

Heron Eccles Playing Fields

Creation of 3G Artificial Grass Pitches (AGP)

Lighting Assessment

Client	Liverpool City Council		
Project	Creation of a 3G Artificial Grass Pitches (AGP)		
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1. Introduction

This lighting assessment is required to establish whether new artificial (flood) lighting associated with the proposed 3G Artificial Grass Pitch (AGP) satisfies the requirements of national and local development plan policies and supplementary planning guidance.

The following considerations have been applied to this statement:

- Why the lighting is required
- Proposed frequency of use, and the hours of illumination
- Site plan showing the area to be lit relative to the surrounding area
- Details of the number, location and height of the proposed lighting columns or other fixtures
- Type, number, mounting height and alignment of the luminaires
- Beam angles and upward waste light ratio for each light
- Isolux diagram showing the predicted illuminance levels at critical locations on the boundary of the site and where the site abuts residential properties or the public highway
- Percentage increase in luminance and the predicted illuminance in the vertical plane (in lux) at key points

Reference documents to be read with this statement include:

Drawing	
SSL1989 02	ATP Floodlighting Scheme
Appendices	
A	Floodlighting Performance Results
B	MHN-FC 2000W
C	ILP 2011 (Guidance Notes for the Reduction of Obtrusive Light GN01:2011)
D	Optivision Luminaire
E	15m Floodlight Mast

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2. The Proposal

2.1 The proposed development will include the creation of new external sports pitches with associated features including:

- 3G Artificial Grass Pitch (AGP)
- Erection of perimeter ball-stop fencing
- Installation of hard standing areas around the AGP for pedestrians, maintenance and emergency access
- **Installation of an artificial (flood) lighting system**
- Installation of outdoor store for maintenance equipment

2.2 The proposed development is situated at Heron Eccles Playing Fields.



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3. Frequency of use / Hours of Illumination

The proposed artificial (flood) lighting systems will be operated during evenings of permitted use, after dusk and up to the approved curfew hour. The permitted out of hours of use of the facility will be determined through the planning application process and the applicant wishes to accommodate hours of use in order to maximise football developmental outcomes; both during the day and during evenings and at weekends via pre-arranged and structured community access.

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4. Floodlighting Proposal

The artificial (flood) lighting proposal includes the following details:

Requirement	Detail provided
The precise location of the pitch, which should take account of the light spill given its proximity to, for example, any highway and any nearby residential properties.	Please refer to Appendix A Floodlighting Performance Results
The types of sport to be played on the pitch and the standard of play - both of which will have an influence on the amount of illumination required.	<p>The type of sports activities associated with the 3G Artificial Grass Pitch (AGP) include:</p> <p>Over 18 and Adult Football Youth U11 / U12 Football Mini Soccer U9 / U10 Mini Soccer U7 / U8 Training Areas</p> <p>The standard of rugby and football activities includes FA affiliated junior / youth football (highest level of competition).</p>
Details of columns – number, height and finish.	<p>The proposed floodlight system comprises 14no. octagonal steel masts with galvanised (brushed silver) finish, mid-hinged.</p> <p>15m high masts are tapered with a 346mm diameter shaft at the base and 102mm diameter shaft to the column top.</p> <p>Please refer to Appendix E 15m Floodlight Mast.</p>
Details of luminaires – number, types, dimensions, finish and output of lamps fitted, to include manufacturer's technical information.	<p>48no. Philips asymmetrical Optivision luminaires sized:</p> <ul style="list-style-type: none"> 386mm high 352mm long 237mm wide <p>Please refer to Appendix D Optivision Luminaire.</p>
Details of any cowls/hoods/shades/baffles that maybe needed to control light spill and glare – number, dimensions and finish.	<p>All luminaires have a zero upward light ration with the use of additional accessories (rear louvres) to limit overspill.</p> <p>Please refer to Appendix D Philips Optivision Louvre</p> <p>The proposed vertical alignment of luminaires is a maximum 4° above the horizontal plane.</p>
Plan showing pitch with the location/position of lighting columns and luminaires.	Please refer to drawing SSL1989 02 Floodlighting Scheme and Appendix A Floodlighting Performance Results, showing results of horizontal and vertical illuminance over the performance areas and spillage exceeding the facility perimeters.
Details of lighting set up – horizontal (rotation) and vertical (tilt) alignment of the luminaires, also to be shown on plan and elevation drawings.	Please refer to Appendix A Floodlighting Performance Results
Details of lighting output, including levels of surface luminance on the pitch and overspill, i.e. off the pitch (manufacturers/supplier's calculations and diagrams should be provided separately and also to be overlaid on an OS base so that the impact on the surrounding area can be assessed).	Please refer to drawing SSL1989 02 Floodlighting Scheme and Appendix A Floodlighting Performance Results.

