

## **CHAPTER 15: LIGHTING**

### **Introduction**

15.1 This chapter will address the lighting effects and environmental impacts of the proposed sustainable mixed-use scheme for a new Community stadium for Boston United Football Club, housing, retail, commercial and leisure uses on land either side of the A16, south of Tytton Lane East in Boston. This chapter is of particular relevance to the impact of the lighting associated with the proposed community stadium, which itself forms the detailed element of the hybrid planning application.

### **Methodology**

15.2 The main factors that generally influence the design of lighting schemes include:

- The general nature of the surrounding area;
- The topography of the areas illuminated;
- The presence or absence of structures to effectively block the spill light beyond the boundaries of the complex; and
- The ability to design the systems with integral shielding devices.

15.3 Spill light and glare analysis are key environmental issues. Spill light is the amount of illumination added to the environment and glare is the discomfort of visions experienced when the image is excessively bright compared to the source's background.

15.4 The approach to the lighting assessment involves the consideration of areas that have a view of the proposals and calculations determining lighting measurement levels and shall consider the impact of light and glare into surrounding areas.

15.5 In designing a suitable lighting solution for the community stadium, a number of key specification issues have to be considered. These include the illuminance level required; the environmental zone category for the site; the minimum mast height for floodlights; and the number of floodlights. Consideration of these issues is outlined below:

- To establish the illuminance for the training pitch, reference was made to the Football Association’s minimum requirements for football at grass roots, competition and training levels. This requires a maintained illuminance level of **200 Lux** over the whole pitch, based on match-level play and training and has the ability for reduced lighting levels and switchdown levels for 3<sup>rd</sup> pitch switching.
- To establish the illuminance level for the community stadium, reference was made to the Football Association’s minimum requirement for football at League 2 level. This requires a maintained illuminance of **500 Lux** over the whole stadium pitch, based on match-level play.
- To establish the illuminance level for the community stadium car park, reference was made to the British Standard minimum requirements for safe public parking and access. This requires a maintained illuminance level of **20 Lux**.
- To establish the appropriate environmental zone for the site, reference was made to The Institution of Lighting Engineers: Guidance Notes for the Reduction of Light Pollution, 2000. This document categorises the environment into four zones, ranging from National Parks to City Centres. The site, in this instance, falls into Zone E3, being an Urban location.

Table 15.1 below shows an example of typical lighting levels for various situations by way of comparison with the lighting levels proposed in the application.

Table 15.1: Typical Lighting Levels

<b>Light Source</b>	<b>Horizontal Lux</b>
<i>Full Moon</i>	<i>0.3 to 0.5</i>
<i>Street Lights – Footpath</i>	<i>3 to 10</i>
<i>Street Lights – Residential Area</i>	<i>5 to 15</i>
<i>Typical City Centre Car Park (non retail)</i>	<i>20 to 30</i>
<i>Office/Classroom</i>	<i>250 to 750</i>
<i>Professional Stadium</i>	<i>800 to 2500</i>
<i>Sunny Day</i>	<i>80,000 to 120,000</i>

## Planning Policy Context

### The Development Plan

#### Boston Borough Local Plan (1999)

- 15.6 Saved Policy G10 of the Boston Borough Local Plan relates to external lighting schemes and states that full planning permission shall not be granted for developments which include a scheme of external lighting unless the proposed lighting scheme:
- Is the minimum required to undertake the task;
  - Will not prejudice highway safety;
  - Will not substantially harm the amenities of nearby land-uses; and
  - Will not substantially harm the character of the area.
- 15.7 The policy further states that, where necessary to safeguard amenity or to prevent wasteful use of energy resources, conditions will be used to require the extinguishments of lights not required for safety or security at an appropriate curfew time.

### Other Material Considerations

#### National Planning Policy Framework (2012)

- 15.8 Central Government guidance on lighting is included in the National Planning Policy Framework (NPPF), which was introduced in March 2012. Paragraph 7 of the NPPF defines 'sustainable development', which is the core principle throughout planning, with this 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 towards the protection and enhancement of the natural, built and historic environment and, as part of this, helping to minimise pollution. The NPPF defines pollution 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."** With regards to light pollution, paragraph 125 of the NPPF

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”**.

### **Existing Situation**

15.9 The application site itself, comprising principally agricultural land, includes little existing lighting. The roads surrounding the site, including the A16, London Road and Tytton Lane East, however, all include street lighting. The built-up areas beyond London Road and Tytton Lane East will also be illuminated during darker hours by the domestic lighting generally associated with residential areas.

