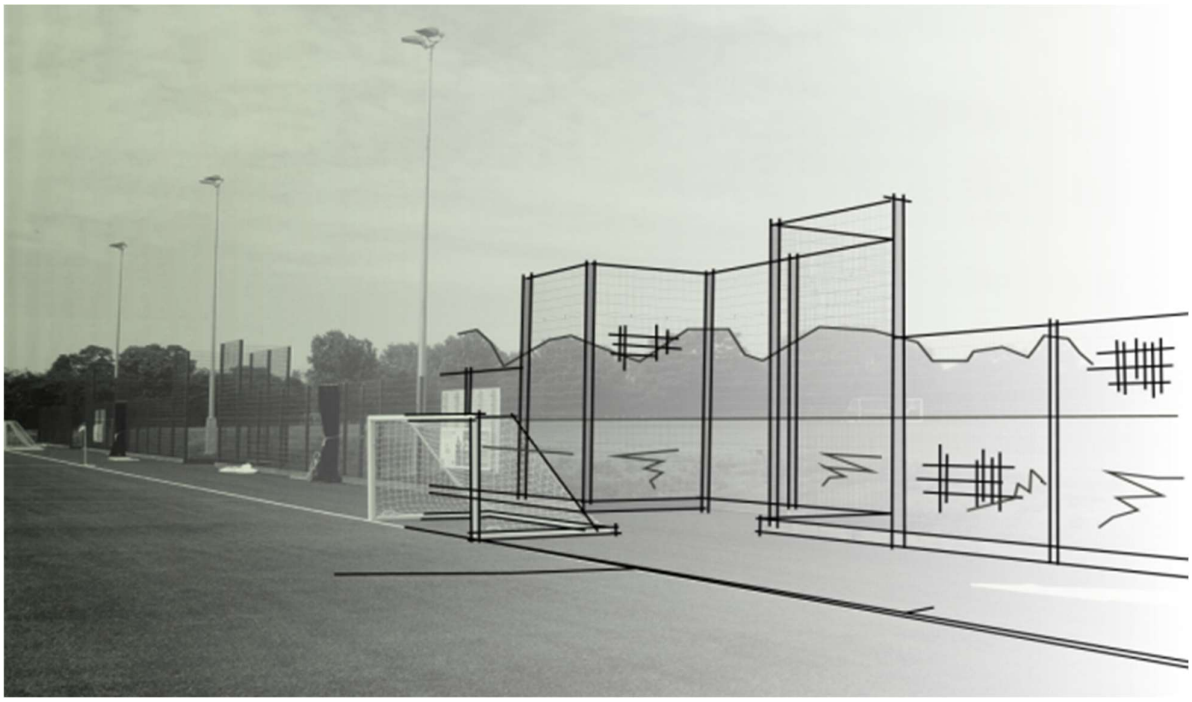
Ryburn Valley High School

Creation of a 3G Artificial Grass Pitch (AGP) with perimeter fencing, hardstanding areas, storage container, floodlights and access pathway

Sports Lighting Statement



Site	Ryburn Valley High School St Peter's Avenue Sowerby Bridge West Yorkshire HX6 1DG		
Project	Creation of a 3G Artificial Grass Pitch (AGP) with perimeter fencing, hardstanding areas, storage container, floodlights and access pathway		
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Sports Lighting Assessment

Sports Lighting Proposal

The proposed Artificial Grass Pitch (AGP) require a sports lighting system to satisfy the necessary and planned usage. The lighting system is vital to ensure that the school, clubs and the local community are able to make use of the facility during the darker winter months, to ensure that training sessions and matches can be safely accommodated.

The proposed sports lighting system will be operated during evenings of permitted use, after dusk and up to the approved curfew hour.

The following hours are proposed for usage of the new AGP.

Monday to Friday: 08:00 to 22:00 hours
Saturday & Sunday: 08:00 to 22:00 hours

The sports lighting hours of usage would be required during these times, but only at the times of the year when daylight is fading or it has gone dark.

The permitted hours of use will be determined through the planning application process and the applicant wishes to accommodate hours of use in order to maximise developmental outcomes; both during the day and during evenings and at weekends for the local clubs or via pre-arranged and structured community access.