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5. Design Process

In designing a suitable floodlighting solution for the proposed development, several key specification issues had to be considered. These included the illuminance (Lux) level required, the environmental zone category for the site, the minimum mast height, the number and type of floodlights.

The task of designing the optimum floodlighting and external lighting design was undertaken using specialist design software (CalcuLux Area 7.7.1.0) provided by Philips Lighting.

The details of how site issues were resolved are as follows:

Design Principal

A new lighting system should provide the following lighting standards, in accordance The Football Association (FA) (FIFA Class II) lighting requirements for varying types of play (which is also satisfies Rugby Football Union (RFU) requirements), which is as follows:

Use	Maintained average illuminance	Uniformity (Min / Ave)
Competition	>200Lux	>0.6
Cross Play	>120Lux	>0.6
Training	>120Lux	No requirement

These floodlight systems must be designed in such a way to allow each individual section of the pitch (e.g. lateral cross pitches) to be individually programmed to facilitate economical management and prevent over lighting to pitches areas when not in use.

(Lux level is the intensity of light as measured on a given surface taking into account the area over which the luminous flux is spread. For example, 1000 lumens which is the output of a given light source concentrated into an area of one square metre, would illuminate that square metre to 1000 Lux. If spread over an area of ten square metres, the same 1000 lumens light source would produce a dimmer illuminance of only 100Lux.)

In addition, the lighting system design seeks to comply with complimentary recommendations published within BS EN 12193:2007 Light and lighting. Sports lighting.

BS EN 12193 is the European standard that deals with sports lighting to ensure good visual conditions for players, athletes, referees, spectators and CTV transmission. Its objective is to provide recommendations and specify requirements for good quality sports lighting by:

- Optimising the perception of visual information used during sports events
- Maintaining the level of visual performance
- Providing acceptable visual comfort
- Restricting obtrusive light

BS EN 12193 specifies lighting for indoor and outdoor sports events most practiced in Europe. It provides lighting values for the design and control of sports lighting installations in terms of illuminances, uniformity, glare restriction and colour properties of the light sources.

All the above requirements are meant to be as minimum requirements. It also gives methods by which these values are measured. For the limitation of glare, it also points out restrictions on the location of the luminaires for specific sporting activities.

Environmental Status

The environmental category was established by referring to The Institution of Lighting Professionals (ILP): Guidance Notes for The Reduction of Obtrusive Light GN01:2011. This document categorises the environment into five zones ranging from E0 (Protected) to E4 (City Centres).

The site at Jeffrey Humble Playing Fields would fall into Zone E2, which is rural surrounding with low district brightness, for example a village or relatively dark outer suburban locations.

The ILP design guidance for this environmental zone is as follows:

Table 2: Obtrusive Light Limitations for Exterior Lighting Installations – General Observers					
Sky Glow ULR [Max %]	Light Intrusion (into Windows) Ev [lux]		Luminaire Intensity I [candelas]		Building Luminance Pre-curfew
	Pre curfew	Post curfew	Pre curfew	Post curfew	AverageL [cd/m2]
2.5	5	1	7500	500	5

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For further details of ILP design guidance please refer to Appendix C ILP 2011.

Floodlight Design

In order to meet the requirements of The Institution of Lighting Professionals: Guidance Notes for The Reduction of Obtrusive Light GN01:2011, the floodlighting system chosen uses a flat glass technology.

The solution has been designed to provide lighting specifically for the external sports facilities, which may be controlled accordingly to endeavour to reduce energy consumption and also potential impact on the surrounding environment.

The Philips OptiVision MVP507 is an asymmetric down lighting luminaire that combines compact dimensions with very high efficiency. Available with narrow, medium and wide beams for flexibility in application, it provides excellent control of spill light, glare and upward leakage of light. OptiVision MVP507 can accommodate metal halide lamps for good colour rendering.

