

SPORT ENGLAND

Artificial Sports Lighting

Updated guidance for 2026

Think of the environment. Please avoid printing this A4 document unnecessarily.

sportengland.org

Sport England's design guidance aims to:

- **Increase awareness of good design;**
- **Help built-environment professionals, clients, user representatives and stakeholders to follow best practice;**
- **Encourage well-designed facilities that meet the needs of sport and physical activity and are a pleasure to use.**

Document accessibility

This document has been designed for comfortable reading at A4 and on a laptop screen but can also be printed at A3 for largeprint versions. The pdf is accessible and has been tested to work with text readers.

The ASL guidance has a new format and is divided into Parts A to D - see page 4. They have been developed to enable the information to be digested and processed easily, with illustrations and tables for quick reference.

User guide

Before using this design guidance for any specific projects, all users should refer to the on-line User guide which explains when and how to use the guidance as well as understanding the limitations of use.

Click here for User guide and other Design and cost guidance

Cover image credit: Mike Norris

Foreword

Artificial Sports Lighting

Sport England believes that well-designed facilities are fundamental to developing opportunities for sport and physical activity for everyone, from beginners to elite athletes.

Sports and leisure facilities should be accessible, inclusive, safe, and flexible, providing equitable opportunities for participation at all levels.

Good design should be based upon:

- Stakeholder engagement putting people at the heart of the whole design process;
- A sound understanding of current trends and practices within individual sports;
- Research and developments in the sport and leisure industry;
- Accounting for a diverse spectrum of user needs;
- Experience gained from previous projects.

These principles apply to all aspects of sports facility design, including artificial sports lighting, which can significantly influence participation, safety, user experience and environmental performance. They should be embedded from the earliest vision and briefing stages through to detailed design, specification, and operation.

Artificial sports lighting plays a vital role in extending participation, improving safety, enhancing performance, and enabling year-round use.

As technologies evolve, lighting design should balance performance, visual quality, sustainability, and environmental considerations.

Appropriate lighting levels, uniformity, and flexible controls should be provided to meet user needs while avoiding unnecessary energy consumption, costs, and environmental impacts.

Sport England's guidance promotes inclusive design principles and practical advice to support informed decision-making, helping create efficient, sustainable, and accessible sports facilities that meet the needs of a wide range of users.

> ***"Artificial sports lighting plays a vital role in helping communities make the most of their sports facilities year-round.***
>
> ***When designed responsibly, it can increase opportunities for participation, improve accessibility, and support people of all ages to be active, while respecting the needs of local communities and the environment."***

Nick Evans, **Director of Planning & Active Environments**

How this document relates to other guidance

The Artificial Sports Lighting (ASL) guidance should be read alongside the latest version of related Sport England guidance and other key statutory and national governing body of sport (NGB) requirements, and the links below:

Sport England ASL contents

Part A Essential reading
1: Introduction
2: Design considerations
3: Planning
4: Operational costs

Part B Indoor sports lighting
1: Multi-sports halls
2: Specialist sports halls
3: Swimming pools
4: Sports domes

Part C Outdoor sports lighting
1: Range of applications
2: Design principles
3: Sport examples

Part D Further information and references
1: Key references
2: Indoor sports
3: Outdoor sports
4: Comparison tables

Other Sport England technical guidance

Strategic Outcomes Planning Guidance (SOPG)	Click here
Accessible and inclusive sports facilities (AISF)	Click here
NGB sport-specific requirements	Click here
Comparative sizes of sports pitches and courts	Click here
Playing Pitch Strategy Guidance	Click here
Sports halls	Click here
Swimming pools	Click here
Fitness and exercise spaces	Click here
Biodiversity Net Gain	Click here

Other sports guidance and references

CIBSE Society of Light and Lighting (SLL)	Click here
CIBSE SLL Lighting Publications	Click here
Institution of Lighting Professionals (ILP)	Click here
British Standards Institution (BSI)	Click here
SAPCA Codes of Practice	Click here

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Part A

Essential reading

1 Introduction

This section provides an overview of the guidance and essential considerations including obtaining appropriate advice, determining the level of play, and ensuring that key principles are applied consistently across a broad range of sporting settings and facility types.

1.1 Purpose of the document

Sport England guidance is aimed at local planning authorities, planners, developers, design professionals (including architects, engineers, and consultants), facility operators, and community sports organisations.

Essentially, it is for those involved in shaping, delivering, and managing indoor and outdoor sports environments.

Across these audiences, the guidance is intended to:

- Support the provision of high-quality, inclusive, and accessible facilities;
- Encourage increased participation;
- Inform evidence-based planning and investment decisions; and
- Ensure alignment with wider national strategies.

By following Sport England's guidance, project teams can ensure that facilities meet technical requirements and contribute positively to the player experience, encouraging facility use, promoting inclusivity and mitigating undesirable environmental impacts.

National Governing Bodies (NGB) should be involved from the outset to ensure lighting solutions are appropriate and meet minimum lighting standards.

The following principles are reflected throughout this document:

- Raise awareness of the importance of good lighting design of **indoor and outdoor sports** and leisure facilities;
- Support built environment professionals, volunteers, clients, operators, user representatives, and stakeholders in **adopting best practice** throughout all stages of the project;
- Provide guidance to develop a planning application and **help stakeholders** through the planning process;
- Encourage the development of facilities that are thoughtfully designed to **meet the needs of sport and physical activity participants,** ensuring that such spaces are enjoyable and fit for purpose;
- To consider **accessibility** and **inclusion** in the design of internal and external spaces, including consideration of supporting equipment and controls specifications;
- To **promote the use of lighting in a sustainable manner,** through consultation with neighbours, and awareness of best practice design;
- To understand where to seek **specialist advice,** and how to ask the questions for reassurance that an appropriate design is being developed.

For further reading and best practice advice, consult Sport England's suite of Design and cost guidance, the relevant NGB guidance, and the Society of Light and Lighting (SLL) Lighting Guides.

1.2 Using the guidance

A well designed visual environment is essential for sports facilities. Artificial sports lighting, used alongside daylight where appropriate, plays a key role in supporting safe and effective activities.

This guidance offers overarching advice by referencing commonly played sports and their typical lighting requirements, outlining principles that can be applied across a wide range of sporting contexts and facility types.

It addresses **sports lighting** for both **indoor** and **outdoor** activities, highlights cases with specific requirements, and can be used to:

- Provide a basic explanation of a complex subject;
- Inform of industry guidance on the types and levels of lighting needed for different sports;
- Cross-reference to other sources of information including Sport England and external publications;
- Enable stakeholders to confidently navigate the design process from inception to delivery, with clear direction on when and where to seek specialist expertise; and
- Help planning officers obtain the appropriate information, consider technical reports and ultimately support a planning application.

The guidance should be read alongside Sport England and other sports guidance and references listed on page 4.


Image credit: D-Max Photography

This guidance offers overarching advice by referencing commonly played sports and their typical lighting requirements, outlining principles that can be applied across a wide range of sporting contexts and facility types.

1.3 Professional advice

As with any guidance, it is important to appoint a suitably-qualified professional team with the expertise needed to take the project forward and deliver the following activities:

- Pre-planning advice and planning research;
- Engagement with user groups to ensure their requirements feed the design process;
- Consultation with the local planning authority (LPA) to understand potential challenges and planning policy;
- Following the RIBA Plan of Work and its Inclusive Design Overlay;
- Develop acceptable sports lighting solutions and specifications;
- Design lighting for connected spaces such as car parks and footpaths;
- Inform design and testing of related systems such as electrical supply, wiring and controls.

To appoint suitably-qualified designers (SQD) and contractors with relevant experience, consider approaching the Society of Light and Lighting (SLL), the Institution of Lighting Professionals (ILP) and the Sports and Play Construction Association (SAPCA) accredited professionals in the Tender process (interview, references, experiences etc.)

1.4 Lighting and sport

1.4.1 Challenges in sports lighting design

Designing lighting for indoor and outdoor sports environments requires a coordinated and thoughtful approach that recognises the specific visual needs of each activity.

Individual sports have distinct expectations for illuminance, uniformity, glare control and visual clarity, and a well-planned scheme can integrate these effectively within a single space.

By establishing the required performance levels early and designing in flexibility, such as adjustable switching, dimming, or tailored luminaire arrangements, projects can support all intended uses while maintaining good visual conditions.

This proactive approach helps ensure the final installation is suitable for all users, adaptable and avoids unnecessary adjustments later in the project.

Early engagement with stakeholders, including NGBs, facility operators, local authorities, and neighbouring communities, is vital to ensure that potential challenges such as delayed planning approvals, regulatory non-compliance, and even outright refusals are avoided.

Overlooking user needs, or specifying unsuitable technology, may produce lighting that is either insufficient for performance or unnecessarily intense, increasing costs and ecological impact.

For further guidance, see Part A 3 Planning, Part A 2.4 Sustainability and Part A 2.6.3 Visual impact.

1.4.2 Understanding the needs of a sports facility

Sports facilities encompass a broad range of types, from small community centres and multi-use sports halls to expansive outdoor pitches and athletics fields. Each facility type is shaped by the particular activities it supports.

For example, a general-purpose sports hall may be designed to facilitate several activities, either in parallel or sequentially, while an outdoor pitch could be divided to cater for different training sessions or competitive matches simultaneously.

Understanding these typologies is essential for ensuring that lighting design responds appropriately to the unique requirements of each space and its users.

The performance level expected within a sports facility is dictated primarily by the level of play it is intended to host. As activities become faster-paced, more competitive or technically challenging, the lighting should support precise visual tasks, quick reactions, and consistent visibility across the entire playing area.

This ensures that lighting contributes not only to the quality of play but also to the safety and fairness of the sporting environment.

Sport England guidance provides recommendations for lighting which take precedence over other guidance for community level facilities.

1.4.3 Levels of play

The 'Classes' used in BS EN 12193 correspond approximately with Sport England's 'Levels of play' categories as follows:

- Class III - Community;
- Class II - Club;
- Class I - International / Premier.

The focus of this guidance is on Community and Club sports.

Establishing the intended level of play at an early stage is crucial and should be done in consultation with the relevant NGB.

This approach ensures that the lighting requirements are tailored to the actual needs of the users, thereby preventing under-specification, which could compromise safety or fairness, and avoiding unnecessary expenditure on over-specified lighting that exceeds the requirements of the intended activities, or may be rarely used. Achieving consensus on these matters helps set clear expectations among all stakeholders involved in the project.

By clearly defining both the facility's typology and the expected level of play, lighting solutions can be specified that are appropriate, efficient, and aligned with the needs and expectations of participants, officials, and spectators.

This clarity of purpose enables designers to deliver environments that are fit for purpose, cost-effective, and capable of adapting to a variety of usage considerations.

Proper identification of the facility type and the level of play also enable lighting designers to develop specifications that suit the actual use of the space, rather than relying solely on generic standards.

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This approach also makes it possible to incorporate flexibility and adjustability into the lighting design from the outset, ensuring that the facility can accommodate a range of activities and user needs as they evolve.

For further information, see Part D.

1.4.4 Visual conditions and balancing priorities

A successful sports lighting system should provide high-quality lighting with good uniformity, targeted provision of light, and effective glare control.

The overall ambience of the playing space is heavily influenced by lighting quality, which also affects spectators' experiences and non-sporting uses like community events or examinations.

It is common for a sporting facility to host a range of sports and user groups, each bringing their own priorities and requirements. The design process should involve learning about and understanding these differing needs.

For example, higher levels of play demand increased lighting levels, as faster and more competitive sports require enhanced visibility for players, officials, and spectators.

Improved illuminance and uniformity support faster reactions, more accurate decisions, heightened safety, and superior viewing conditions.

Balancing the priorities of various stakeholders and user groups is best achieved by focusing the design on the sports that are most frequently played or subject to the more onerous regulations.

Where considerable variation in lighting levels is required, flexible solutions such as dimming controls or supplementary lighting may be employed to accommodate the needs of different activities.

1.4.5 Lighting quality

High-quality lighting in a sports facility is characterised by uniformity, targeted provision of light, accurate colour replication, and effective glare control, and illumination appropriate for the level of play. It ensures enhanced visibility for players, officials, and spectators, and contributes positively to the overall ambience of the space, supporting both sporting and non-sporting activities.

The lighting should also be adaptable to the varying requirements of the users, providing optimal conditions for safety, performance, and enjoyment.

It is common for a sporting facility to host a range of sports and user groups, each bringing their own priorities and requirements. The design process should involve learning about and understanding these differing needs.

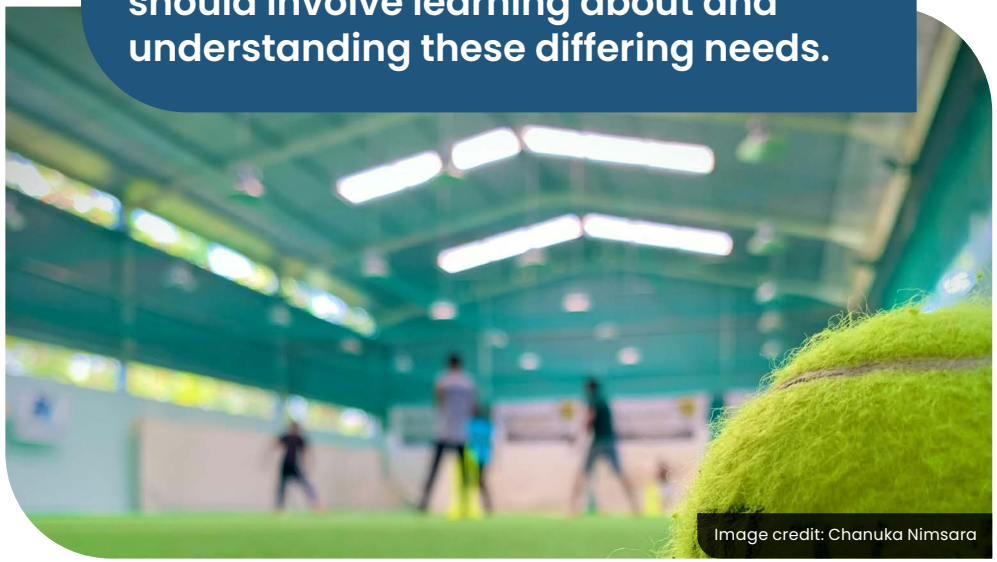


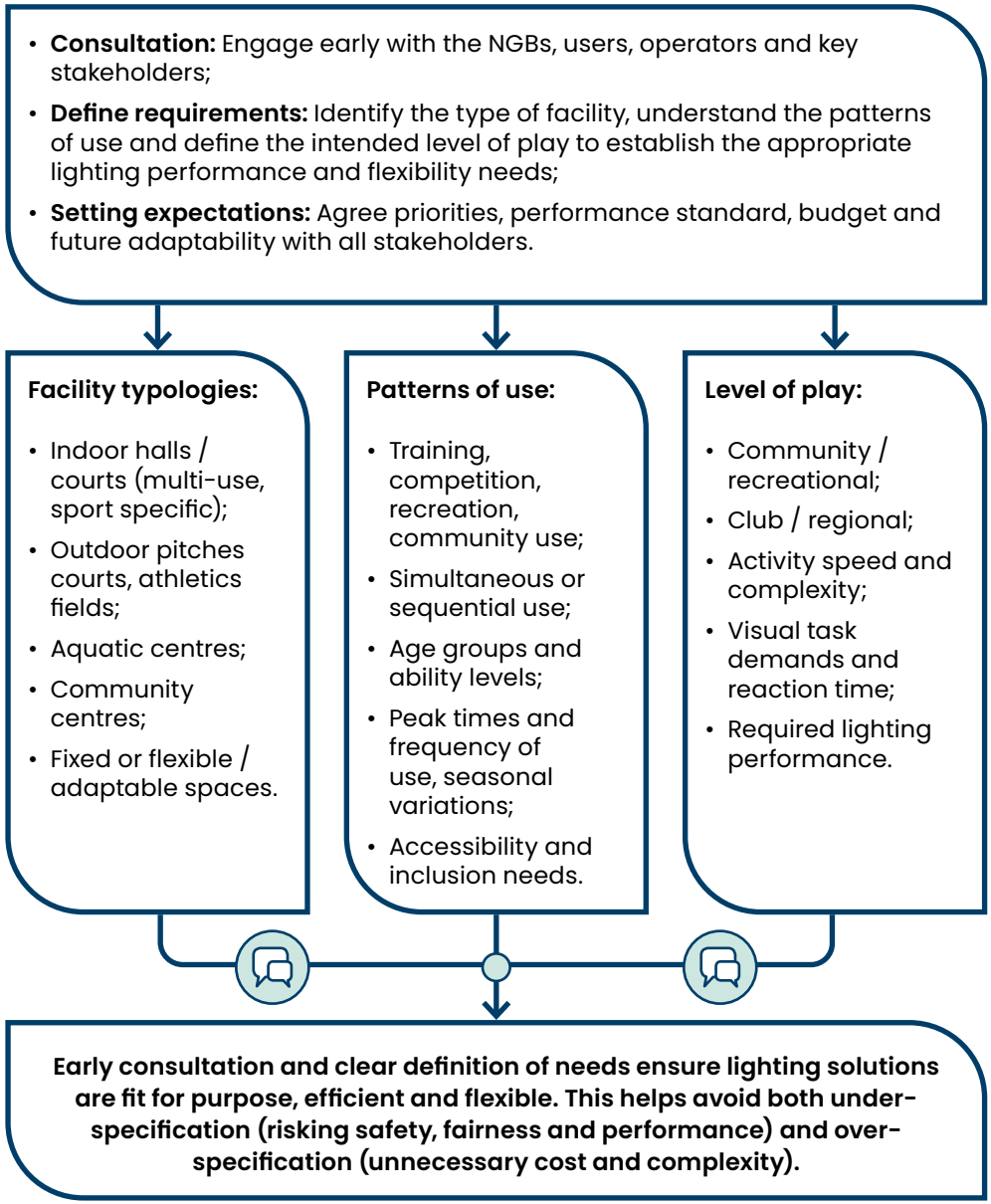
Image credit: Chanuka Nimsara

1.5 Consulting the NGB

The benefits of consulting with the NGB are key from the outset and throughout the design process:

- **Ensuring compliance and safety:** Early engagement with the NGB helps ensure that the lighting design meets the relevant technical requirements, providing safe and effective visibility for both training and competitive match play. This reduces the risk of failing to meet sport-specific performance and safety standards and ensures the facility is suitable for all intended levels of use;
- **Future-proofing the facility:** Aligning the lighting design with NGB guidance and competition pathways helps avoid costly future modifications and operational restrictions. It enables facilities to accommodate phased improvements without major redesign and ensures compatibility with evolving league, competition, and governing body requirements;
- **Supporting funding and planning applications:** Lighting schemes that comply with recognised technical standards (see Part D 4)[1] and endorsed by the NGB, can strengthen funding and planning applications. This instills greater confidence among funders and stakeholders and enhancing the likelihood of successful submissions.

Figure A1 Consulting the NGB



1 Part D 4 provides further guidance which includes a set of Comparison tables.

1.6 Steps to avoid common problems

The development of lighting schemes for sports facilities is essential for extending usage hours, ensuring safety, and supporting a range of activities. However, poorly planned or executed lighting can lead to a range of issues that impact usability, sustainability, and community relations.

Steps to avoid the most common problems encountered in indoor or outdoor venues may include the following:

Poorly planned or executed lighting can lead to a range of issues that impact usability, sustainability, and community relations.

Consultation and engagement:



- Engaging stakeholders early in the project planning process ensures clear technical direction, and helps align design and budget with community expectations;



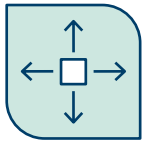
- Local authority planning engagement also helps to prevent costly changes and complaints from neighbours;
- Defining user needs accurately leads to a lighting design tailored to actual sports and participants, avoiding over-lighting, improving energy efficiency, and boosting user satisfaction;



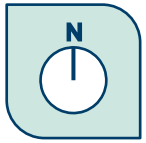
- Involving the community through open dialogue identifies and resolves concerns early, reduces planning objections, and fosters trust and smoother approvals.



Site research and analysis:



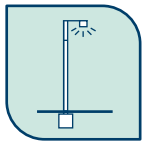
- Conducting a site-specific assessment that takes into account the site's orientation, topography and the location of sensitive ecological receptors allows for optimal lighting placement and luminaire integration, minimising light spill, and harmonising the facility with its surroundings and neighbours;



- Undertaking thorough planning research and early dialogue with authorities ensures compliance with policies, minimises redesigns and delays, and builds positive relationships with planners and funding bodies;



- Early electrical assessments and correct sizing of power systems by qualified engineers ensure safe, reliable operation and prevent system failures or costly upgrades;



- Conducting proper geotechnical surveys and early procurement provides stable, long-lasting column bases, reducing construction and operational risks.

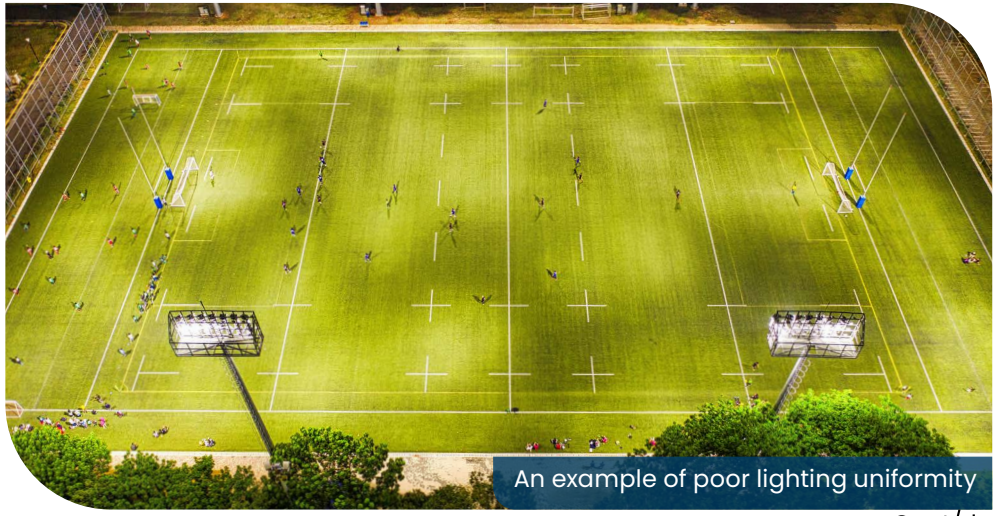
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Selection, layout and control:

- Implementing controlled lighting that satisfies design codes and standards helps minimise obtrusive light, respects neighbours and wildlife, and improves community perception and planning outcomes;
- Utilising daylight-linked controls and considering daylight integration reduces energy consumption, enhances visual comfort, and provides a consistent user experience;
- Carefully matching LED upgrades to existing conditions and managing expectations delivers improved energy efficiency, reduced glare, and will help avoid complaints from neighbours;
- Installing purpose-built LED luminaires ensures electrical compatibility, safety, improved lighting distribution and uniformity, and avoids uncertainty over the safety of retrofit lamp solutions;
- Selecting LED luminaires with high-quality driver technology, to provide safe, flicker-free lighting even when dimmed;
- When space is limited, careful consideration of column placement will ensure run-off areas remain safe. Exploring alternative solutions can help optimise layouts. Where columns are positioned close to run-off zones, appropriate padded protection should be incorporated to enhance safety and minimise the risk of serious injury.

Biodiversity and ecology:

- Incorporating ecological considerations by using targeted lighting controls and designs protects wildlife, preserves biodiversity, and ensures compliance with environmental legislation;
- Consulting an ecologist is advised to understand the seasonal implications of sports lighting use. For example, bats may be typically active during the warmer months and less active during winter;
- Understanding the impact, and proposing mitigation should consider the seasonal and hibernation cycles of wildlife to prevent ecological harm while still enabling safe and effective use of sports facilities.



An example of poor lighting uniformity

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Sustainability, energy and whole-life value:



- Good-practice disposal and recycling of redundant lighting infrastructure supports material recovery, reduces environmental impact and embodied carbon, and can lower whole-life costs, when undertaken in accordance with UK waste regulations by suitably licensed contractors;



- Specifying appropriate sports lighting technology will help ensure reliable performance, reduced glare and flicker, and lower lifetime costs, avoiding issues seen with unsuitable products;

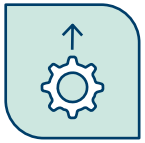


- Careful application of value engineering should maintain essential criteria to achieve a balanced solution combining cost efficiency, durability, sustainability, and quality (in particular sport requirements and user comfort and accessibility);



- Incorporating advanced lighting controls allows for tailored scenes, significant energy savings, improved comfort, and enhanced sustainability and efficiency.

Testing, commissioning, handover and maintenance:



- Implementing a planned maintenance regime preserves lighting quality, ensures safety, extends equipment life, and keeps operational costs predictable;



- Testing and certifying old columns before considering them for re-use gives confidence in their structural integrity, may help reduce carbon footprint, and enables safe integration with modern systems;



- Accurate commissioning, including proper aiming and testing, delivers compliance with standards, fully functional lighting controls, and upholds the design intent to provide a quality user experience;



- A proper client handover should take place and client control management training should be given for the lighting to be managed as per the design intent following the design and commissioning.

2 Design considerations

This section outlines the advantages of effective artificial lighting and explains how the specific demands of different sports influence lighting requirements, enabling the development of an appropriate design strategy.

2.1 Lighting benefits

2.1.1 Introduction

The general benefits of good artificial lighting can be readily understood.

Good lighting enables sporting activity by making facilities safe, visible, and inviting at all times of day. Well-lit pitches, courts, pools and paths also reduce injury risk, improve performance, and increase confidence for players of all ages and abilities.

By extending usable hours beyond daylight, lighting also supports regular participation, community engagement, and organised sport. This consistent access encourages active habits, helping people stay physically fit, socially connected, and mentally healthy throughout life, and supporting long term public wellbeing.

Artificial lighting enables designers to deliver consistent, uniform, and adequate lighting levels within sports facilities. While daylight is sometimes sufficient, artificial lighting is often used to supplement natural light, ensuring that appropriate illumination is maintained throughout the space.

Lighting is critical in supporting safety across sporting environments. For users and players, it reduces the risk of injury by improving visibility, while for marshals and facility managers, it enhances the ability to monitor user safety, such as in swimming pools, and supports essential maintenance and cleaning activities.

The importance of daylight should not be underestimated in indoor sports environments. Thoughtfully designed lighting schemes in sports environments can have a positive impact on mood, reduce stress, and support mental focus, all of which contribute to overall wellbeing and improved performance.



Places Leisure, Camberley
Image credit: Fotohaus

Lighting is critical in supporting safety across sporting environments. For users and players, it reduces the risk of injury by improving visibility, while for marshals and facility managers, it enhances the ability to monitor user safety, such as in swimming pools, and supports essential maintenance and cleaning activities.

2.1.2 Operational and financial benefits

The following summarises some key operational and financial benefits:

- **Increased use of facilities:**

  Facilities equipped with sports lighting can operate safely beyond daylight hours, resulting in substantially higher usage rates compared to unlit alternatives. This increased availability provides users with greater choice and flexibility when scheduling playing times;

- **Programming flexibility:**

  Extended operating hours afforded by artificial lighting give facility managers and users more freedom to design and implement varied programming, including the initiation of new sports development programmes;

- **Additional income:**

  Higher rates of facility use translate to greater opportunities for generating additional income. This is particularly important given the significant capital investment required for facilities such as Multi-Use Games Areas (MUGA) or Artificial Grass Pitches (AGP). However, it is important to note that increased usage may be offset by additional wear and tear on the playing surface, potentially reducing its service life;

- **Usage options:**

  An artificially illuminated MUGA adjacent to a sports hall can accommodate outdoor activities such as community football, netball, and racquet sports. This flexibility not only maximises facility use but also allows more expensive indoor spaces to be reserved for other activities;

- **Opportunity at education sites:**

  Outdoor sports lighting may unlock opportunities for sporting activity at education sites, including usage for community use and for extra-curricular schools use. Without such lighting of athletic fields, MUGAs and AGPs, usage is often limited due to periods of darkness or poor daylight, for example in late afternoons and evenings during weekdays. Funding for sports lighting can be supported by a demonstrated need from the local community.



Image credit: Musco Sports Lighting, LLC

2.2 Sports specific guidance

The sports catered for, along with the anticipated level of play, will determine the lighting requirements.

It should be noted that conflicting guidance might sometimes be given by different organisations or publications regarding the recommended standards of lighting for different sports.

- **Different purposes:**
  - Sport England focuses on planning and design ensuring facilities meet local needs;
  - NGBs define sports rules;
  - BS EN 12193 (Light and lighting. Sports lighting) provides technical standards; and
  - SLL Lighting Guide 4 (LG4) Sports lighting explains technical issues and how to design to them;
- **Inconsistency between sports:**
  - Each NGB defines levels of play differently, meaning lighting requirements vary widely by sport;
- **Generic versus detailed requirements:**
  - BS EN 12193 provides broad lighting classes, while NGB rules can be much more specific, creating gaps designers should reconcile;
- **Planning needs are separate:**
  - Sport England and local planning authorities focus on need, impact and environment, which fall outside technical standards and typically rely on ILP guidance;
  - Consideration should be given to any lighting requirements set out in local authority planning policies. For further information, see Part A 3 Planning;
- **Update cycles:**
  - Guidance is rarely updated simultaneously, causing temporary mismatches;
- **Multi-sport venues:**

  Designers have to consider a wide range of requirements for different sports, which could lead to unnecessary cost.

In such instances, resolution may be found by:

- Consulting with the NGB;
- Consulting with stakeholders;
- Reviewing the likely regular use of each sport;
- Reviewing the level of play and frequency of use at higher levels;
- Review of control systems and how they can be used to adapt lighting for each sport.

Where a facility is to be used for activities for which different lighting levels are needed, the lighting should be installed to cater for the most demanding set of lighting requirements.

Often it will be possible to provide a reduced level of lighting for the activities with lower lighting requirements, by selective switching or dimming of the luminaires, while maintaining uniformity across the playing surface.

For additional guidance, see Part A 2.10 Lighting controls.

2.3 General requirements

It is important that the lighting requirements of each sport are fully understood at the outset of a project. This requires an understanding of the nature of the sporting activity and key characteristics.

Many sports involve swift player actions and reactions and involve relatively small objects such as shuttlecocks and balls travelling within three dimensions at very high speed and at height.

Design considerations

Lighting installations for sport should balance the following issues within an integrated design:

- Players, users and their needs;
- Illuminance, of the playing surface and volume;
- Contrast, playing surface, foreground, background;
- Uniformity of illuminance and illuminance gradient;
- Contrast, on playing surface and surroundings;
- Surface finishes and reflectance;
- Glare control;
- Colour rendering;
- Compliance with statutory regulations.

For more information on the range of diverse user needs that may need to be considered, see Sport England's Accessible and inclusive sports facilities (AISF) Part A.

2.4 Sustainability

2.4.1 Circular lighting

A circular lighting approach replaces the traditional linear model by encouraging the reuse, refurbishment and recycling of lighting products.

It aims to reduce waste and resource use throughout the system's lifecycle by designing for longevity, enabling maintenance and upgrades, and ensuring components can be recovered and repurposed.

Lighting designers play a key role in shaping lighting projects and installations. By adopting circular economy principles, they can influence how lighting systems are designed, manufactured, procured, operated and eventually returned.

This holistic approach considers aesthetics, lighting quality, material impacts, energy efficiency, financing, maintenance needs, and opportunities for reuse or recycling.

For further guidance, see Part A 2.9.6 Circular lighting considerations.



