumination certification

Appointment of Lighting Consultants

The early appointment of an accredited lighting consultant (see design section) is critical to the success of your project. Clubs must seek the expertise of an 'approved' electrical or lighting engineering contractor. An 'approved' contractor is one which is in possession of the NICEIC (National Inspection Council for Electrical Installation Contracting) Approved Contractor's award; ISO 9000/BS5750 (International Standards Organisation/British Standard) or a qualified lighting engineer and member of the Institute of Lighting Professionals. A lighting specialist will guide you through all aspects of your project including feasibility, design, planning, installation and maintenance.

Before appointing lighting consultant/companies it is important to scope out the project brief, establishing clear requirements and identifying any known constraints. Some of the key requirements to consider are;

- Outline project objectives
- Justification of need, existing and planned weekly hours of use & when and level of play and required floodlighting criteria in your league.
- Site/pitch details including site map with boundaries if available.
- Critical date for completion (if known)
- Budget – capital & revenue secured and unsecured.
- Risks – Finance, planning

A template project brief attached at appendix A and programme of use template at appendix B.

Design and Technical Considerations

Ensuring that an appropriate feasibility study and design specification is prepared by a suitable specialist in line with the club and league requirements will limit any issues and unnecessary expense. Floodlights must be designed and installed by qualified professionals as highlighted above. When designing a floodlighting system, it is important that an assessment of the available power supply is made to determine if adequate capacity is on hand as bringing a new supply to site can increase costs dramatically. See costs section. The total installed power requirements for an eleven-a-side pitch is likely to be in the order of 35 to 40 kilowatts. Equally it is important to consider that

long term power supply needs not only include playing areas but also other ancillary facilities on site as this may dictate the capacity of incoming power and the installation plan. Annual energy costs should be evaluated from one supplier to the next and budgeted in the clubs business plan so that the long term annual costs are achievable from the outset.

Lighting requirements

Lighting should provide uniform illumination over the pitch appropriate for the proposed grade of play. Lighting requirements are dictated by good, safe and stable visual conditions for players and viewing requirements of spectators. Particular attention should be paid to providing low glare and uniform lighting within goalmouth areas to ensure good viewing conditions for goalkeepers. Equally consideration needs to be taken to limit the visual obstruction of the match for spectators wherever possible. Access for installation, maintenance, budget (capital and ongoing maintenance and energy costs) and potential planning challenges are among but not limited to the additional considerations when designing floodlighting installations that meet a clubs needs.

Columns

The number of columns is dictated by your needs and the site conditions. The required and future lighting levels, the visual impact of columns, minimising light spillage, clubhouse and spectator locations are part of the consideration when designing the right model for your club. Particular attention should be taken to ensure player safety and therefore no lighting structures should be placed within 5m of the side lines or goal lines. Furthermore, care should be taken to ensure that the structures do not obstruct the sightlines of spectators and spectator walkways.

Specialist sports lighting manufacturers have developed a range of products to meet the needs of football clubs. These include fixed masts, raising and lowering of masts and telescopic masts designed to meet different needs and budgets. Telescopic masts whilst more expensive, are often used in sensitive locations and can solve planning issues where the visual intrusion of columns is a concern, however the operator must take into account the extra time required to raise and lower the columns. Other factors may also include supply costs and access both installation and on going maintenance. We would advise clubs to conduct a simply analysis of the pro's and cons of the solution options available to them.

Design solutions

Typically eight, six or four columns of between 15m to 18m in height are used for grass pitches suitable for FA competitions and National League System.

Show 2 illustrations of Steps 2 – 7 illustration and Conference illustration

Modern lamp technology and designs have significantly improved the efficiency of lighting systems by as much as 30% when compared with older installations and helping to reduce light pollution as result. The FIFA – Guide to the artificial lighting of football pitches & Sport England Artificial Sports Lighting guidance documents, contains more detailed information about the design and technology used for artificial sports lighting.

It is vitally important the club thinks about how and when they plan to use the lights. This will influence the designs. For example remote switches will allow the club to switch the lights on/off from an accessible source usually the club house particularly useful on dark winter evenings. Variable switches will allow the club to illuminate parts of the pitch they wish to use, particularly useful for training and managing/rotating pitch use. Furthermore there are often practical solutions to other site issues. For example the columns can provide electrical sockets to parts of the ground that previously been unable to reach, brackets can be mounted for tanoys/public address systems, lights for spectator areas/footpaths or training areas.

Planning Permission

Before submitting a planning application for floodlights, consultation with the local planning department is recommended. Planners will also advise of other organisations to consult with (e.g Environmental Health) so that the level of information can be confirmed before an application is made. An accurate assessment of the proposed usage is useful when discussing floodlighting plans (See appendix B).

When submitting a planning application for floodlights the planning authority is likely to require a lighting spillage drawing showing the levels of light pollution and their impact on the surrounding neighbourhood and their properties. Lighting engineers or specialist lighting contractors can provide such plots and in many cases handle the planning application. Consideration needs to be given to the visibility of the lighting columns and pitch location in relation to nearby residential properties. Recent guidance has suggested that there should be a **minimum of 65m** from the perimeter of the

pitch to the nearest residential building and not garden boundaries. However there are plenty of floodlit facilities that operate under this distance. The use of soil bunding and tree-planting can significantly reduce noise levels and visual impact of columns. When constructing new pitches consideration should be given to its orientation and site location avoiding sensitive planning issues wherever possible. It is advisable to research the impact of other similar local floodlit facilities so that a strong justification can be put forward to outweigh any concerns.