Please refer to Appendix D Optivision Luminaire.



Please see the below photographs illustrating a recent installation using the above floodlight:



Mast Design

The mast height was calculated using the method detailed in the CIBSE guide LG4 "Sports Lighting".

This uses angles projected from the centre of the pitch and the touchlines to produce a head frame location zone.

When applied to this project the optimum mast height ranged from 12m to 18m.

A 15m mounting height was chosen for the new 3G Artificial Grass Pitch (AGP), as this will allow all luminaires to be mounted horizontally.

These masts heights will result in low vertical overspill and good uniformity on the playing surface to ensure that artificial lighting:

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- Is directed fully downwards towards the playing pitch surface;
- Avoids sky glow;
- Achieves full cut-off as recommended by The British Astronomical Association's Campaign for Dark Skies.

By contrast, higher columns would require more intensive lighting needed to provide adequate results at ground level and lower column heights would result in a higher aiming angle for every luminaire, resulting in increased overspill and glare.

On this basis, 15m high mounting heights provide the most efficient solution and the proposed masts will offer a slim-line profile, which will minimise daytime impact.

Please refer to Appendix E 15m Floodlight Mast.

Lighting Performance

The lighting proposal is detailed within Appendix A Floodlighting Performance Results Rev01, which shows the mast locations, floodlight orientations, luminance levels on the pitch and projected overspill values.

The design for the 3G Artificial Grass Pitch (AGP) achieves values which meets the requirements of BS EN 12193 as follows:

Period	Property	Result
Initial 100hrs usage	Average illuminance Uniformity	285 Lux 0.61 Min / Ave
Maintained usage incorporating 0.8 maintenance factor	Average illuminance Uniformity	226 Lux 0.61 Min / Ave

All design calculations have been undertaken using an open, unobstructed site.

Design values of overspill will be further reduced by existing mature trees, adjacent buildings or natural screening.

The maintained luminance values for the floodlights are calculated using a maintenance factor of 0.80 to account for environmental conditions and depreciation of light output between cyclical maintenance, including bulk lamp change.

Obtrusive Light Calculation

The closest residential property situated on Greenleigh Road, which is situated approximately 84m from the AGP (to the property boundary); is identified on Appendix A Floodlighting Performance Results, in order to establish obtrusive light calculations.

To this property, light Intrusion (into windows) is calculated at less than 2 Lux at both ground level and at a height of 1.75m above ground level, which is below the pre-curfew 5 Lux threshold for the environmental zone E2.

All floodlights will be extinguished at the permitted curfew time and therefore, light Intrusion (into windows) will be 0 Lux which is below the post-curfew 1 Lux threshold for the environmental zone E2.

To this property, luminaire intensity will be 650 maximum candelas (cd), which is below the pre-curfew 7500 candela threshold for the environmental zone E2.

All floodlights will be extinguished at the permitted curfew time and therefore, luminaire intensity will be 0 candela which is below the post-curfew 500 candela threshold for the environmental zone E2.

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6. Planning Policy Context

Central Government guidance on lighting and planning is contained in the National Planning Policy Framework (NPPF) which came into force in March 2012.

Paragraph 7 of the NPPF defines Sustainable Development, which is the core principle of planning, setting out that there are three dimensions to sustainable development: economic, social and environmental.

Part of the environmental dimension of sustainable development is clearly stated to include contributing to protecting and enhancing our natural, built and historic environment; and, as part of this, helping to minimise pollution.

Pollution is defined within the NPPF as including: "Anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light."

Perhaps most importantly with regard to light pollution, paragraph 125 of the NPPF also states that "By encouraging good design, planning policies and decisions should limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation".

Obtrusive light was made a Statutory Nuisance under the Clean Neighbourhoods and Environment Act 2005. The Council can take action against sources of intrusive light where these are shown to be causing a nuisance, for example a domestic floodlight shining into window in a neighbouring dwelling. In addition, conditions imposed on any planning consent for lighting must ensure that adequate control can be enforced. It is acknowledged that many lighting installations which may cause obtrusive light do not require planning permission or do not fall under the Act as a statutory nuisance.