Lancaster University Sports Centre
Image credit: David Millington

2.4.2 Biodiversity net gain (BNG)

BNG is a key consideration, requiring careful assessment of lighting impacts on biodiversity. For new and retrofit schemes, best practice is to design lighting that supports ecological resilience, minimises harm to wildlife, and enhances the site's natural value.

While BNG primarily focuses on habitats, species, and ecological connectivity, artificial lighting (including the consideration of light obtrusion from internal or external lighting systems), is recognised as a factor that may impact biodiversity, particularly nocturnal wildlife.

When designing lighting schemes for new developments, designers should consider mitigating light obtrusion to avoid adverse effects on sensitive habitats.

BNG principles can also be applied to retrofit projects, where upgrades to existing sports facilities, car parks and public spaces provide opportunities to reduce ecological impacts through the replacement of outdated lighting with modern, shielded and energy-efficient luminaires, alongside the introduction of timers and controls, and the removal of unnecessary lighting.

High colour temperature light sources may emit more blue-wavelength light and contribute more to sky glow, so specifying warmer light sources, and measures such as backspill shields, will help reduce spill light and protect ecologically sensitive areas.

While publications, e.g. ILP GN08, recommend very warm white light (2700K, or even 2200K) near sensitive habitats including watercourses, bat habitats, hedgerows, treelines, and commuting corridors, it may not be suitable for sporting activity. However, it may be considered for lighting associated roads, car parks and footpaths which may operate for longer periods if the playing area is timed to align with booking schedules.

For further information, see Part A 2.9.3 Correlated colour temperature, and Sport England's Biodiversity Net Gain (BNG) guidance.

Figure A2 Typical spectrum of white light

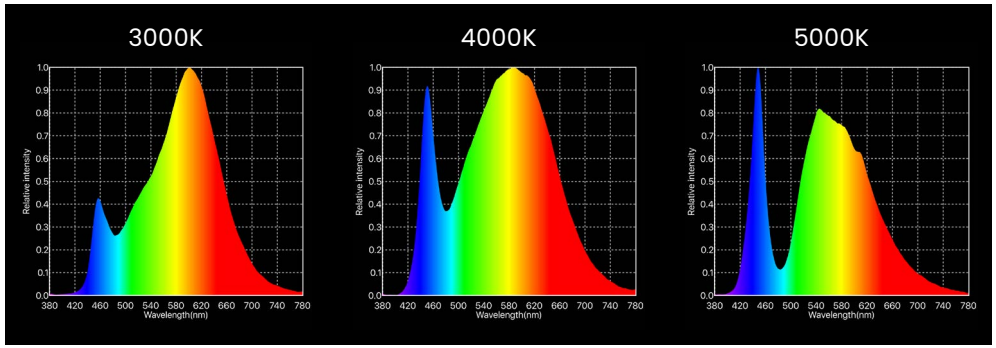
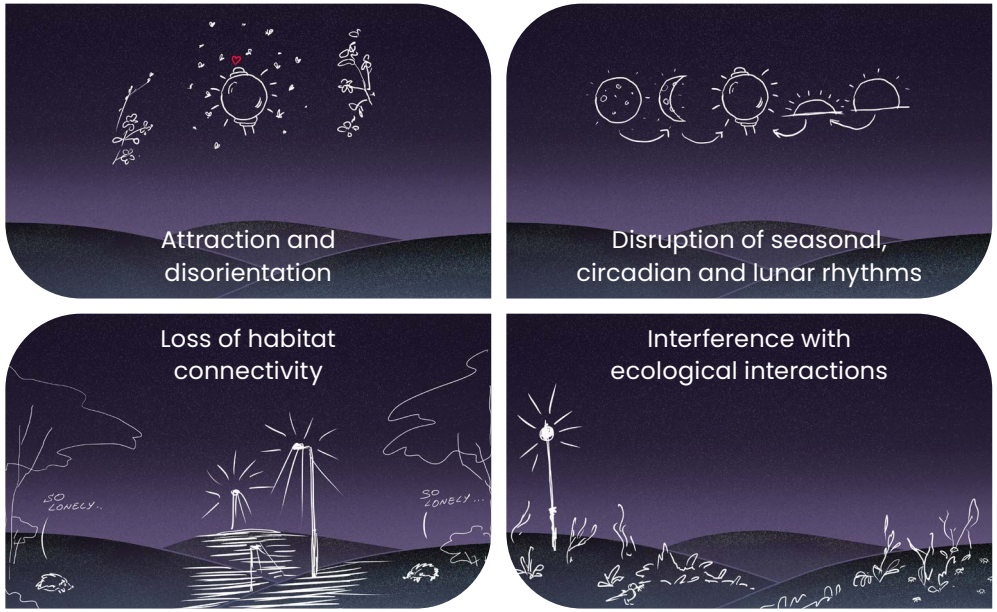


Figure A3 Four negative effects on wildlife

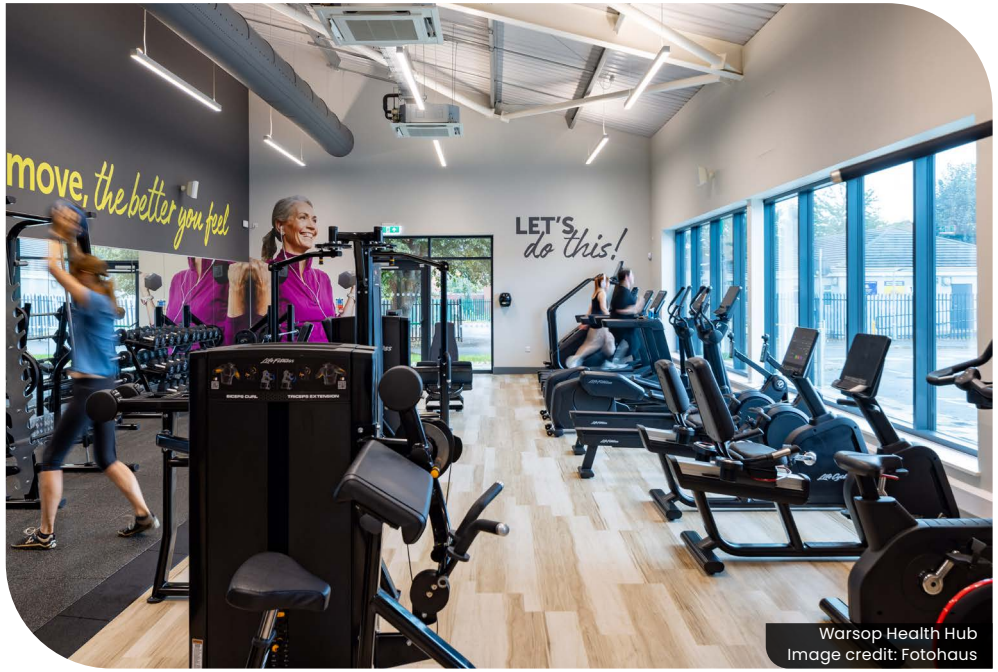


2.5 Daylight

Successful sports facility design requires a balance between visual quality, thermal comfort, energy performance and climate resilience. This helps ensure facilities remain safe, comfortable and fit for purpose under both current and future climate conditions.

Daylight should be recognised as more than an auxiliary source of illumination. When integrated effectively, it forms a key element of an overarching environmental strategy.

While this document focuses primarily on artificial sports lighting for both indoor and outdoor facilities, the starting point for artificial lighting design in many cases should be to make the best use of natural daylight first and then supplement with artificial lighting where and when required.



Warsop Health Hub
Image credit: Fotohaus

2.5.1 Benefits

Daylighting in sports facilities offers a range of benefits that enhance both performance and wellbeing.

Natural light supports visual acuity, helping users, players and spectators perceive movement, depth, and colour more accurately. This is especially important in fast-paced sports where tracking objects and reacting quickly is essential.

Beyond visual performance, daylight contributes to mental alertness and mood regulation, supporting circadian rhythms and reducing fatigue.

Exposure to natural light has been linked to improved concentration, particularly in environments where people may be located for long periods of time, for example sports tournaments, and reduced stress, making it valuable not only for players but also for other users, coaches, officials, and spectators.

Research has shown that sunlight has a unique non-physical property which induces psychological wellbeing.

Daylight can also provide excellent playing conditions and reduce energy consumption when balanced with artificial lighting.

Managing glare, reflection and contrast is essential to avoid discomfort or disability glare but when carefully integrated, daylighting enhances the overall experience in sports facilities, combining sustainability with high-quality visual and psychological outcomes.

Essentially, daylight can be thought of in a similar manner to artificial light sources, in terms of distribution, intensity and positioning to maintain a comfortable visual environment.



Discovery College
Image credit: Arup

Daylight can provide excellent playing and indoor activity conditions, and can reduce energy consumption when balanced with artificial lighting.

2.5.2 Using daylight

The use of natural light in indoor sports spaces to augment the artificial lighting system that would normally be required is an issue that often generates conflicting interests.

Any proposal to use natural light requires very careful consideration of how glare can be controlled and how reasonably stable and uniform levels of lighting can be ensured.

Similarly, the use of daylight should be carefully balanced with thermal comfort for the building occupants and the potential heat gains on the building systems.

Visual disturbance, such as glare, is most commonly caused by windows, which can create bright spots and excessive contrast in the areas where players are most sensitive.

Research shows that users including players and spectators, prefer a well-lit, uniform court with minimal glare, reflections, and minimal contrast in lighting between adjacent areas.

Direct sunlight or bright sky seen through windows or reflected from surfaces can cause discomfort or disability glare, which may unacceptably affect play, and pose a safety risk. However, with thoughtful design and appropriate measures incorporated, such risks can be mitigated.

When considering the use of daylight in a space, a risk assessment is required. The framework in Figure A4 on the following page is an example of a structured approach to assessing daylight-related risks and opportunities within sports facilities.

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The exact requirements of the risk assessment will be specific to the location, and the relevance and significance of each issue will depend on the specific characteristics of the project, the users involved, and the consequences of adverse visual conditions.

Daylight and artificial lighting should be considered as an integrated system, with design decisions and mitigation informed by the likelihood of the risk occurrence, the severity of impact, and the visual requirements of the sports activities and users.

Figure A4 Example of a risk assessment framework

Topic	Direct glare	Reflected glare	Vertical visibility	Control contrast	Daylight integration	User comfort	Safety and performance
Lighting objective	Minimise disability / discomfort glare from direct sunlight / skylight affecting players, officials and spectators.	Prevent visual disturbance caused by reflections from floors, walls, glazing or equipment.	Ensure adequate visibility of players, balls, equipment and facial recognition throughout the space.	Manage luminance ratios and brightness differences within the field of view.	Achieve effective integration of daylight and electric lighting to support operational flexibility.	Create a visually comfortable environment for all users, including those with sensory sensitivities.	Support safe movement, visual awareness and optimum sports performance.
Key questions	Does direct sunlight enter the playing volume? If so, how frequently does this occur and for what duration? How may glare affect users, and their ability to perform safely?	Are there surfaces creating distracting reflections, what frequency and duration? Could reflections affect ball tracking, player visibility or spectator comfort?	Are there sufficient vertical illuminance levels for safe play and visibility? Can players easily track balls against backgrounds and roof structures?	Are brightness contrasts causing visual adaptation issues? Do daylight conditions create excessively bright or dark zones?	Can daylight and electric lighting operate seamlessly together? Can lighting conditions be maintained consistently throughout the day?	Could daylight conditions adversely affect neurodivergent users or those with visual sensitivities? Are transitions between daylight and electric lighting smooth and comfortable?	Do daylight conditions support safe movement and athletic performance? Could glare or insufficient visibility increase safety risks?
Design measures to consider	Orient glazing and rooflights to control daylight penetration across playing and spectator areas.	Assess solar reflection hotspots, glare and bright sunlight penetration within critical sightlines.	Consider matt or diffusing finishes and balanced surface reflectance to limit specular reflections.	Provide balanced, diffuse daylight while minimising excessive contrast and sudden changes in brightness.	Use diffuse glazing with care, it can appear very intense with direct sunlight exposure.	Coordinate daylight openings, shading and glare controls with the electric lighting design.	Assess daylight across playing, run-off and circulation areas. Ensure daylight supports ball tracking and spatial awareness.
	Apply appropriate inclusive-design guidance, including PAS 6463: Design for the Mind. Neurodiversity and the Built Environment.						
Operational measures to consider	Can shading be adjusted according to season and time of day? How easy is it to adjust, and is it resilient to regular use?	Monitor reflective surfaces following refurbishment or replacement. Consider whether finishes need to be changed to avoid unwanted specular reflections.	Automatically supplement daylight with artificial lighting when vertical illumination falls below operational requirements.	Utilise dimming systems and daylight-linked controls to maintain consistent visual conditions.	Operate sensor-based lighting controls. Maintain commissioning settings. Adjust controls for different activities and events.	Train staff to manage shading systems and lighting controls or make them intuitive to operate by the users. Review user feedback and adjust settings where necessary.	Establish operational procedures for managing challenging daylight conditions. Maintain lighting control systems and shading devices.

Cont/d...

While natural lighting in indoor sports facilities should be carefully managed, it can offer significant benefits when designed appropriately.

Rooflights, for example, can be fitted with diffusing layers to soften incoming daylight and distribute it evenly across the playing area or internal space.

Placing the rooflights between courts or using manual / motorised blackout blinds may form mitigation for glare-sensitive activities like badminton, ensuring optimal conditions without compromising flexibility.

Artificial lighting systems can also be integrated with daylight-responsive controls, automatically adjusting output to maintain consistent illumination levels.

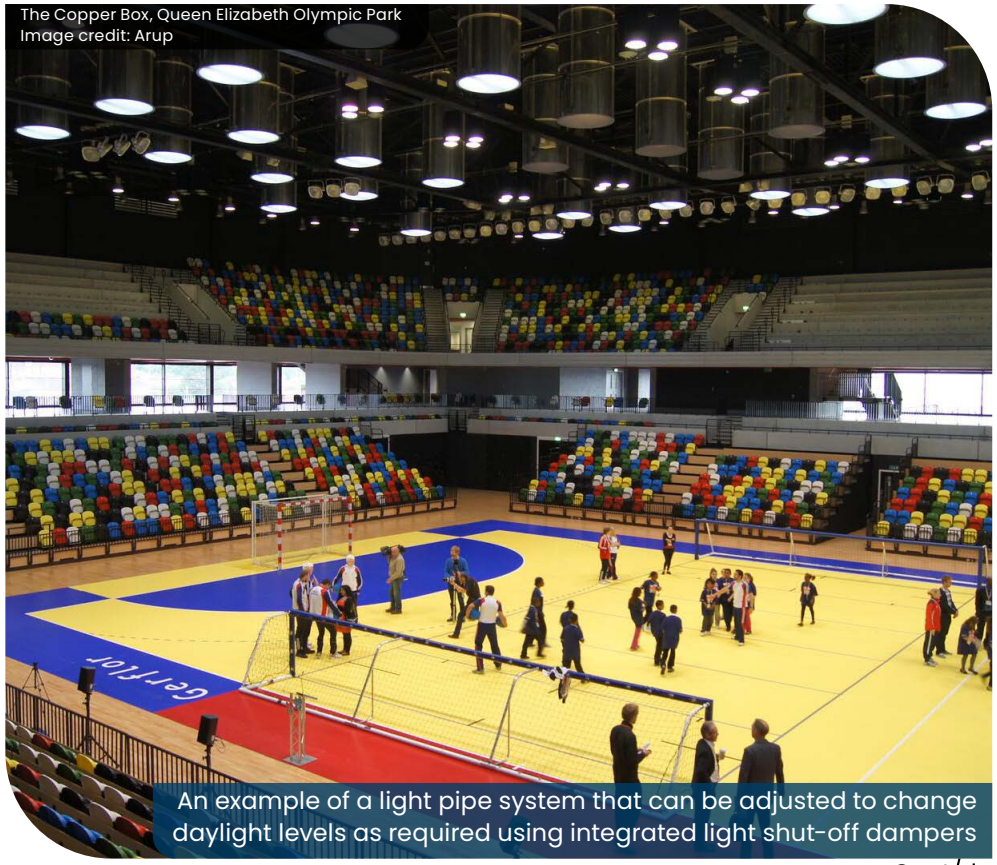
While some solutions may involve additional capital costs, these should be weighed against long-term energy savings and the wellbeing benefits of natural light.