Consideration also needs to be taken regarding the hours and pattern of use. For example, An Artificial Grass Pitch funded through the Football Foundation will be required to make available 85 hours of weekly use. Failure to consider these issues may lead to planning challenges, therefore early consultation with Local Authority planning departments are strongly recommended to discuss the issues you may face. Furthermore engage residents that might be affected by your scheme early on and actively respond to their views and concerns. It might be possible to negotiate longer winter evening use in return for shorter summer use when residents will be using their gardens.

On receiving planning consent, often conditions are attached it is therefore vital that the club fully understand the impact of these conditions on your ability to deliver your activities and strictly adhere to these conditions to protect future use. For example a planning authority might limit the number of floodlit matches for a grass pitch per week due to the impact on neighbouring properties. A facility operator must be careful to ensure that the business case for the floodlights takes into account these restrictions.

Construction programming & Payment schedules

The optimal time to complete works is outside of the winter playing season usually in the spring and summer periods (March to Sept). The winter months are usually avoided due to the trench and reinstatement work required around the pitch. Typically, for a new installation, the construction period is 5 – 6 weeks. This consists of up to 2 weeks to complete the trench, cabling and foundation works. Then a period of 2 weeks to allow the foundations to cure and then a further 2 weeks for installation and final certification of use. Appendix C shows an example on site checklist that a contractor would carry out prior to starting works. The checklist also includes the client's responsibility.

Clubs should discuss and agree the payment schedule up front and on appointment of the contractor. Usually a lighting contractor will expect an up front deposit payment, payment on part

completion and further payment on certificated completion/handover. Often contractors are open to negotiating depending upon your cash flow situation. The club needs to be fully appraised of all the costs relating to the scheme and your responsibilities and commitments. See costs section.

Maintenance & Testing

Following installation or re-lamping a lighting system will normally suffer an initial deterioration in lighting performance, typically in the order of 15% to 25%. Regular maintenance will help reduce any deterioration and thereby extend the life of bulbs, lamps and columns. Failure to carry out general maintenance in accordance with manufacturer guidelines will result in a declining performance system, can affect warranty and ultimately leads to a system that is deemed unsafe.

Routine maintenance including cleaning of lamp glass, realignment and lamp replacement should be carried out in accordance with manufacturer guidelines. Often clubs can combine this with other contractual maintenance operations on site minimising costs and manpower. Items such as lamp replacement are sometimes covered under the manufacturer's warranty and in these instances will represent a significant cost saving for the club. It is vital that clubs have written confirmation of maintenance obligations.

Bi -annual maintenance should include electrical testing, illumination testing and certification. Clubs competing in the National League System are required to provide an updated certification (Floodlighting Survey Chart & Floodlighting Inspection report, see appendix D) every two years. These are necessary to ensure the lighting system continues to meet the required standards after installation. Readings shall be on a grid of 88 markings (8 across, 11 down) evenly spaced with the outside readings falling on the pitch boundary line. The average of all the readings is taken to be the average illumination level in lux of the floodlighting installation. Often lighting companies that design and install the floodlights offer a range of maintenance options and can include the bi annual testing as part of the service at a cost. The inspection reports should be carried out by qualified lighting engineers. The measurements should be made using a calibrated luminance meter. It should have been calibrated with 12 months of the measurement and the meter's serial number and last calibration date contained within the inspection report.

Costs

It is important to consider all costs related to a floodlighting project including capital spend, revenue and lifecycle costs. Capital expenditure not only includes the floodlighting contract and installation but also professional fees, planning fees and any connection or supply charges. Typically a new FA entry level match competition standard floodlighting installation of six masts (2 floodlights on each mast) 180 lux will cost in the region of £35,000. For 250 lux on an eight mast system (3 floodlights on each mast) will cost in the region of £50,000. Training lights at 75 - 100 lux on 4 masts (2 floodlights on each mast) will cost in the region of £30,000. These discussions should take place with your approved lighting consultant as indicated above at stage 3.

Clubs should seek guidance at the feasibility stage regarding revenue costs including energy supply, maintenance and replacement costs and budget accordingly. Your current energy supplier should be able to provide an estimate based on your proposed usage timetable. It is advisable to obtain an indicative maintenance budget for the proposed scheme during the design stages of the project. An example formula of calculating cost of ownership can be found at Appendix E.

A typical floodlighting system will have a life span of between 20 & 25 years before full replacement. It is strongly recommended that clubs consider the replacement costs (sinking fund) and budget accordingly for such eventualities.

Glossary of Terms

Term	Symbol	Explanation
Illuminance	E	The quantity of light falling on a surface is termed illuminance ('E')
	E.ave	The average horizontal illuminance as a result of either calculation or measurement
	E. min	Minimum pitch illuminance on a surface at a specific point.
Illuminance Uniformity	E min / E max	
Lux		The measurement of light. The unit of illuminance lumen/m2, incident on a pitch surface. 1 Lux = 1 Lumen/m2

Appendices

Appendix A	**Project Brief Template**
Appendix B	**Programme of Use Template**
Appendix C	**An example on site check list**
Appendix D	**Floodlighting Survey Chart & Floodlighting Inspection report**
Appendix E	**Cost of Ownership Calculation Formula template**

Reference

FA competition rule book – season 2009 – 2010 FA floodlighting regulations

FA AGP Guidance notes - Floodlighting

AGP Guidance – FF Technical sheets

FA Football Facilities in Schools

FIFA – Guide to the artificial lighting of football pitches

Sport England Artificial Sports Lighting – updated guidance for 2011