15.10 One of the existing sports pitches at Wyberton Playing Fields Association to the south of the site also includes column-mounted floodlighting.

### **Impact of Development**

15.11 The lighting proposals are detailed on drawing No. UKS 10021 with these showing the mast locations, floodlight orientations, illuminance levels on the pitch & projected overspill values. A copy of this drawing is included in Figure 15.1, with further details of the proposed lighting, as described below, included in Appendix 15.1.

### **Training Pitch**

15.12 The mast height for the training pitch was calculated using the method detailed in the CIBSE guide LG4 “Sports Lighting”. This uses angles projected from the centre of the pitch & the touch line to produce a head frame location zone. When applied to this project the optimum mast height ranged from 12m to 18m for the training Pitch. A 15m mounting height was chosen as it would allow the floodlights to be mounted horizontally. This will result in low vertical overspill & good uniformity on the playing surface, without compromising cost. The 15m HL250 mast will offer a slimline profile which will minimise daytime impact. If the mounting height was reduced to 12m the floodlights would be elevated above the horizontal consequently increasing overspill.

- 15.13 In order to meet the requirements of The Institution of Lighting Engineers: Guidance Notes for The Reduction of Light Pollution, 2000, it is proposed the Abacus AL5760 Challenger 1 floodlight, using Flat Glass Technology is utilised for the illumination of the training pitch.
- 15.14 The Abacus AL5760 series floodlight has been specifically designed for lighting outdoor sports grounds and smaller sports stadiums where obtrusive light control is an essential requirement, giving excellent light control, whilst reducing light overspill and upward light and glare. The series also incorporates an internal baffle, which redirects upward waste light back into the floodlighting beam, increasing efficiency and reducing glare to participants and the surrounding environment.
- 15.15 For the training pitch the design achieves a maintained minimum illuminance value of 232 **Lux** with a uniformity in excess of **0.70** which meets the requirements of The Football Association.
- 15.16 With reference to the light spillage to this area the main brightness of the spillage light will remain inside the site, however some light will spill around the immediate boundary of around 30m distance from the pitch. This can be limited further with taking any blockages into account or a cowl / shield can be added to the floodlight to reduce this further. Glare will be limited on this pitch, as all floodlights are flat to the ground and shall have an upwards light ratio of less than 2%. Therefore the physical glare will be minimal.
- 15.17 The potential impacts of the lighting proposals associated with the operation of the training pitch are anticipated to have a **slight adverse** effect on the character of the surrounding area during use in night hours, though a **neutral** effect on the amenities of adjacent land uses and are, therefore, considered to be **not significant**.

### **Stadium Pitch**

- 15.18 The mast height for the stadium pitch was calculated using the method detailed in the CIBSE guide LG4 "Sports Lighting". This uses angles projected from the centre of the pitch & the touch line to produce a head frame location zone. When applied to

this project the optimum mast height ranged from 22m to 27m for the Stadium Pitch. A 25m mounting height was chosen as it would allow the floodlights to be mounted to ensure the peak output of the floodlights is aimed just over the halfway line. This will result in low vertical overspill & good uniformity on the playing surface, without compromising cost. The 25m mast will offer a slimline profile which will minimise daytime impact. If the mounting height was reduced to 22m the floodlights would be elevated above the horizontal consequently increasing overspill.

- 15.19 In order to meet the requirements of The Institution of Lighting Engineers: Guidance Notes for The Reduction of Light Pollution, 2000, it is proposed the Abacus AL5900 Challenger 3 floodlight is utilised for the illumination of the stadium pitch.
- 15.20 This design of floodlight delivers an optically precise symmetrical beam, specifically designed and suited to stadium floodlighting requirements. As with the lighting proposed for the training ground, this design of floodlight also incorporates an internal baffle, which redirects upward waste light back into the floodlighting beam, increasing efficiency and reducing glare to participants and the surrounding environment.
- 15.21 For the stadium pitch the design achieves a maintained minimum illuminance value of **507 Lux** with a uniformity in excess of **0.70** which also meets the requirements of The Football Association.
- 15.22 With reference to the light spillage to this area the main brightness of the spillage light will remain inside the site, however some light will spill around the immediate boundary of around 15/20m distance from the pitch. This can be limited further with taking any blockages into account or a visor can be added to the floodlight to reduce this further.
- 15.23 Glare to this pitch will be higher than the training pitch; this is due to the height of the mast and the type of floodlights being different to the training pitch. However each individual floodlight is aimed with a telescope and is pin pointed to a specific point on the pitch. This will keep glare to the bare minimum and to an acceptable level.