Daylight delivered overhead, via rooflights, can achieve good levels of natural light and visual comfort for users, players and spectators, and it generally provides more uniform and higher-quality lighting on the court compared to windows.

This is because rooflights place potential glare sources in less sensitive areas of the visual field, reducing the risk of discomfort.

Daylight delivered overhead, via rooflights, can achieve good levels of natural light and visual comfort for users, players and spectators.

The Copper Box, Queen Elizabeth Olympic Park
Image credit: Arup



An example of a light pipe system that can be adjusted to change daylight levels as required using integrated light shut-off dampers

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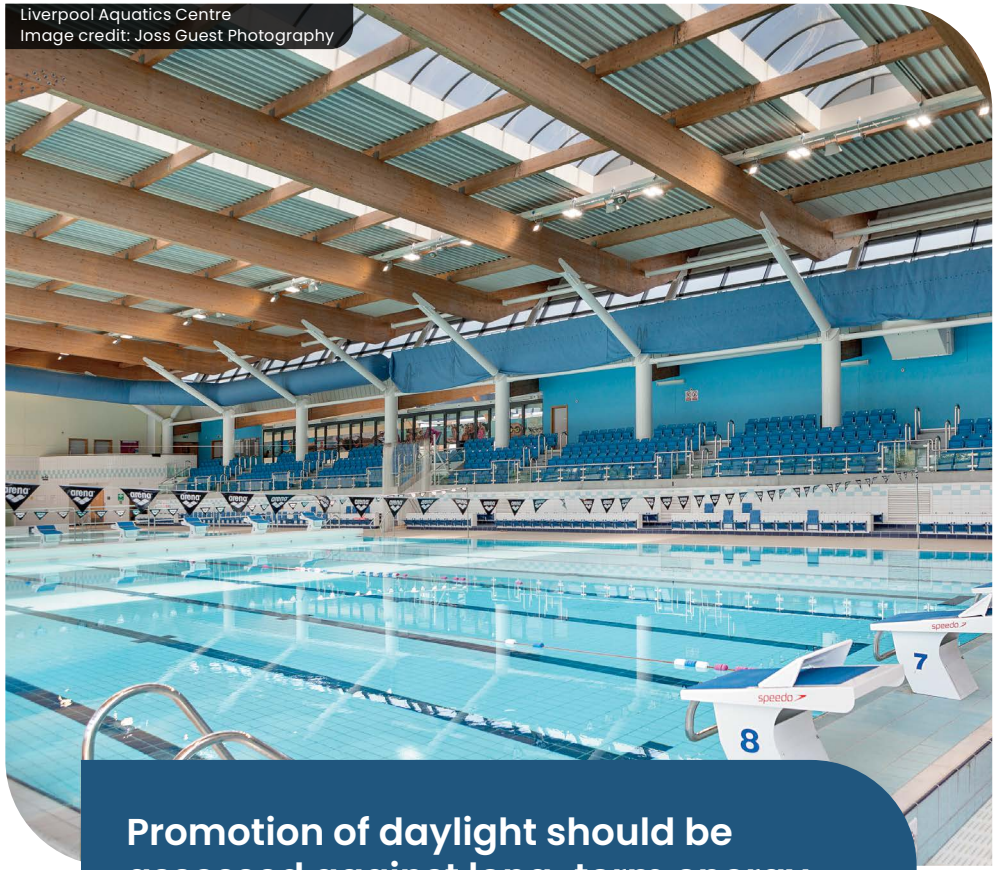
However, problems such as glare and visual discomfort can still occur, especially when no proper daylight / sunlight controls or shading devices are available to customise the environment for users and the time of day / season.

Advice from a daylight consultant should be sought on the positioning of rooflights to avoid direct daylight glare over playing courts or reflected glare from the playing surface.

Promotion of daylight should be assessed against long-term energy savings, potential heat gains, visual comfort, and the overall enhancement of the indoor environment.

Ultimately, value for money is achieved through a balanced approach that considers capital expenditure and energy efficiency, alongside operational performance, user wellbeing, and the quality and adaptability of the sports facility.

For further information, also refer to Sport England's guidance on Reducing energy costs.



Promotion of daylight should be assessed against long-term energy savings, potential heat gains, visual comfort, and the overall enhancement of the indoor environment.

2.6 Developing a design strategy

Table A1 below summarises the key steps in developing a lighting design strategy.

Table A1 A lighting design strategy

Stage	Design strategy	Comment
Inception	Define scope, objectives, outline budget and KPIs / success criteria.	Client to write a brief of the project.
	Conduct stakeholder mapping to identify key consultees and decision-makers.	
	Initiate site visits (for a new development) to understand constraints and opportunities.	
	Identify priority sports and NGBs.	
	Client to outline the specialist advisors necessary for the project. Design teams to agree on roles, responsibilities, and timelines.	See Part A 1.3.
	Review procurement options.	
Early engagement	Engage user groups to capture functional requirements. Consider factors such as social inclusion, age demographics, change of sporting use (e.g. badminton courts changing to pickleball) to inform the engagement.	Facility users - who are they, what are their lighting needs, what level will they perform, duration, frequency of activity etc.? External - Site / building - what are the constraints, who are the neighbours, what could be the impact?
	Stakeholders – who are they, who are the decision makers, who are the consultees, what are their concerns, what information do they need to facilitate the lighting scheme.	What is the role of the planning authority, what information might they need, what format, what do they need to request, how do they interpret the data?
	Funding conversations – are there measures necessary to unlock funding for the scheme?	

Cont/d...

Table A1 A lighting design strategy cont/d...

Stage	Design strategy	Comment
Developing the lighting concept	Confirm the layout(s) of sports areas and the anticipated uses.	Analyse and prioritise in terms of programme and building operation.
	Define the volume(s) of the field(s) of play.	
	Identify adjacent areas with visual connectivity, e.g., spectators' areas, housing overlooking a multi-use games pitch.	Who else is affected by the lighting where special attention is required?
	Consider the environmental impact factors.	Review the impact on humans, wildlife and biodiversity, while identifying mitigation measures.
	Establish the general lighting requirements for general illuminations.	See BS EN 12193, SLL LG4 (CIBSE).
	Establish the NGBs detailed requirements and the pattern of luminaires to be switched around individual courts (in a multi-sports situation procurement options).	See Sport England / NGB requirements and establish / resolve any conflicts with industry references.
Planning approval	A pre-application meeting with the local planning authority (LPA) will ensure they fully understand the proposed scheme. It is an opportunity to seek their input regarding relevant planning policies and clarify their expectations for the information required within the planning application. The discussions should cover lighting effects, lighting equipment, and lighting performance, with the aim of achieving compliance with established guidance, such as the ILP Guidance Notes, and adhering to environmental considerations. You may need to organise workshops and interviews with technical experts and community representatives. Share visualisations and concept options for feedback before finalisation.	Establish the schedule of information required for the planning application. Guidance from a planning consultant / specialist is recommended as an Environmental Impact Assessment may be necessary, particularly on larger projects, in residential neighbourhoods, in intrinsically dark environments.

Cont/d...

Table A1 A lighting design strategy cont/d...

Stage	Design strategy	Comment
Design development	Iterative design reviews with stakeholders at key milestones (e.g. 25%, 50%, 75% completion).	Incorporate feedback into design solutions and specifications.
	Finalise design documentation and specifications.	Design evidence data (light spill diagrams etc.) that planning conditions will be met, may need to be submitted to the local planning authority.
Construction	Contractor / Installer: Executes installation to specification.	
	Commissioning, testing and verifying performance.	For external projects, you may need a lighting specialist to help confirm the lighting is correctly installed and aimed, as per the design. This may require giving evidence to NGBs on the illumination performance or may require evidence to be submitted to the planning authority (e.g. to discharge conditions on light obtrusive impact).
Post-handover	Monitor implementation and measure engagement success against agreed metrics.	Verifying that lighting performs as intended in practice, supports user satisfaction, energy efficiency, compliance and safety. It enables optimisation of controls, identification of maintenance needs, and early resolution of issues such as glare, uneven illumination or obtrusive light impacts.
	There may need to be a post-occupancy monitoring phase to ensure compliance, optimise control systems or consider mitigation of external lighting and obtrusive light effects.	

2.6.1 The lighting journey

Good lighting design goes beyond compliance with illuminance levels. It should focus primarily on the human experience, creating spaces for functionality and performance, as much as considering the transition from one space to the next, guiding people through an intentional and cohesive journey.

A well-considered lighting journey will create a welcoming, interesting, accessible and positive sporting environment and improve the perception of safety for users of the sports facility.

Avoiding abrupt changes in light between spaces requiring different lighting treatment will help deliver a smoother visual experience. Lighting can then support user orientation but guide visitors intuitively from arrival to activity.

Managing glare throughout the journey helps reduce visual stress, assisting all users in navigation and performance in the sports facility.

In essence, thoughtful lighting fosters comfort, reinforces brand identity, and elevates the overall experience. Conversely, poor lighting design may risk disorientation, safety hazards, poor l evels of accessibility and inclusivity, and a negative impression of the facility.

This is especially important on larger sports facilities, where different designers may have responsibilities for different areas, it is key that all lighting designers collaborate closely, to maintain visual consistency and cohesion across the entire site.

According to BS EN 12464, recommended illuminance levels follow a logarithmic progression, e.g.:

5 - 7.5 - 10 - 15 - 20 - 30 - 50 - 75 - 100 - 150 - 200 - 300 - 500 - 750 lux.

To maintain visual comfort and avoid abrupt transitions, lighting design should prevent more than two-step changes in illuminance between adjacent spaces.

This principle ensures a gradual adaptation of the human eye, reducing discomfort and enhancing spatial perception.

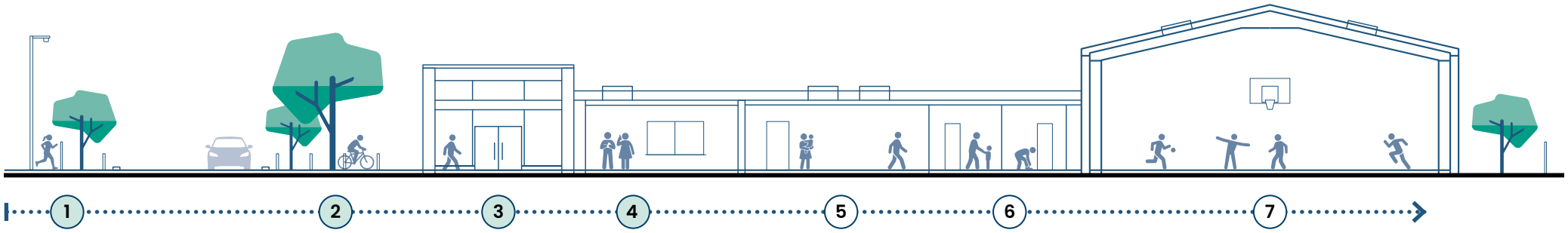
By adhering to this scale, designers can create environments where changes in brightness feel natural and intuitive, supporting both visual performance and aesthetic continuity.

Figure A5 on the following pages presents an example lighting journey through a sports facility, highlighting key lighting considerations at each stage of the user experience.

A well-considered lighting journey will create a welcoming, interesting, accessible and positive sporting environment and improve the perception of safety for users of the sports facility.

Cont/d...

Figure A5 Example lighting journey



1 Arrival at the site boundary



- Lighting should signal the transition from public to private space and define a clear route into the site;
- The lighting levels should transition smoothly into the site to avoid contrast;
- Illumination of the main entrance will help define its destination from the site boundary.

2 Entering the site



- Creating a sense of progression with layered lighting, brighter near paths and entrances, softer at landscaped edges. This helps visitors orient themselves and feel guided toward the main entrance without confusion;
- Ensure accessible parking spaces are clearly identified.

3 Facility entrance



- The entrance should act as a clear focal point, with lighting that smoothly manages the transition between lower external levels and brighter interior levels;
- Accent lighting can highlight doors and signage, improving visibility while balancing safety, warmth and a welcoming sense of arrival.

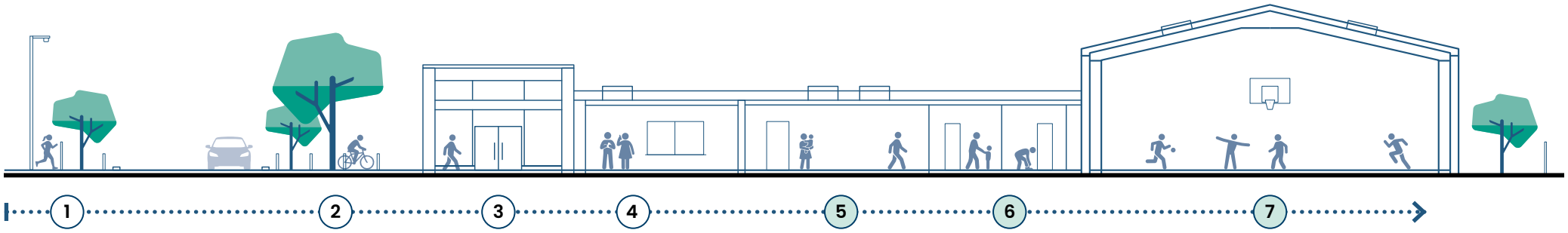
4 Reception / foyer



- Continuing the transitional approach from the outside to the entrance, lighting continues to lead the user into the facility and help them adapt to the brighter internal space;
- Warm white light colours may create a relaxed and welcoming ambience, particularly in the retail or café spaces.

Cont/d...

Figure A5 Example lighting journey cont/d...



5 Circulation



- Circulation lighting should provide consistent illumination, with brighter visual cues at intersections to support clear navigation;
- As occupancy levels vary, lighting should be optimised in conjunction with available daylight and usage patterns to maintain appropriate illumination levels throughout the day.

6 Changing rooms



- While typically considered as functional spaces, changing rooms are the penultimate stage of the lighting journey as they prepare the user for the highest levels of light that will be experienced in the sports area.

7 Sports area



- Lighting should meet performance standards for visibility and safety;
- Compared to other areas of the building, cooler-white light may be used to define this as a key active space, with high uniformity, minimal shadows, and appropriate colour rendering for all users.




Melksham Community Campus
Image credit: Fotohaus

2.6.2 How lighting interacts with the facility

Inter-relationships in the design of sports lighting are outlined below and are also considered later in this design guidance.

- Inter-relationships with building design elements such as:
  - Reflectance, visual contrast and the colour of playing surfaces (including water in swimming pools);
  - Variation in background surface reflectance and finish (e.g. matt versus gloss);
  - Configuration of walls and roof and their relationship with the field of play;
  - Spatial coordination with the playing area (to avoid glare to users, players, referees etc.);
  - Spatial coordination of lighting equipment with roof structures, other services and externally with lighting columns and safety zones around the field of play.
- Wider inter-relationships with issues such as:
  - Understanding the individual users, and the level of play and competition required at the facility;
  - User satisfaction and comfort, on the field of play and across the facility;
  - Modelling and perception of the playing object at speed, through the air;
  - Focus on sustainability in terms of whole project lifecycles, equipment longevity, and end of life equipment disposal / recycling;

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- Enabling access to sports facilities for all users, user comfort, and ensuring a safe 'kerb-to-court' journey;
- Thinking about the user journey from arrival at the site, to navigation through the facility and departure after the session;
- Energy usage and optimisation based on occupancy;
- Environmental factors, such as obtrusive light (light pollution);
- Availability of a suitable electrical supply.