Existing Situation

The grassed playing field is not illuminated.

Impact on Development

The lighting proposals are detailed proposal drawing, showing mast locations, floodlight orientations, illuminance levels on the pitch and projected overspill values.

The 3G Artificial Grass Pitch (AGP) design achieves a maintained average illuminance value of 226 Lux with 0.61 uniformity in accordance with lighting requirements for varying types of play.

The maintained illuminance values are calculated using a maintenance factor of 0.80. This takes into account light losses due to dirt accumulation on the floodlight front glass and lamp lumen depreciation, ensuring that the minimum requirements for safe play are achieved.

As less than 5 Lux vertical illuminance will be projected towards any residential property windows whilst floodlights are in operation, the proposed lighting systems will exceed the requirements for an environmental zone E2 location.

Luminaire intensity created whilst floodlights are in operation is below the threshold for the environmental zone E2 location.

Upward waste light will also be minimised and with floodlight elevations used 0% will be projected into the atmosphere. This will meet the recommendations of The Campaign For Dark Skies, an organisation who lobby for low light pollution lighting systems

Mitigation Measures

Obtrusive light, whether it keeps you awake through a bedroom window or impedes your view of the sky, is a form of pollution and can be substantially reduced without detriment to the lighting task.

How can I minimise the problem?

- Do not "over" light. This is a major cause of obtrusive light and is a waste of energy. There are published standards for most lighting tasks, adherence to which will help minimise upward reflected light.
- Dim or switch off lights when the task is finished. Generally, a lower level of lighting will suffice to enhance the night time scene than that required for safety and security.
- Use specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. Care should be taken when selecting luminaires to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. Please remember that lamp light output in LUMENS is not the same as lamp wattage and that it is the former which is important in combating the problems of obtrusive light.

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- Consideration also has to be given to the issue of glare. The asymmetric distribution of the floodlights allows for a lower tilt angle from the horizontal, hiding the lamp and therefore reducing glare not only to players and spectators but also to any surrounding residents, motorists and wildlife. The maximum tilt angle for any floodlighting should ideally be no more than 6 degrees from the horizontal plane.

Monitoring Programme

On completion of the installation, the system will be tested and commissioned to ensure design levels are achieved and not exceeded. During the operational life cycle of the system, periodic lighting checks and assessments will be undertaken to ensure the installation continues to satisfy the requirements set out in the lighting design.

These assessments include:

- Lighting Levels to each individual area
- Overspill levels

Robustness of Analysis

Within the design calculations, the use of the model is based on the land being flat and has not taken into account the topographical survey, or any blockages that could have an impact on the lighting plan.

The results provided are the worst case in design format.

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7. Lighting Assessment Conclusion

1. The proposed floodlighting system is specifically designed to fulfill sports lighting requirements and is particularly suited to applications where low light pollution is essential.
2. Performance of the proposed artificial lighting (floodlighting) systems satisfies the intended sporting applications and standards of play.
3. A 15m high mounting height to the 3G Artificial Grass Pitch (AGP) provides the most efficient solution and the proposed masts will offer a slim-line profile, which will minimise daytime impact.
4. The proposed Philips OptiVision MVP507 is an asymmetric down lighting luminaire will provide the optimum sports lighting solution, ensuring that light reaches the sports surface and not into the sky or polluting the environment.
5. Performance of the proposed artificial lighting (floodlighting) system complies with an Environmental Zone E2 (ILP) which is rural surrounding with low district brightness.
6. Light intrusion to the closest residential properties are below the threshold for an E2 environmental zone and as such, does not create an unacceptable impact by way of artificial lighting.
7. Luminaire intensity created whilst floodlights are in operation is below the threshold for the environmental zone E2 location and as such; does not create an unacceptable impact by way of artificial lighting.
8. Upward waste light will also be minimised and with floodlight elevations used 0% will be projected into the atmosphere. This will meet the recommendations of The Campaign For Dark Skies, an organisation who lobby for low light pollution lighting systems
9. Control switches and time clocks shall be installed to the floodlights to ensure they do not remain on any later than the permitted curfew hour and therefore mitigate impact to the surrounding environment.
10. Time clocks will be set to operate within a pre-programmed time including a seasonal changeover facility for BST and GMT.

End of document

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