15.24 The potential impacts of the lighting proposals associated with the operation of the stadium pitch are anticipated to have only a **slight adverse** effect on the character of the surrounding area and the amenities of adjacent land uses during use in night hours and are, therefore, considered to be **not significant**.

### **Amenity**

15.25 With regard to amenity lighting, 8 metre high columns will be utilised to reduce the number of lighting points to a minimum.

15.26 In order to meet the requirements of the appropriate British Standard, it is proposed Abacus AL4250 Pegasus Luminaries are utilised for the amenity lighting. These include high performance Optimum Reflector Systems in highly polished and anodised aluminium, producing a square illuminance distribution at ground level and also result in the need for fewer lighting points within the site.

15.27 For the amenity and car park areas the design achieves a maintained minimum illuminance value of **22 Lux** with a uniformity in excess of **0.25** which meets the requirements of the appropriate British Standard. The maintained illuminance values are calculated using a maintenance factor of **0.77**. This takes into account light losses due to dirt accumulation on the floodlight front glass & lamp lumen depreciation, ensuring that the minimum requirements for safe play are achieved along with safe walking and car park access.

15.28 In all instances the amenity lighting is controlled to ensure that all lighting stays within the site boundary and is directional lighting to provide lighting to the designated areas only. The lighting spill is very little due to the higher mounting heights and flat glass proposals, which also keep glare to the minimal rate.

15.29 The potential impacts of the lighting proposals associated with the amenity and car parking areas of the stadium development are anticipated to have a **slight adverse** effect on the character of the surrounding area during use in night hours, though a **neutral** effect on the amenities of adjacent land uses and are, therefore, considered to be **not significant**.

15.30 In summary, the proposals for the training, stadium and amenity/parking areas will ensure excellent horizontal & vertical overspill containment. As less than **2 Lux** illuminance will be projected towards any residential property windows the system will exceed the requirements for an Environmental Zone E3 location. Upward waste light will also be minimised and, at the floodlight elevations proposed, 0% will be projected into the atmosphere. This will meet the recommendations of The Campaign For Dark Skies, an organisation, which campaigns for low light pollution systems.

### **Mitigation Measures**

15.31 Ideally there should be no surface illuminance at the façade of any residential property. Illuminance levels of less than **5 Lux** are normally considered to be acceptable for residential properties and the illuminance level for roads varies depending on the existing levels of lighting of the road in question.

15.32 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**

15.33 Following the results of the assessment, no monitoring is proposed

### **Robustness of Analysis**

15.34 All the design calculations have been undertaken using an open, unobstructed site, the values of overspill will be further reduced any existing mature trees or natural screening. The assessment has therefore been undertaken from the basis of the worst-case scenario.

## Summary and Conclusions

- 15.35 The proposed system would be suitable for installing in an Environmental Zone E3 situation, meeting the most stringent of light control parameters whilst maintaining the specified illuminance levels for the sports pitch.
- 15.36 The impact on residents will be minimised as overspill values into gardens will be no more than moonlight & vertical illuminance into windows before curfew are below the values recommended by the ILE. Daytime visual impact will also be minimised by using slimline masts & light grey floodlights which do not stand out against the skyline
- 15.37 As detailed above, the impact on the gardens of the residential properties adjacent to the pitch, (a maximum of 2 **Lux** horizontal light) will be less than those associated with street light levels, with the impact on the properties themselves and their windows being less than those associated with moonlight levels.
- 15.38 Once installed the proposed lighting solution will ensure that glare and spill light levels are at a minimum and the light reaches the sports surfaces and will not project into the sky or otherwise pollute the environment. The potential combined impacts of the lighting proposals associated with the operation of the stadium are therefore considered to have a **slight adverse** effect on the character of the surrounding area during use in night hours and a **slight adverse** effect on the amenities of adjacent land uses, (though with this limited to the stadium floodlights resulting in no greater than moonlight levels to the windows of the closest existing residential properties), such that the effects are considered to be **not significant** and are instead considered appropriate for the classification of Environmental Zone in which the development will be situated.