- Health and safety issues such as:
  - Identifying and mitigating risk early in the design process;
  - Considering measures to enable safer maintenance of lighting equipment mounted at height;
  - Considering the resilience the electrical systems to securely provide lighting, especially in fast moving sports such as cricket and hockey;
  - Avoiding glare and distraction from the light sources;
  - Ensuring a high-quality visual environment to manage players' safety, for example in swimming pools where lifeguards need to see into the basin;
  - Consider the long-term benefits of luminaire quality and longevity to minimise working at height, maintenance labour, and exposure to hazards and disruption;
  - Design for ease of access to luminaires, to maintain a consistent lighting environment;
  - Plan for routine cleaning and replacement without disruption;
  - Management of lighting using controls to optimise energy use.

For sport-specific lighting requirements, consult Sport England's suite of Design and cost guidance, the relevant NGB guidance, and the SLL LG4.

For further information, also refer to Sport England's Reducing energy costs guidance.



Warsop Health Hub
Image credit: Fotohaus

2.6.3 Visual impact

When considering any external lighting for sports facilities, it is important to recognise that lighting impact extends beyond just sports lighting on the field of play. The effects of illumination can influence various aspects of a site, including car parks, pathways, functional lighting, façade lighting and signage.

Therefore, the visual impact of external lighting scheme should be considered in terms of the daytime (view of the lighting masts and equipment), and obtrusive light (possible impact of the lighting at night).

As noted in Part A 1.3 (Professional advice), consultation is essential to ensure minimal disturbance to the surrounding environment and community.



Stone Leisure Centre - Day view
Image Credit: Roberts Limbrick



Stone Leisure Centre - Night view
Image Credit: Roberts Limbrick

2.6.4 Daytime visual impact

A daytime visual impact assessment may be required to assess how sports lighting masts affect the landscape and views. Key factors include landscape character, visibility from sensitive viewpoints, and mast's scale, form, and contrast with its surroundings.

Assessing receptor sensitivity is key, as residential, scenic or heritage areas are more vulnerable to change. A visual impact assessment should identify potential impacts on amenity and guide mitigation measures (e.g. using base hinged, or telescopic masts to avoid daytime visibility). The goal is to balance the lighting infrastructure requirements with environmental and community concerns.

Specialist consultants can produce visual impact studies that include contour plans and sections to show the extent of the area around the pitch which would be affected by light spillage. These are helpful for initial feasibility studies and decisions about the optimum location of a pitch on the site and are likely to be required to support applications for statutory consents.

2.6.5 Obtrusive light

Light obtrusion (light pollution) is the excessive or misdirected artificial light from human activity. It occurs when lighting systems, such as sports lighting or internal illumination through glazed façades, are poorly designed, controlled, or maintained, resulting in unwanted brightness that disrupts the natural night environment.

Light pollution leads to inefficiency, increased costs, nuisance for residents, disruption of nocturnal wildlife, and a reduction in overall night-sky quality. Manifestations include glare, sky glow, and spill light entering neighbouring properties.

Cont/d...

Consultation with specialist lighting designers is recommended, especially when planning authorities have concerns regarding lighting performance. Their expertise ensures robust design, assessment and compliance with environmental guidelines to limit the impact of light obtrusion.

Dark Sky International[1] recommends five principles in its Outdoor Sports Lighting Program, which help define the design approach:

1. All lighting should have a clear purpose.
2. Lighting should be directed only to where it is needed.
3. Lighting should be no brighter than necessary.
4. Lighting should be used only when it is useful.
5. Warmer colour luminaires should be used where possible.

Lighting controls (see Part A 2.10) form a key part of managing obtrusive light, e.g., dimming lighting between sessions to circulation levels, week-night time scheduling, and considering seasonal timing of lighting to reduce impact on nocturnal wildlife.

An environmental zone designation, as outlined in ILP Guidance Note 1 (GN01) The Avoidance of Obtrusive Light, guides the management of artificial lighting based on local sensitivity.

Categorising areas by zone (see Table A2) enables planners and designers to set suitable lighting limits, minimising obtrusive light and protecting wildlife and residential amenity.

When an area to be lit lies within visual distance of the boundary between two zones, then the obtrusive light values applicable to the most onerous zone shall apply.

The local nocturnal context determines the necessary thresholds for lighting and mitigation measures for each location.

Table A2 ILP GN01 Lighting environmental zones

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Intrinsically dark.	UNESCO starlight reserves, IDA dark sky places.
E1	Natural	Dark.	National Parks, Areas of Outstanding Natural Beauty etc.
E2	Rural	Low district brightness.	Village or relatively dark outer suburban locations.
E3	Suburban	Medium district brightness.	Small town centres or suburban locations.
E4	Urban	High district brightness.	Town / City centres with high levels of nighttime activity.

Further guidance can be found in freely available publications such as ILP GN08 (Bats and Artificial Lighting) and the Dark Sky International Outdoor Sports Lighting Program.

For guidance on the assessment of sports lighting within the planning application process, see Part A 3 Planning.

1 Dark Sky International is a global nonprofit organisation dedicated to protecting night skies and reducing light pollution through advocacy, education, and conservation.

2.6.6 Colours of surfaces

The visibility of playing objects depends on the balance between their brightness and that of surrounding surfaces. Therefore, excessive contrast or dark backgrounds can make viewing difficult, while moderate, consistent luminance supports visual adaptation.

The colours of the surfaces in a sports hall (walls, ceiling, floors, dividing nets etc.) should complement rather than compete, helping playing objects stand out clearly.

For example, a mid-tone colour surface helps badminton players see a white shuttlecock and lighter-tone colour helps players see the flight of a red cricket ball.

Conversely the ball colour may need to be chosen to suit the venue, or the lighting of the venue.

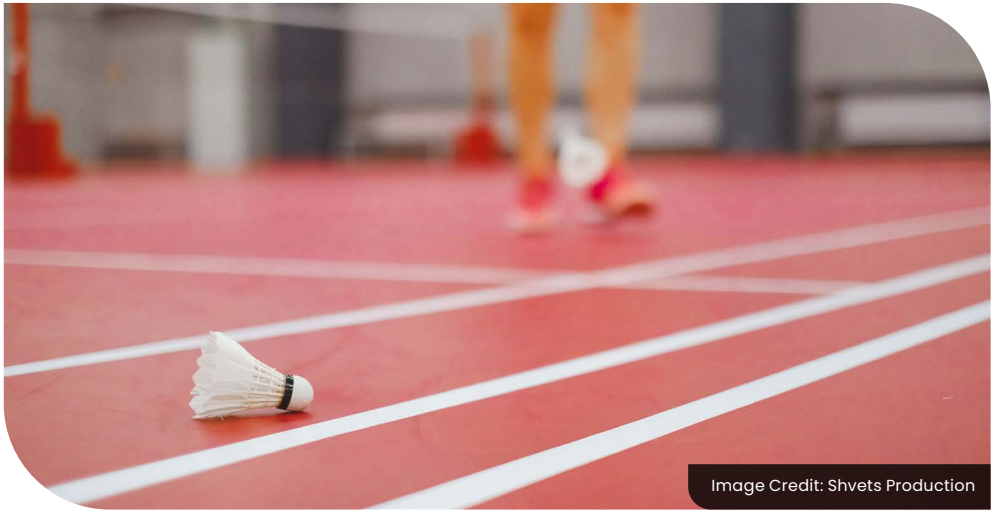


Image Credit: Shvets Production

2.7 Accessibility

Accessible, inclusive sports lighting supports safety, performance and dignity for everyone, across ages, abilities, and sensory needs. Good design starts with early consultation, clear objectives and whole-journey thinking (arrival - orientation - play - departure).

Priorities include consistent illumination, glare control, smooth transitions between spaces, high colour rendering where it adds value, and flicker-free operation.

Lighting controls should be simple, accessible, and enable lighting to be adaptable to needs. For information on luminaire specifications, see Part A 2.9.

Lighting design should consider the needs of neurodivergent users, people with visual impairments, wheelchair users, children and older adults, so that navigation, cues and task visibility are easy for everyone.

It is also important to plan for ongoing maintenance and testing to ensure this inclusive quality is maintained throughout the life of the facility.

Lighting design should consider the needs of neurodivergent users, people with visual impairments, wheelchair users, children and older adults, so that navigation, cues and task visibility are easy for everyone.

Cont/d...

Daylight supports wellbeing but should be managed, avoiding sharp direct sunlight in critical spaces, and enjoying the benefits from diffuse light where possible.

Provide shading and automatic controls to stabilise illuminance due to daylight and prevent glare and thermal load. Manual overrides should also be available.

Lighting determines whether spaces feel legible, safe and welcoming:

- **For players and official:** appropriate illuminance, sufficient contrast, vertical light and good colour rendering improve object recognition, depth judgment and decision-making.
- **For spectators and public users:** consistent, glare-controlled lighting reduces fatigue and anxiety, aiding orientation and wayfinding.

Poorly considered lighting can impact accessibility, for example:

- Flicker may trigger headaches or seizures;
- Veiling reflections can obscure surfaces and signage;
- Harsh contrasts disorient those with reduced visual acuity or slower adaptation.

In short, inclusive lighting improves equity of access, reduces incidents, and enhances enjoyment, turning facilities into places people want to return to, not just venues they can technically use.

Also refer to Sport England's AISF guidance.



Anchor design decisions in recognised guidance and user evidence. Useful references include:

- BS8300-2: Design of an accessible and inclusive built environment. Buildings. Code of practice;
- PAS 6463: Design for the Mind. Neurodiversity and the Built Environment;
- SLL Lighting Factfile 19 (LF19) Lighting for neurodiversity.

2.8 Sports lighting performance

2.8.1 Codes and standards

Design codes and standards that provide guidance on lighting performance for various indoor and outdoor sports including British Standards, Codes of Practice, lighting guides, and design guides published by the NGBs, are listed in Part D.

Design codes and standards are provided for information only. As described in Part A 1, early consultation with stakeholders, NGBs, facility operators, local authorities, and neighbouring communities, is critical to ensure the appropriate lighting conditions are agreed and applied in the design.

2.8.2 Volume of the field of play

The whole of the three-dimensional volume above and including the field of play should be considered, rather than just the two-dimensional surface of the playing area. This can include:

- Safety zones around the playing area;
- Space reserved for officials and team benches;
- The underwater volume in the case of a swimming pool;
- Vertical volume (e.g. rugby, field sports, diving);
- Spectator facilities.

For sports where height above the playing area plays a significant role (e.g. badminton, athletics throwing events, cricket and rugby), lighting design should address both horizontal and vertical planes to illuminate the entire playing volume.

This ensures that users, players, officials, and spectators can clearly see and track the playing object through the air.

Figure A6 Volume of the field of play

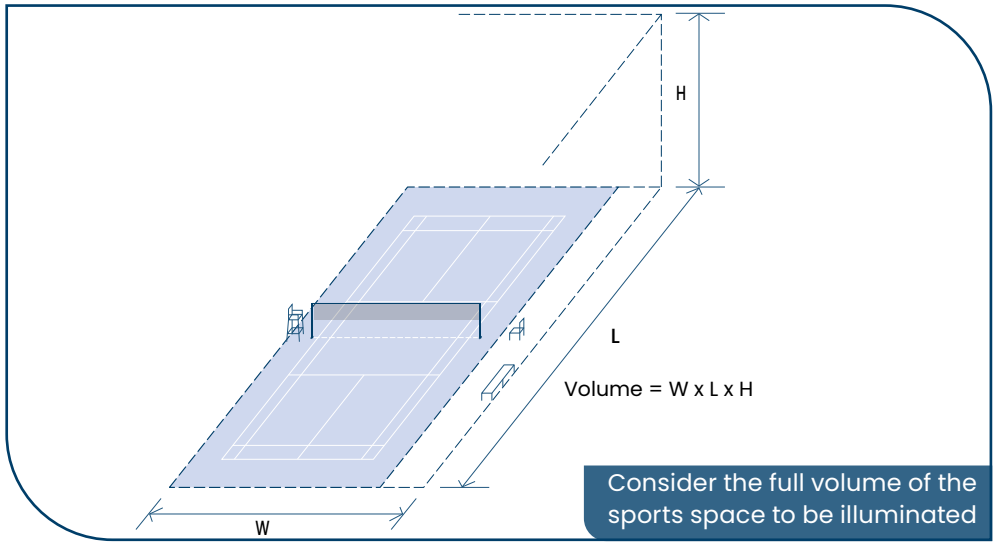


Table A3 on page 45 provides lighting considerations for various sports regarding the necessary illuminated space above the field.

Uniformity of light within this volume is also essential (see Part A 2.8.4). In addition to the main playing area, lighting should include safety or run-off zones, making up the total area. Both surface and overhead lighting levels in all zones require attention.

For further information, refer to Sport England's Sport-specific guidance.

For a comparison of space requirements specific to a range of indoor and outdoor sports, also refer to Sport England's 'Comparative Sizes of Sports Pitches and Courts' guidance.

Cont/d...

Table A3 Volume of the field of play considerations

Sport	Vertical lighting consideration	Comment
Court sports, e.g., badminton and tennis	Flight of playing object typically below 5 m above the court.	Be careful to avoid LED downlights with sharp cut-off cones of light. At high level, these will result in the ball appearing to be flickering as it passes through the beams. Consider a higher quantity of distributed luminaires rather than fewer higher-powered luminaires. Consider whether illumination of the soffit may improve or have a negative impact on visibility of the ball or shuttle.
Small ball, high speed aerial sports, e.g., lacrosse and hurling, cricket and tennis	4 m flight.	These are many fast paced, airborne sports with a small object, play is often above shoulder height and uniformity gradient above ground level is critical for visibility of the ball.
Large ball, lower speed flight, e.g., rugby	Flight of the ball can exceed the height of the goal posts.	Consider height of the sports lighting system to provide even illumination at pitch level and aerially. Consider implication on obtrusive light.
High velocity object sports, e.g., athletics javelin	Flight of javelin or discus.	Both sports are focused on throwing over a large horizontal distance rather gaining height. In professional circles, 12 m is the likely maximum height of javelin, and 8 m for a discus. With the athletics field typically in the centre of a running track, obtaining good aerial uniformity at these heights, using from a perimeter sport lighting system should be possible.
High range sports	Athlete rising / falling in a confined vertical area.	The athlete travels from high to low level on a local area close to the diving board or high jump. Vertical height of the luminaires focused on these is a key consideration, and the uniformity gradient of light should be consistent over the vertical falling distance. Glare should be avoided to the divers when standing on the diving platform. The proximity and aiming of the lighting near the diving boards is a key consideration in these locations to minimise glare towards the divers, and towards the judges below.

2.8.3 Horizontal and vertical illuminance

Lighting references, best practice case studies and design guides generally specify 'horizontal illuminance', i.e., illuminance on the horizontal plane.

There is, however, a requirement for suitable and sufficient vertical illuminance, e.g., on the bodies of participants and on the equipment required for the playing of sports.

Calculations are therefore based upon the reasoning that when the values of horizontal illuminance specified are attained, the corresponding values of vertical illuminance required for the safe and efficient playing of a sport are usually simultaneously achieved.

Values of vertical illuminance should not be less than 30% of the corresponding simultaneous horizontal values, measured at the same locations:

- Vertical illuminance values are typically measured 1 m above court level;
- Horizontal illuminance is measured on the court surface.

When vertical illuminance is critical, it is separately specified, calculated and measured.
Always refer to the relevant NGB guidance as the vertical levels may not always be measured at 1 m.

As a further general guideline, the focus point angle of LED luminaires should not exceed 60°, measured from the line perpendicular to the playing surface. For example, a symmetric luminaire (with an uplight cowl) should not be tilted above 60°, or a 60° asymmetric should not be tilted above horizontal.

See Part A 2.11.2 External luminaires for further guidance.