The sports lighting proposal includes the following details shown in Table 1:

Table 1 – Lighting system detail

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 Report'. Light spillage does not impact on any local residential properties or highways.
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.	The standard of football activities includes FA affiliated junior / youth football (highest level of competition).
Details of columns – number, height and finish.	The proposed floodlighting system comprises of 6Nr. 13m high steel masts, all finished galvanised (Z275) self-coloured. 13m high masts are tapered with a 346mm diameter shaft at the base and 102mm diameter shaft to the column top.
Details of luminaires – number, types, dimensions, finish and output of lamps fitted, to include manufacturer's technical information.	Philips Optivision LED gen3.5 luminaires to the AGP. The luminaires, manfuactured by Philips Lighting, have been selected as they provide a complete lighting system even for the most complex of areas. They are a high efficiency luminaire with low energy consumption and meet the highest performance standards providing outstanding uniformity. They are also dimmable which provides reduced level lighting options when each pitch is only being used for training purposes. The design of the luminaire allows for a slimine fitting, much less obtrusive than other fittings. Refer to 'Appendix B - LED Floodlight Data Sheet' for technical information and images of the LED's
Details of any cowls/hoods/shades/baffles that maybe needed to control light spill and glare – number, dimensions and finish.	The specific type of luminaire proposed has a zero upward light ratio. The spill limiting technology provided by the Philips Optivision LED gen3.5 luminaire which ensures that we can achieve the controlled spillage levels indicated on the lighting scheme design submitted as part of this application. The lighting system design will comply with recommendations published within ILP Guidance Notes for the Reduction of Obtrusive Light 2021 (Appendix C). On completion of the installation, the system will be tested and commissioned to ensure the LUX levels submitted as part of this application are achieved and not exceeded.
Plan showing the pitch with the location/position of lighting columns and luminaires.	Refer to drawing 'SC105 06 – Floodlighting Scheme', and 'Appendix A - Floodlighting Performance Report', showing results of horizontal and illuminance over the performance areas and spillage exceeding the facility perimeters at ground level and 3m above ground.
Details of lighting set up – horizontal (rotation) and vertical (tilt) alignment of the luminaires	Refer to 'SC105 06 - Proposed Floodlighting Scheme".

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).	Refer to drawing 'SC105 06 - Proposed Floodlighting Scheme" and 'Appendix A - Floodlighting Performance Report'.

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 7.9.0.0) 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 with The Football Association (FA) (FIFA Class II) lighting requirements for varying types of play as shown in table 2.

Table 2 – Sporting lighting level requirements

Class of Play	**Maintained average illuminance**	**Uniformity (Min / Ave)**
Competition	>200 Lux	>0.6
Cross Play	>120 Lux	>0.6
Training	>120 Lux	No Requirement

The floodlight system has been designed in such a way to allow each half of the AGP to be individually programmed to facilitate economical management and prevent over lighting to areas of the pitch when not in use.

(Lux level is the intensity of light as measured on a given surface considering 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.

Selection criteria of chosen design:

- Adequate illuminance levels (as per above requirements)
- Good uniformity (as per above requirements)
- Low light pollution (displayed within design)
- Good aesthetic appearance (unistreet product is developed and used within most councils for street lighting around the UK)
- Regular maintenance
- Vandal resistant equipment and materials

Environmental Status

The environmental category was established by referring to The Institution of Lighting Professionals (ILP): Guidance Notes for The Reduction of Obtrusive Light GN01/21 (as included in 'Appendix C – ILP Guidance Notes'). This document categorises the environment into five zones ranging from E0 (Protected) to E4 (Urban).

This site has been classified as an E3 Zone (well inhabited rural and urban settlements) due to the site being located on the edge of the settlement of Sowerby with houses to three sides and open fields to the south west. The E3 zone has been highlighted in Table 3 below, which has been taken from Appendix C.

Table 3 – Environmental Zones

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity

Floodlight Design

To meet the requirements of The Institution of Lighting Professionals: Guidance Notes for The Reduction of Obtrusive Light GN01:2021, the floodlighting system chosen uses a flat glass technology.

The products and system have been chosen specifically to mitigate spillage of lighting to the surrounding area and the houses to the east whilst still maintaining an average of 200 lux across the pitch.

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 potential impact on the surrounding environment.

The LED gen3.5 luminaires, manufactured by Philips Lighting, have been selected as they provide a complete lighting system even for the most complex of areas. They are a high efficiency luminaire with low energy consumption and meet the highest performance standards providing outstanding uniformity. They enable highly precise light distribution with minimum spill light. They are also dimmable which provides reduced level lighting options when each pitch is only be used for training purposes. The design of the luminaire allows for a slimine fitting, much less obtrusive than other fittings.

Please refer to 'Appendix B – LED Floodlight Data Sheet' for further details.

Figure 1 – Example LED

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 13m mounting height was chosen for the new Artificial Grass Pitch (AGP), as this will allow all luminaires to be mounted (vertical alignment) with a maximum 2° above the horizontal plane.

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

- 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, 13m high mounting heights provide the most efficient solution and the proposed masts will offer a slim-line profile, which will minimise daytime impact.

Figure 2 – Examples of 15m high slimline floodlighting column with LEDs (proposal is for 13m)

Floodlighting Performance

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

The design for the Artificial Grass Pitch (AGP) achieves values which meets the requirements of BS EN 12193 as shown in table 4 (found on page 6 of 'Appendix A – Floodlighting Performance Report' confirming 205lux at 0.63 uniformity.

All design calculations have been undertaken using an open, unobstructed site, thereby creating a worst case scenario.

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

The maintained luminance values for the 200lux lighting (highest lux level) has been calculated using a maintenance factor of 0.9 to account for environmental conditions and depreciation of light output between cyclical maintenance, including bulk lamp change.

The football pitch can be switched to a lower level of lighting for community usage and training.

Obtrusive Light Calculation

Obtrusive light has been calculated for 2 of the residential households to the east of the proposed AGP.

'Observers' have been placed on four residential properties spaced along the southwest row of the closest residential buildings, due to their proximity to the proposed floodlights. For each of the houses, two observers have been placed at the closest part of building. The observers have been set to 1.8m and 3.6m high by the building to replicate the height of the average person standing up on the ground floor and the first floor windows.

All calculations have been made without the consideration of the dense tree line between the houses and the lights.

Details of the exact observer locations can be found in 'Appendix A – Floodlight Performance Report' on page 5.

The ILP (Appendix C) provides guidance on the maximum values for the luminous intensity of luminaires in designated directions where views of bright surfaces of luminaires are likely to be a nuisance to occupants of premises, or from positions where such views are likely to be maintained. The luminous intensity values for an

E3 zone have been highlighted in the table below. The column highlighted is the apparent surface of the light source seen from the observer position. Therefore, for an E3 zone the pre-curfew light intensity seen by an observer can reach up to 10,000 candelas.

Table 4 – Limits for the luminous intensity of bright luminaires

Light technical parameter	Application conditions	Luminaire group (projected area A_p in m²)					
		$0<A_p \leq 0.002$	$0.002<A_p \leq 0.01$	$0.01<A_p \leq 0.03$	$0.03<A_p \leq 0.13$	$0.13<A_p \leq 0.50$	$A_p > 0.5$
Maximum luminous intensity emitted by luminaire (I in cd)[5]	E0 Pre-curfew Post-curfew	0 0	0 0	0 0	0 0	0 0	0 0
	E1 Pre-curfew Post-curfew	0.29 d 0	0.63 d 0	1.3 d 0	2.5 d 0	5.1 d 0	2,500 0
	E2 Pre-curfew Post-curfew	0.57 d 0.29 d	1.3 d 0.63 d	2.5 d 1.3 d	5.0 d 2.5 d	10 d 5.1 d	7,500 500
	E3 Pre-curfew Post-curfew	0.86 d 0.29 d	1.9 d 0.63 d	3.8 d 1.3 d	7.5 d 2.5 d	15 d 5.1 d	10.000 1,000
	E4 Pre-curfew Post-curfew	1.4 d 0.29 d	3.1 d 0.63 d	6.3 d 1.3 d	13 d 2.5 d	26 d 5.1 d	25,000 2,500

Table 5 is taken from 'Appendix A – Floodlighting Performance Report' which shows the maximum intensity of light for each observer at the nearest properties and their respective garden, with no interference (e.g. trees, fences walls etc.) thereby providing a worst case scenario. Please note the luminaire code, position and aiming angles columns relate to the light source and not the observer positions.

Table 5 – Obtrusive Light Calculations

Obtrusive Light Calculations:

Switching Mode	Observer Code	Luminaire Code	Position			Aiming Angles			Maximum Intensity (cd)
			X (m)	Y (m)	Z (m)	Rot.	Tilt90	Tilt0	
1	Aa	G	-31.50	-42.00	13.00	40.00	72.00	-0.00	1751
1	Bb	G	-31.50	-42.00	13.00	40.00	72.00	-0.00	1267
1	Cc	E	-31.50	42.00	13.00	-0.00	70.00	0.00	1225
1	Dd	E	-31.50	42.00	13.00	-0.00	70.00	0.00	839
1	Ee	G	31.50	-42.00	13.00	140.00	72.00	0.00	736
1	Ff	G	31.50	-42.00	13.00	140.00	72.00	0.00	719

The highest maximum intensity for the proposed lighting is 1751 candelas, which is significantly below the pre-curfew luminous intensity of the 10,000 candela threshold for a development within environmental zone E3, and also below the pre-curfew luminous intensity for an E2 zone of 7,500 candelas, also.
All floodlights will be extinguished at the permitted curfew time and therefore, luminaire intensity will be 0 candela which is accords with the post-curfew 1,000 candela threshold for the environmental zone E3.