Figure A7 Horizontal and vertical illuminance

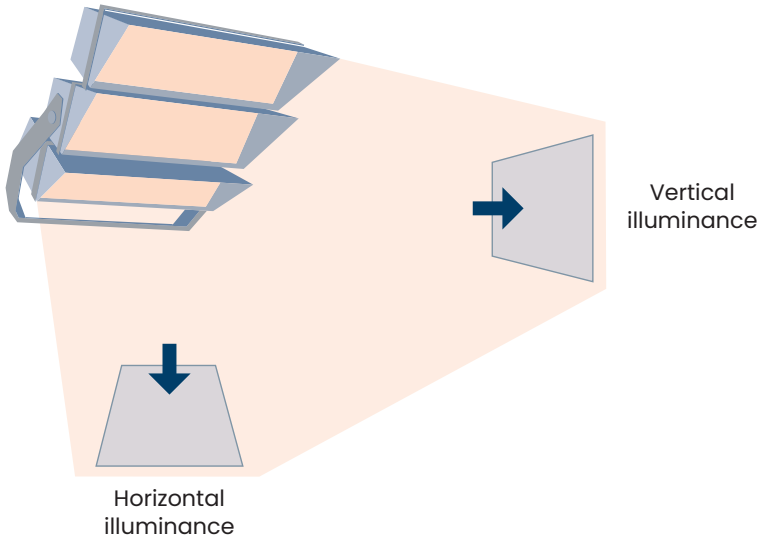
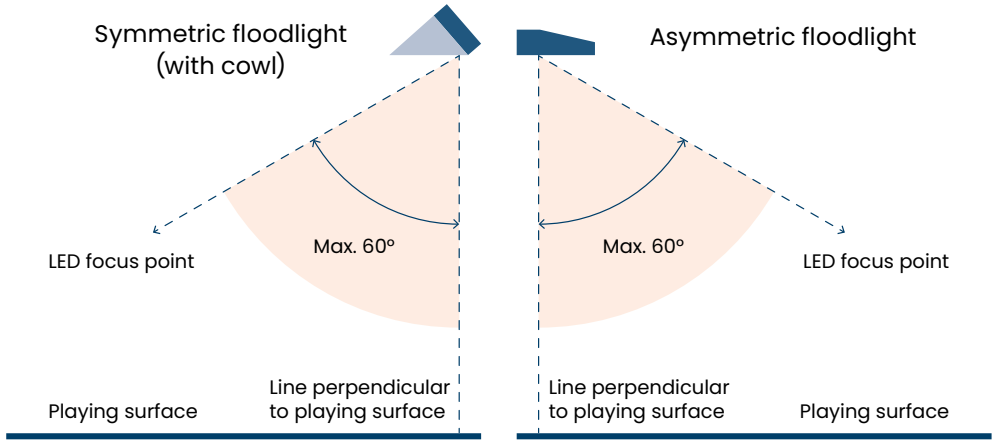


Figure A8 Luminaires focus point angle



2.8.4 Uniformity of illumination

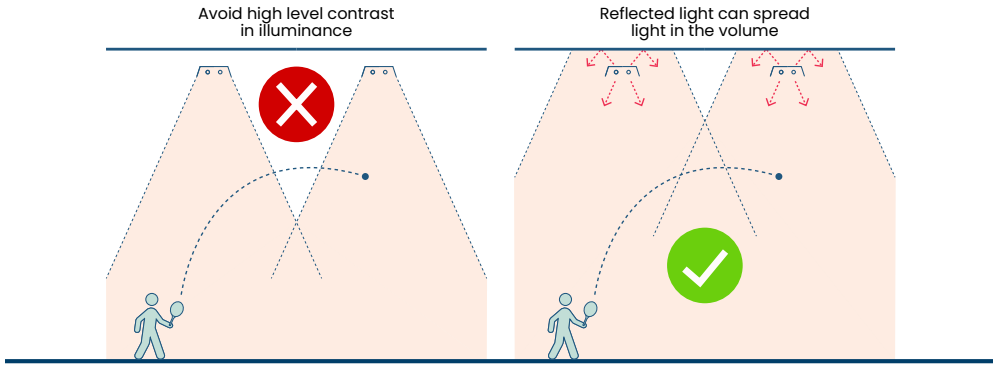
The field of play should be illuminated evenly to create equal playing conditions for all occupants and to create a consistent level of visibility so that those taking part, or watching, can follow the action.

Changes in illuminance levels can create difficulties in judging the speed and the trajectory of the playing object. It is generally expressed as a ratio between minimum to average illuminance.

Uniformity can be achieved by combining appropriate luminaire spacing in proportion to their mounting height to ensure overlapping light distributions and avoiding narrow beam luminaires. Closer spacing with lower output luminaires typically provides a more uniform outcome than fewer widely-spaced high-output luminaires.

LED luminaires can have a more focused optical systems, which can cause noticeable changes in brightness as an object moves from one beam of light to another, especially within the upper volume of the field of play.

Figure A9 Even illumination



Even illumination is required in the full volume of the field play

It may therefore be necessary to review the lighting spacing arrangements when retrofitting from lamp technology to LED technology to maintain good consistent lighting within the volume.

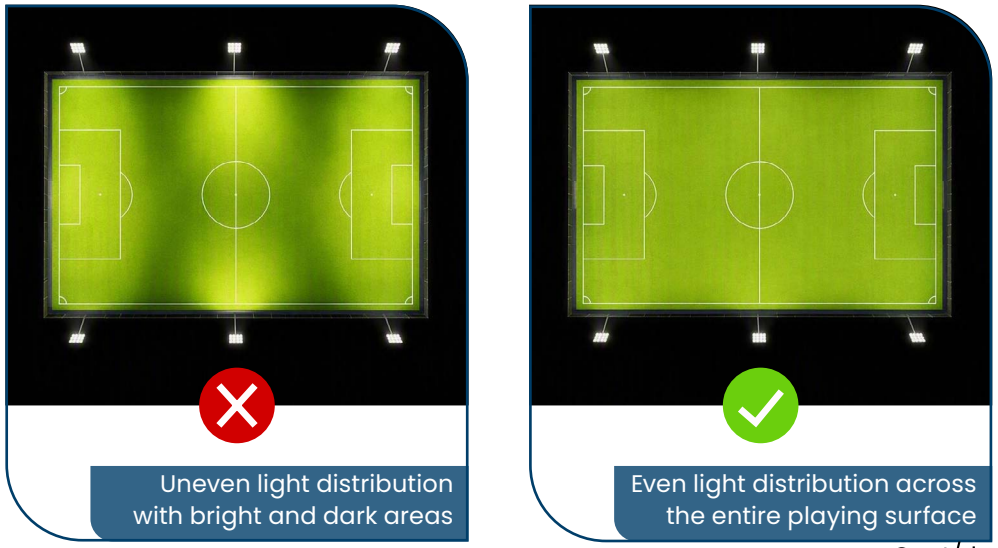
2.8.5 Uniformity gradient

Designing sports lighting involves meeting horizontal illuminance and uniformity ratio requirements. Some sports also require controlled illuminance gradients to prevent abrupt changes and banding on the playing area.

Using regularly arranged luminaires or lighting masts is likely to improve both uniformity and uniformity gradient (UG), while widely placed or too few luminaires may lead to shadows and uneven lighting.

Consistent lighting ensures safety, fairness, and proper perception of movement.

Figure A10 Correct and incorrect uniformity



Uneven light distribution with bright and dark areas

Even light distribution across the entire playing surface

Cont/d...

The UG, as defined by BS EN 12193 and LG4, tracks brightness changes between grid points; a low UG maintains smooth transitions, reduces discomfort, and supports player performance and spectator experience.

Some NGBs may use Minimum Adjacent Uniformity Ratio (MAUR) to assess the gradient of illuminance.

The example of MAUR in the diagram below shows the secondary reference points that are considered in relation to a primary reference point. In this case, the primary reference point is 28, and the secondary reference points are 16, 29, 40 and 27.

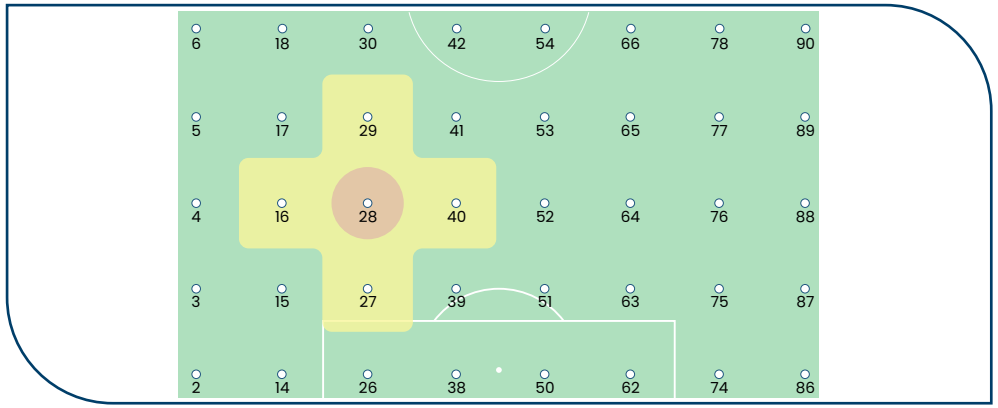
MAUR evaluation: Reference point 28 on the horizontal plane.

Reference point 28: Eh = 500 lux

MAUR > 0.60

The illuminance value at the secondary reference points 16, 29, 40 and 27 on the horizontal plane must be greater than 500 x 0.60 = 300 lux, and less than 500 x 1.4 = 700 lux.

Figure A11 Example of MAUR on the horizontal plane



2.8.6 Glare

The experience of glare can be described in two ways:

- **Discomfort glare:** is where bright light sources or excessive contrast cause visual annoyance or discomfort, without necessarily reducing the ability to see objects clearly;
- **Disability glare:** by contrast, directly reduces visual performance by scattering light within the eye, lowering contrast and making it difficult to see objects clearly.

In sports environments, disability glare is particularly critical, as it can momentarily prevent players from tracking the ball or judging spatial relationships, potentially affecting performance and safety.

The complete elimination of glare in sport settings is difficult to achieve due to the ever-changing direction of view of the participants. Nevertheless, measures should be taken to minimise glare that may adversely affect participants' visual performance.

When considering glare minimisation, the following aspects should be addressed:

- **Product considerations:** These include the use of baffles, louvres, deep-set LEDs, and other physical features of the luminaire that help control light spill and reduce direct glare. Very compact light sources may be more susceptible to glare;
- **Photometric considerations:** Factors such as high light intensity, luminance of the light emitting surface, and the size of the light source, all of which affect the distribution and perception of glare within the space;

Cont/d...

- **Location considerations:** Geometric factors including exclusion zones around the playing area, high aiming angles, luminaire height, background / soffit luminance, and limiting a direct view into the light source influence how glare is perceived by the users. Consider key player / user viewpoints for glare mitigation, e.g., backstroke swimmers and badminton players may be looking towards the ceiling.

The miniature size of the LED light source can perceptibly make for a more intense glare experience than old lamp technologies and this is a key factor when considering replacing existing luminaires.

Externally, the height of existing masts may be insufficient for glare avoidance.

The simplest way to test this may be via mock-up of sample luminaires for visual comparison.

Ideally, glare control should be achieved through optimised aiming strategies and careful equipment selection rather than relying on louvres or shields, which can compromise luminaire efficiency and overall system performance.

For further information, see Part A 2.10 Lighting controls.

It should be noted that the glare limits in lighting standards were developed for older lamp technology, so they should be treated as maximums, and lower glare limits should be targeted.

For further reading and best practice advice on critical placement of luminaires, consult the relevant NGB guidance, SLL LG4, and Sport England's suite of Design and cost guidance.

2.9 Equipment specification parameters

2.9.1 Light sources

Traditional lamp technologies have now been replaced by LED light sources, which are available in a wide range of types, qualities and price points.

Their characteristics differ and manufacturers are continually developing improved products. Selection of appropriate LED products is made on the basis of colour quality, efficiency, energy consumption, light distribution, and life expectancy.

The phase-out of hazardous lamp technologies like mercury-containing fluorescent lamps is underway to improve energy efficiency and reduce environmental harm.

Government directives have driven a shift toward safer, longer-lasting LED alternatives. Bans are already in place for mercury-containing lamps and efficacy targets have effectively eliminated almost all lamp technologies in the UK market.

Following the shift to LED technology, there has been an increase in the use of retrofit LED lamps, in place of the fluorescent or metal-halide lamps within existing luminaires.

Using retrofit LED lamps into existing lamp-based luminaires is discouraged. They can pose safety and performance risks, electrical incompatibility with existing fluorescent or metal-halide lamp ballasts may cause flicker, overheating, or fire hazards. The light distribution may also be poor due to mismatched optics, reducing visual comfort and effectiveness.

Emergency lighting systems may fail if not properly integrated. Non-compliance with standards and voided warranties are also concerns.

2.9.2 LED technology

Advances in LED lighting have transformed how sports facilities are designed, operated, and experienced.

Modern LED systems now deliver significantly higher efficiency compared to earlier LED generations, while maintaining full brightness and extended lifetime.

This step-change in performance is critical for sports venues, where long operating hours and high illumination levels can otherwise drive substantial energy costs.

The lighting industry is shifting towards digital, connected solutions, which can optimise lighting use automatically based on occupancy, scheduling, and real-time usage, while also providing predictive maintenance and detailed performance analytics.

These capabilities help venues reduce running costs, improve lighting consistency, and extend equipment life, all key benefits for pitches, courts, and training areas.

Sustainability is another driving force behind the development of LED technology. Reliable lighting starts with efficient LED sources, durable construction and responsible materials. Getting the specification right from the start delivers long-term benefits.

Circular lighting approaches, including 3D-printed luminaires made from bio-circular materials coming onto the market, support lower embodied carbon and easy repair, refurbishment, or recycling. For further information, see Part A 2.9.6.

Meanwhile, developments in human-centric and circadian lighting are available to improve athlete wellbeing and visual comfort in indoor training environments by better simulating natural daylight and seasonal cycles.

LED sports lighting will continue to move toward greater efficiency, connectivity, and designs that prioritise user experience, environmental responsibility, and long-term operational value.



Luminaire with integrated spill louvre

2.9.3 Correlated colour temperature

Correlated colour temperature (CCT) describes the appearance of light and is measured in Kelvin (K).

Low CCT (<3000K) describes a warm, yellowish-white light, while high CCT (>5000K) describes a cool, bluish-white light.

In the sporting environment, cool-white light is considered to have a more stimulating effect. However, high CCT may be perceived to be cold and stark in indoor spaces, and outdoors it has a detrimental impact on the nocturnal environment due to the typically dominant blue wavelengths (see ILP GN08).

In environmentally sensitive locations, it may be necessary to restrict the spectral content at particular wavelengths, especially where the needs of local wildlife and ecology should be considered alongside those of the players, who may prefer cooler CCT.

As CCT does not directly correspond to spectral content, decisions should be based on the specific species present and their sensitivity to different wavelengths.

Figure A12 Indicative examples of colour temperature



Usage times of illuminated sports areas throughout the year should also be reviewed through consultation with an ecologist (to advise on spectrum / CCT or periods when floodlight use should be limited) to ensure an appropriate balance between ecological protection and user requirements.

Particularly sensitive ecological habitats could include designated spaces such as Areas of Outstanding Natural Beauty (AONB)[1], Sites of Special Scientific Interest (SSSI)[2] and Dark Sky Places (see Part A 2.6.5 for information on the Dark Sky International Outdoor Sports Lighting Program).

Refer also to Part A 3.4.4 which considers the perceived impact of change in colour temperature.

Consultation with NGBs, Ecologists, local planning authorities and neighbours, and an understanding the baseline is key in selecting the appropriate colour temperature.

Due to the characteristics of the LED and the optical system within the luminaire, the CCT may vary across the width of the light beam. These variations are particularly noticeable when light falls on white or neutrally finished surfaces, where differences in colour temperature are more easily perceived.

This is described technically in BS EN 12193, however, it is recommended that a luminaire sample is always obtained to inspect the beam for colour consistency or striations.

1 An AONB is a designated area in the UK recognised for its exceptional landscape and natural beauty, protected to conserve and enhance its character for the nation.

2 A SSSI is a protected area in the UK recognised for its exceptional natural value, either due to rare species of plants and animals, important habitats, or significant geological or physiographic features.

2.9.4 Colour rendering

Colour rendering describes how accurately a light source reveals the true colours of objects compared with natural daylight. High-quality artificial lighting reproduces colours faithfully, allowing users, players, officials and spectators to see surroundings clearly and without distortion.

This performance is measured using the Colour Rendering Index (CRI), expressed on a scale from 0 to 100, where higher scores indicate more natural colour appearance.

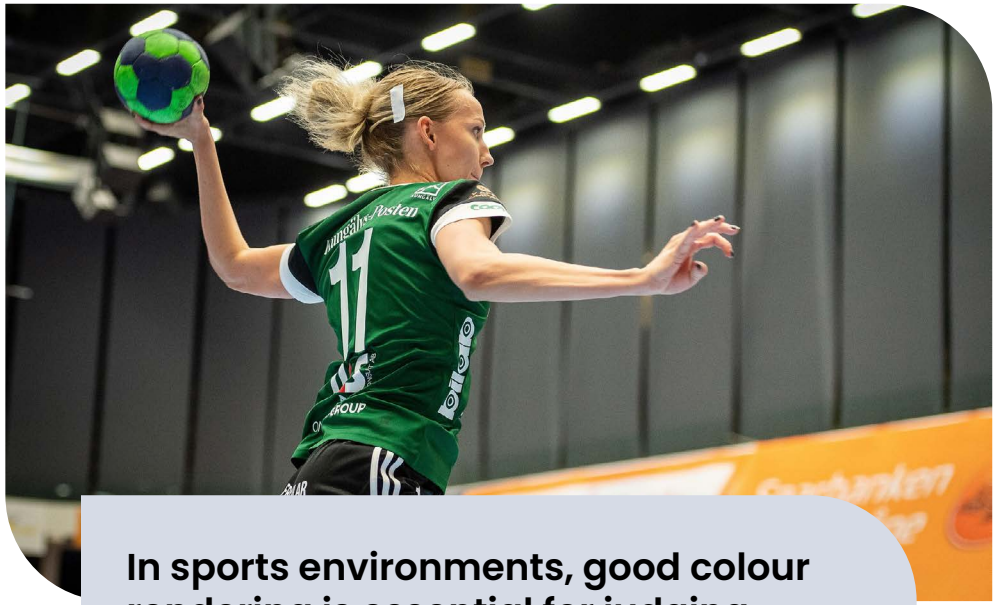
Accurate colour rendering matters because even if two light sources have the same colour temperature, objects may still appear dull or inaccurate if the spectral quality differs, affecting visibility and perception during sport. A minimum CRI of 80 is considered appropriate for sports environments.

In sports environments, good colour rendering is essential for judging distance, speed, ball flight, and player movement. A high-CRI lighting system helps distinguish team colours, improves object contrast, and supports quick decision-making during fast-paced activity.

In multi-sport facilities, it enhances inclusivity by ensuring users with visual sensitivities or colour-perception differences experience a clearer, more readable environment.

Beyond performance, effective colour rendering improves overall comfort and wellbeing. When lighting renders colours naturally, players may experience lower visual fatigue, and spectators gain a more engaging, lifelike viewing experience.

As LED technology evolves, improved quality and more uniform spectral output continue to enhance colour rendering capabilities, with increasing efficiency.



In sports environments, good colour rendering is essential for judging distance, speed, ball flight, and player movement.

2.9.5 Flicker

Artificial sports lighting should remain steady and visually comfortable at all times, particularly when luminaires are dimmed for different modes of operation. Flicker can distract players, officials and spectators, and some people have a sensitivity to visible and non-visible flicker effects.

A common cause is low quality lighting control equipment, so LED drivers should be carefully selected and proven to perform smoothly at all brightness levels, not just at full output.

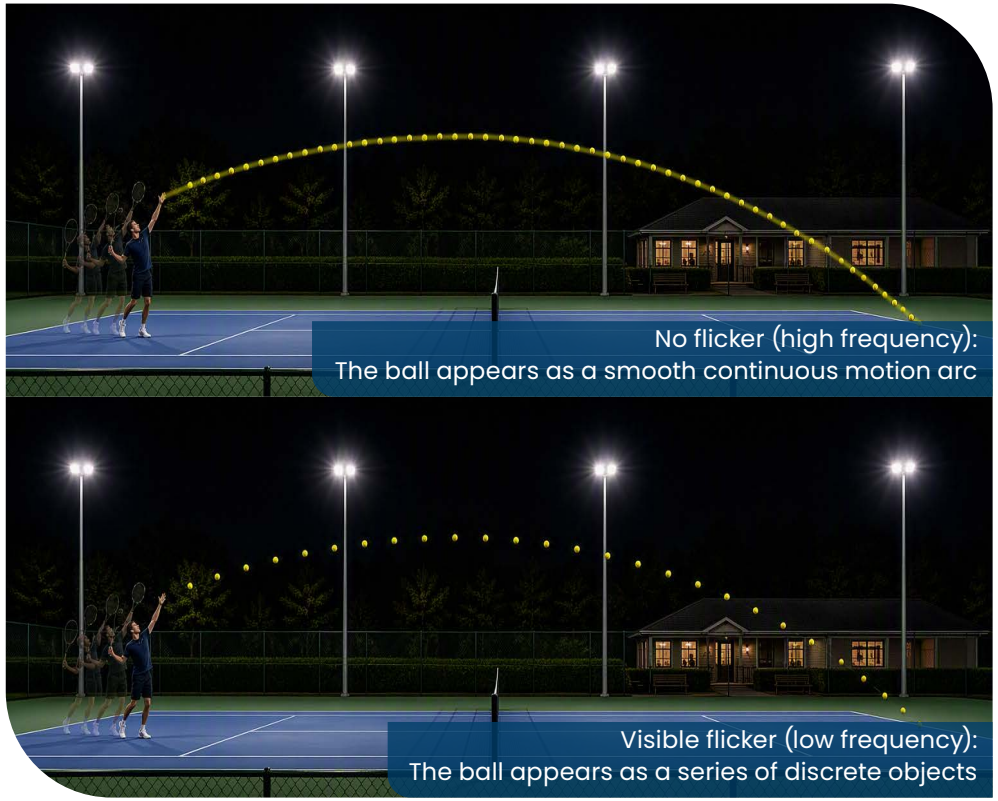
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Preference should be given to established manufacturers who can clearly demonstrate flicker free performance with the chosen LED drivers and lighting control system.

Confidence in quality should be based on clear evidence, such as independent testing, recognised standards, successful use on similar sports facilities.

A demonstration is always recommended which includes full output and dimming modes to confirm that the light remains stable and comfortable.

Figure A13 Indicative examples of flicker



2.9.6 Circular lighting considerations

Circular lighting applies circular-economy thinking to how lighting is designed, used and renewed.

It promotes durability, adaptability, maintenance, and reuse to minimise waste and resource consumption.

The following **five principles** should guide designers in creating long-lasting, flexible systems that reduce environmental impact while enhancing lighting quality:

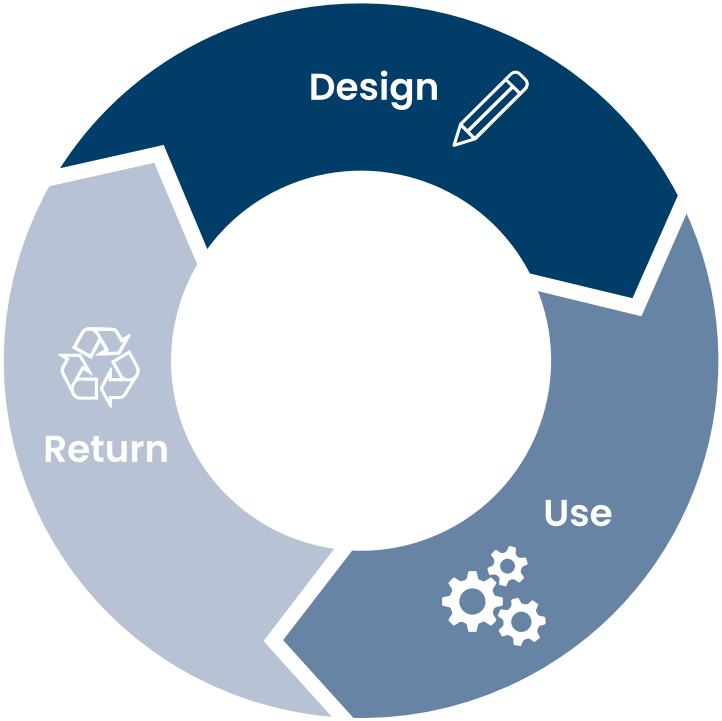
1. **When designing buildings and interiors, daylight should be considered first in the design. Doing so helps spaces achieve the necessary daylight levels for functionality, user experience, and wellbeing, while also lowering the dependence on electric lighting;**
2. **Effective circular lighting design should consider more than just meeting energy efficiency and durability standards. The overall quality of the lighting design significantly influences how long it lasts and how well it supports circularity;**
3. **Lighting systems need to be able to adapt to changes in building layouts, functions, and programmes over time. They should also be capable of integrating new technologies as they become available;**
4. **To support different functions and uses throughout the day, the outputs, layers, and distribution of light within spaces should offer enough flexibility and resilience;**
5. **Lighting products should be created so that they can be taken apart into their basic components. This allows materials to be upcycled, downcycled, or, when necessary, recycled back into the supply chain.**

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To support designers in developing lighting schemes, the circularity principles should be incorporated within the operational lighting framework outlined in the diagram below.

In addition, the questions included in Table A4 on the following page should also be reviewed and considered during the specification stage.

Figure A14 Operational lighting framework



Design

- Consider the sustainability of the materials, and select those that can be re-used or recycled;
- To ensure that the least amount of carbon is used in this process, compare the circular design credentials of different manufacturers for each product where possible (see Table A4);
- Ensure that the lighting is designed to the appropriate light levels, do not overlight;
- Look for opportunities to lower energy consumption with the use of a control system and CLO technology.

Use

- Driver access and replace-ability is an important factor for maintaining the luminaire;
- Chose luminaires with long lifetime characteristics to lower maintenance / service frequency;
- The operator must be trained to use the lighting control system;
- Ensure optimal light levels in spaces reducing energy consumption.

Return

- Specifying luminaires with a long lifetime will reduce the replacement frequency;
- Select manufacturers who accept the return of their old lighting equipment for repair, refurbishment, renovation or re-purposing;
- Where this is not possible, ensure there are accountable processes for dismantling and recycling of redundant equipment.

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Table A4 Circular principles in luminaire specification

Aspect	Questions
Certification	• Is the product Cradle to Cradle Certified™? • Can an Environmental Product Declaration (EPD), Product Environment Profile (PEP) or any Life Cycle Assessment (LCA) for the product be provided? • Can information on Global Warming Potential (GWP), required for the LCA, be provided?
Materials and manufacturing	• Where is the product manufactured / assembled? • What proportion of re-used and or recycled materials are used in manufacturing? • What proportion of the waste material from the manufacturing that is reused? • What proportion of the energy used in the manufacturing from renewable sources?
Packaging and delivery	• Is the product packaging reusable, recyclable or compostable? • Does the supplier retrieve packing materials from site after delivery?
Flexibility and maintenance	• Is it possible to change the optics and accessories to allow for flexibility for future uses? • Can luminaire LED engine and driver be replaced? • Can LED engine and driver gear be re-fitted in situ or only in factory? • What needs to be replaced within the LED engine to maintain equivalent performance?
Monitoring	• Does luminaire record the operating / burning hours electronically? • Does luminaire include a 'luminaire logbook' to prove year of manufacture, operating history and / or performance data? • Does luminaire have the means to update firmware and logging?
End-of-life	• Can the luminaire be dismantled (and reassembled)? • Can all materials used in the luminaire manufacture be recycled and returned to the materials reservoir?

2.9.7 Luminaire specification

Sustainable luminaire specifications are critical because they address both environmental responsibility and operational efficiency.

Energy-efficient designs reduce electricity consumption, while durable materials and long lifespans minimise waste and maintenance needs.

Compliance with environmental standards ensures future-proofing against regulations and supports green building certifications, which can enhance property value and corporate reputation.

The quality of the components that make up a lighting system are very important if the system is to provide a long term, durable and sustainable lighting solution.

Standards including BS EN 60598 (Luminaires), and BS EN IEC 62031 (LED modules for general lighting. Safety specifications) as well as NGB specific guidance should be referenced in the luminaire specification.

Some NGBs also offer product endorsement as a measure to support performance and quality.

See Part D 1.3 for further information on lighting codes, standards and guides.



Places Leisure, Camberley
Image credit: Fotohaus

Compliance with environmental standards ensures future-proofing against regulations and supports green building certifications, which can enhance property value and corporate reputation.

Cont/d...

The characteristics in Table A5 below are for guidance in selecting appropriate products with good sustainability credentials.

Industry standard metrics are available but may not always be easy to compare. Therefore, specialist lighting input is recommended at the specification stage.

Table A5 Luminaire specification quality guidance

Characteristic	Specification	Lifetime benefit
Energy efficiency	High-efficiency LED modules with low power consumption and high lumen-per-watt ratio (luminous efficacy).	Significant reduction in energy bills and carbon footprint over the luminaire's lifespan. Efficacy values should satisfy building regulations as a minimum, and when comparing two products high efficacy is worthy consideration. Sports lighting luminaires typically exceed 120lm/W and this will continually increase.
Material selection	Use of recyclable or recycled materials within the luminaire housing is preferred and is becoming a more common component in manufacture.	Lower environmental impact during production and disposal, contributing to circular economy goals.
Lifecycle and durability	Good reliability, long operational life (e.g. >50,000 hours) and robust design using quality materials and appropriate moisture ingress and impact protection, to minimise early failures.	Reduced maintenance costs and fewer replacements, saving resources and labour over time, always obtain a sample luminaire and inspect build quality, visit an existing site to inspect durability.
End-of-life considerations	Design for easy disassembly and recycling, with clear disposal instructions.	Enables simple maintenance of individual luminaire components to extend their useful life. Also simplifies recycling, reduces landfill waste, and supports compliance with sustainability regulations.
Environmental certifications	Compliance with standards such as BREEAM, Cradle-to-Cradle and select products with Environmental Product Declarations EPD and Energy Performance Certificates (EPCs).	Enhances building sustainability ratings, improves market value, and supports corporate Environmental, Social, and Governance (ESG) goals.

2.9.8 Maintenance factor

Lighting systems will degrade over time even with regular maintenance. The extent and speed of this loss depend on many factors including LED quality, driver technology and drive current. The maintenance factor ('depreciation factor') shows how much lighting performance will drop from its initial level over time.

The Maintenance Factor (MF or f_m), is used in lighting design calculations to account for the reduction in light output from a luminaire over time due to dirt accumulation and aging.