Lighting Intrusion

Highlighted in Table 6 below is the illuminance levels for an E3 zone for both pre and post-curfew which are 10 lux and 2 lux respectively.

Table 6 – Maximum values of vertical illuminance on premises

Light technical parameter	Application conditions	Environmental zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (E_v)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx

Figure 3 below shows the spillage for the proposed lighting for the AGP. Please note that anything in blue is less than 1 lux

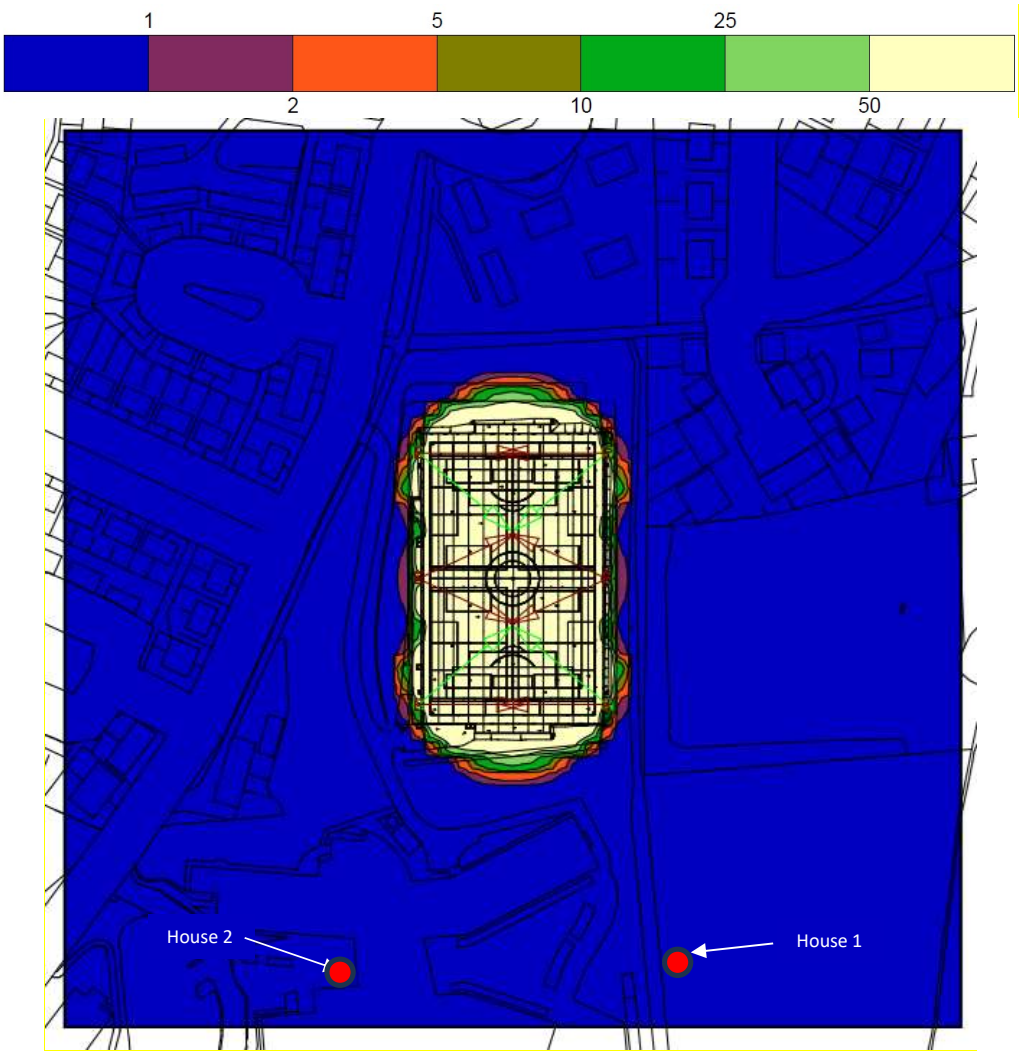

Figure 3 – Spillage for the proposed AGP (Lux)

The lighting intrusion to the nearest properties are significantly less than 1 lux (blue) at ground level. Therefore, the proposed lighting design would meet the pre-curfew and post curfew thresholds for a development within environmental zone E3.

During curfew hours the lighting light intrusion will be <1 Lux which accords with the curfew 10 Lux threshold for a development within environmental zone E3.

All floodlights will be extinguished at the permitted curfew time and therefore, light intrusion will be 0 Lux which is accords with the post-curfew 2 Lux threshold for a development within environmental zone E3.

Planning Policy Context

Central Government guidance on lighting and planning is contained in the National Planning Policy Framework (NPPF) which was updated in 2023.

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.

The NPPF, in paragraph 185 sets out that:

Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:
a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life65;
b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
c) 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.

Floodlight Impact on Development

The maintained illuminance values are calculated using a maintenance factor of 0.90. 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.

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.

Mitigation Measures

Obtrusive Light and Mitigation Measures

Obtrusive light, whether keeping someone awake through a bedroom window or impeding the view of the skyline, is a form of pollution. Obtrusive light can be substantially reduced without detriment to the lighting task. The design included for in this proposal represents a significant advancement on older type pitch floodlighting systems and ensure obtrusive light is significantly reduced in terms of;

- Proposed design does 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.
- Design ensures that floodlighting switch off lights when the pitch is not in use. LED lamps do not have a cool down period and so the football pitch will be 'dark' immediately after the pitch floodlighting system is switched off.
- Proposed design uses specifically designed lighting equipment that minimises the upward spread of light near to and above the horizontal. Luminaries have been selected to reduce spill light and glare to a minimum.
- 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 will be no more than seven degrees from the horizontal plane.
- Limitation of the lighting impact will be controlled by the strict management of permitted operating times. An intelligent control system shall be in place that allows pre programmable switching of the lights for each allocated time slot to ensure lights are extinguished at the curfew hour every night of use.

The intelligent control system will be set to operate within a pre-programmed time including a seasonal changeover facility for BST and GMT.

Ecological Factors Considered

When creating a lighting design it is important that ecological factors are considered within the lighting design.

As an industry standard, LED lighting colour temperature is generally accepted as 5,700 kelvin as it provides a good representation of the colour temperature during the daylight hours and provides a better and safer user experience for sports. The lighting design proposed utilises 4,000 kelvin LEDs, a warmer white, to reduce the coolness of the lights whilst still providing an acceptable and safe colour temperature for an outdoor sporting application.

The lighting design also attempts to not 'over light' the football pitch. The lighting design has been produced to meet the minimum requirements of 200 lux for FA competitive lighting, as outlined above, without exceeding the requirements and over lighting the football pitch.

Monitoring Programme

On completion of the floodlighting installation, the system will be tested and commissioned to ensure the agreed 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.

As such the results provided are the 'worst case' in design format.

Lighting Assessment Conclusion

1. The proposed floodlighting system is specifically designed to fulfil 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 13m high mounting height to the 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 LED system is a down lighting luminaire that 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 E3 (ILP).

6. Light intrusion to the closest residential properties whilst floodlights are operated is comfortably below the threshold for an E3 environmental zone and as such, does not create an unacceptable impact by way of artificial lighting.

7. Luminaire intensity created whilst floodlights are operated is below the threshold for the Environmental Zone E3 location and as such; does not create an unacceptable impact by way of artificial lighting.

8. All luminaires have a zero upward light ration to limit overspill and the proposed vertical alignment of luminaires is 2° maximum above the horizontal plane.

9. Upward waste light will also be minimized, achieving full cut-off with 0% projected into the atmosphere. This satisfies the recommendations by The British Astronomical Association's Campaign for Dark Skies, an organisation who lobby for low light pollution lighting systems.

10. Use of the artificial (flood) lighting system within permitted times will be controlled by a photocell detector and timer switch to ensure that any lighting does not adversely impact neighbouring residential amenity.

11. 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.

12. Time clocks will be set to operate within a pre-programmed time including a seasonal changeover facility for BST and GMT.

The lighting scheme has been designed to minimise the impacts on surrounding areas outside of the Artificial Grass Pitch (AGP) and given the proposed location of the AGP within the site footprint, we do not consider that the proposed lighting would result an unacceptable impact by way of artificial lighting on residential amenity or the surrounding landscape.

End of document

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