The f_m is the ratio of the light output from a luminaire after a period of use to new, and considers the environment (cleanliness), luminaire and light source longevity, and maintenance:

$f_m = f_{LF} \cdot f_s \cdot f_{LM} \cdot f_{SM}$ where:

f_{LF} is the luminous flux factor and accounts for the gradual reduction in the LED light source as it ages. It is recommended that the manufacturer is consulted to advise on an appropriate value which considers the anticipated lifetime of the installation;

f_s is the survival factor and represents the proportion of light sources still operating at the end of the maintenance cycle. LSF is normally 1 for LED products;

f_{LM} is the luminaire maintenance factor and accounts for dirt accumulation and aging of the luminaire. Consult CIBSE / SLL Code for Lighting and / or ISO/CIE 22012 for suitable values;

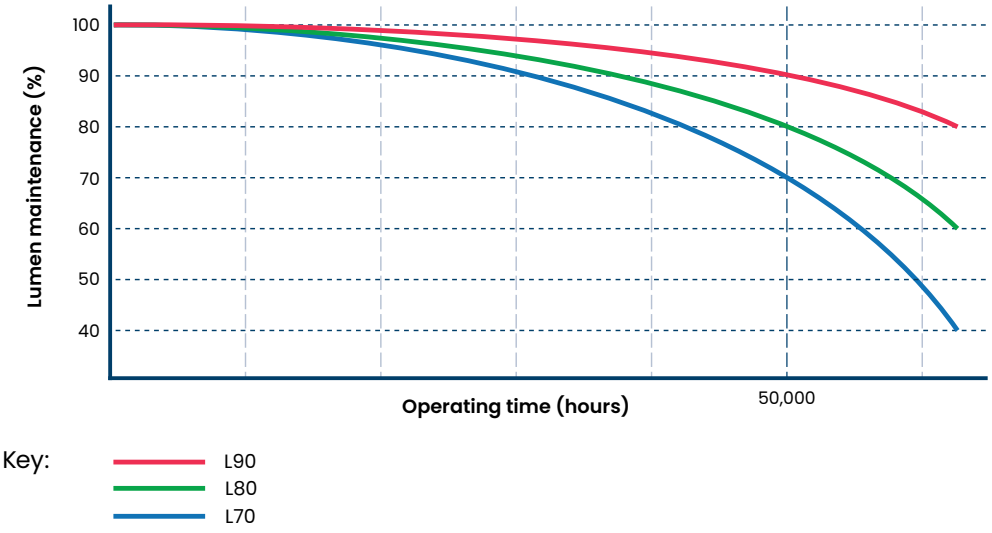
f_{SM} is the surface maintenance factor and considers accumulated on internal spaces. Consult CIBSE / SLL Code for Lighting for suitable values. It is omitted for external spaces. In spaces with little indirect light contribution (e.g. a hall with a high, dark ceiling), this value may be closer to 1.

Selecting the appropriate luminous flux factor (f_{LF}) needs to consider the specified luminaire lifetime and the installation lifetime (see Part A 2.9.6 Circular lighting considerations).

For example, a luminaire rated L_{90} at 50,000 hours, in a gym operating 24 hour/day, 365 day operation (8,760 hours/year) could reach its L_{90} threshold within six years (see Figure A15 below). Therefore, considering the L_{80} value at 100,000 hours may be more appropriate if the lighting will be installed for longer than six years.



Figure A15 Indicative lumen maintenance over time



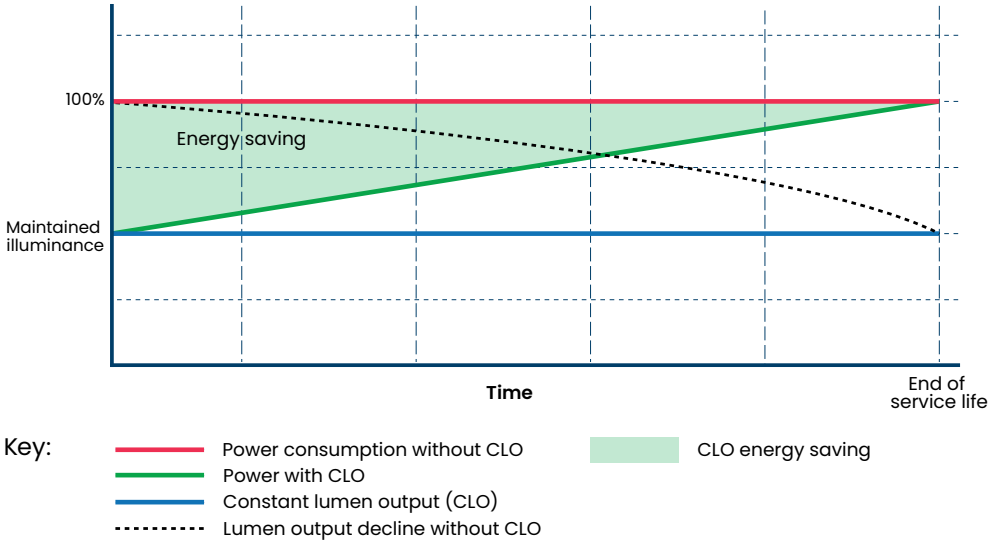
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Constant Lumen Output (CLO) technology is a feature in some modern LED luminaires that ensures consistent light levels throughout the product lifetime. CLO compensates for the degradation of the LED output by gradually increasing the power to the LEDs over the life of the luminaire.

This approach improves energy efficiency because luminaires are not overpowered initially to account for future losses, so it particularly useful for outdoor sports applications to help avoid obtrusive light.

When considering specification of CLO, the designer should consult the manufacturer for advice on the appropriate maintenance factor and evaluate its benefits in relation to lumen maintenance and anticipated luminaire service life, noting that the benefits of CLO may be limited where lumen maintenance is high (e.g. >L90).

Figure A16 Energy saving by CLO



Understanding LED lifetime data

Manufacturers should provide you with lifetime criteria which describe lumen maintenance and reliability of LED luminaires over time, i.e., the expected longevity of the luminaire.

This is normally described by the luminaire lifetime rating which is characterised by a mnemonic $L_{nn}B_{nn}$, e.g., $L_{90}B_{10}$.

In this example:

- L_{90} means that after the specified lifetime (e.g., 50,000 hours), the luminaire will still deliver 90% of its initial luminous flux. This indicates very low light degradation;
- B_{10} refers to the failure rate: only 10% of the luminaires in a batch are allowed to fall below the L_{90} threshold within that lifetime. In other words, 90% of units will maintain at least 90% of their original light output.

Why it matters:

- High L-value (L_{90}) ensures consistent lighting quality and reduces the need for early replacements;
- Low B-value (B_{10}) ensures reliability across the installation, minimising maintenance costs and downtime.

Together, $L_{90}B_{10}$ is a strong indicator of long-term performance and sustainability, as it reduces costly waste, early replacement cost and disruption, reliability and energy inefficiency. This is an industry standard, but it may be interpreted in different ways.

A specialist lighting consultant will be able to advise.

2.9.9 Emergency lighting

Emergency lighting is intended to provide safe environment in the event of power failure. The requirement for emergency lighting is established through the Building Regulations, particularly Approved Document B, which sets out fire safety principles including means of escape.

However, detailed determination of the areas requiring emergency lighting and the system design is defined in BS 5266-1 (Emergency lighting - Emergency lighting of premises. Code of practice) and supported by a risk assessment.

Further practical design guidance which expands on BS 5266 and explains how to apply it in practice is provided in SLL LG12 (Emergency lighting).

BS 5266 provides guidance for the design, installation and wiring of emergency lighting systems to ensure safe illumination if normal lighting fails.

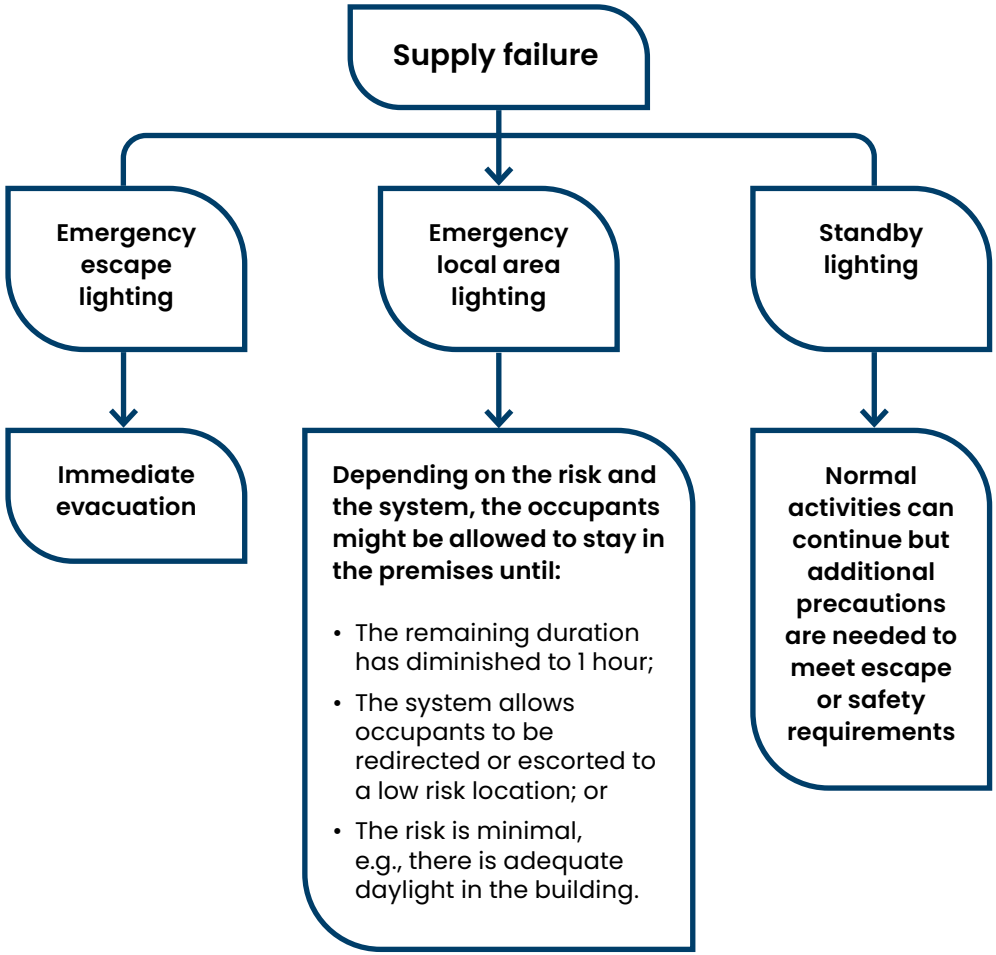
In addition, BS EN 1838 (Lighting applications. Emergency lighting for buildings) should also be referenced as it defines the performance requirements for emergency lighting systems to ensure occupants can safely evacuate or remain in a building during a failure of normal lighting.

It sets out minimum illuminance levels, uniformity requirements and lighting distribution for escape routes, open (anti-panic) areas and high-risk task areas.

The standard also addresses glare control, the visibility and luminance of safety signage, and the time taken for lighting to reach required levels after power loss.

Different types of emergency lighting are described in Figure A17 opposite.

Figure A17 Emergency lighting



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Emergency lighting can perform the following functions, and some can be combined into a single system:

- Emergency escape lighting, which provides illumination of escape routes and signs to assist occupants to evacuate the premises, and points of emphasis;
- Emergency local area lighting, which provides lighting for safe movement in the premises when the occupants do not need to evacuate the premises immediately; and
- Standby lighting, uses and alternative power supply, and provides sufficient lighting to continue operation.

BS EN 12193 describes 'safety lighting'. Its purpose is to allow for safe stopping of an event and is described as percentage of the level of the performance class.

It may be provided as part of the emergency lighting system, and should be instantaneous after power failure for at least the period specified.

Table A6 Safety lighting levels and minimum periods

Sport	% for minimum periods (seconds)
Swimming	5% for 30s
Indoor gymnastics	5% for 30s
Indoor and outdoor equestrian	5% for 120s

2.10 Lighting controls

2.10.1 Benefits

Lighting controls are key in optimising the efficiency and usability of community sports facilities both internally and externally.

One of the most significant benefits is energy efficiency. By enabling automated dimming, zoning, and scheduling, lighting controls reduce unnecessary energy consumption, lowering operational costs and supporting sustainability goals.

This is particularly important for facilities operating long hours or hosting multiple activities.

They also ensure compliance with the required class of play, delivering appropriate illumination levels for training, recreational play, or competitive matches.

Supporting accessibility and inclusivity is another key advantage.

Modern control systems allow easy adjustment of lighting levels to suit different sports, age groups, or special visual needs, ensuring inclusivity for all users.

For additional information, refer to Sport England's AISF guidance and PAS 6463: Design for the Mind. Neurodiversity and the Built Environment.

2.10.2 Automatic controls

Automatic occupancy sensing can help optimise energy use in areas with intermittent activity, such as changing rooms and corridors, where luminaires may often be left on for the duration of a sporting event when the players are elsewhere.

In sports halls, it is important to set a minimum switch-off delay of at least 15 minutes to prevent luminaires turning off unexpectedly during short pauses of inactivity.

Additionally, when occupancy sensors are used, the lighting should dim gradually over a few minutes before switching off completely. This is a critical safety measure, ensuring that players and staff are never left in sudden darkness during sporting activities. This gives users a clear warning and time to react by reactivating the luminaires if needed.

Where a room is used for other purposes, for example school examinations, it is important that a fixed override is provided to maintain illumination for up to three hours.

The lighting design should take into account appropriate positioning of sensors to mitigate extreme changes in light levels.

In circulation spaces, instantaneous light should be provided without delay to avoid users being left in a dark environment. For these area types, the lighting should be set at a low dimmed level (< 10% of intensity) during times that the sensors are not triggered and apply a three to five seconds transition from the time of movement/thermal detection for any light intensity changes.

Transitions in light intensity in areas of frequent or longer duration of occupancy should benefit from extending the fade in / out timings to 10 seconds.

Externally, the use of automatic controls may assist with obtaining planning consents as they can turn off lighting when not required, help avoid conflict with neighbours, and provide logs and evidence of usage not exceeding planning conditions.

External lighting sensors should avoid instantaneous switch on to full power and aim to increase over a few seconds to avoid startling wildlife.

2.10.3 Focus on simplicity

The possible complexity of lighting control systems can be a drawback. More recently, lighting control systems have evolved, becoming far more intuitive and accessible than traditional PC based systems.

One of the biggest changes is the shift towards app-based control interfaces, which allow facility managers and even end-users to manage lighting from smartphones or tablets. These systems prioritise user confidence for optimal energy and performance benefits.

When choosing a lighting control system, it is recommended that a demonstration is witnessed, ideally in an existing installation where operator feedback on the usefulness and simplicity of the system can be sought

Two main types of lighting control system may be considered:

- DALI (Digital Addressable Lighting Interface);
- BLE (Bluetooth Low Energy).

These are compared in Table A7 on the following page.

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Table A7 Lighting control system considerations

Aspect	DALI	BLE
Control method	Wired digital control system.	Bluetooth (wireless) digital control system.
Control hardware	Typically requires a head-end control computer.	Intelligence is within the components (luminaires, sensors, switches) head end computer not essential.
Installation	Requires control cabling; higher installation effort.	Minimal additional cabling; reduced installation time and disruption.
Commissioning	Specialist software and trained installers typically required.	Table / smartphone app based commissioning; faster and more accessible.
Scalability	Typically limited to 64 addresses per DALI line without gateways.	Highly scalable without physical loop limitations.
Flexibility and reconfiguration	Physical wiring can constrain post installation changes.	Highly flexible; changes made through software without rewiring.
Security	Inherent physical security through wired network.	Uses encryption and access control.
Maintenance	May require specialist commissioning engineer to maintain.	Easy updates to firmware, can be managed via smart device app.
Upfront cost	Higher initial cost due to cabling.	Lower installation cost; hardware costs broadly comparable.

2.10.4 Daylight linking

Daylight-linked dimming is a smart lighting strategy that adjusts artificial lighting according to available natural daylight. This approach is recommended for delivering significant energy savings and reducing operational costs.

By maintaining consistent illuminance levels, it enhances visual comfort and prevents glare, creating healthier and more productive environments.

It also supports the transition from daytime to nighttime use in internal sports facilities.

These systems are typically automatically controlled, however manual overrides are also recommended.

2.10.5 Supporting facility operations

A well-designed system should streamline facility management. Features such as remote monitoring, automated scheduling, and integration with booking systems allows the optimised use of the lighting and helps manage the users (e.g. not overstaying their booking slot).

Lighting linked to booking systems should be considered to optimise the use of lighting based on required use, helping avoid light obtrusion and unnecessary energy consumption and extending system life, for example.

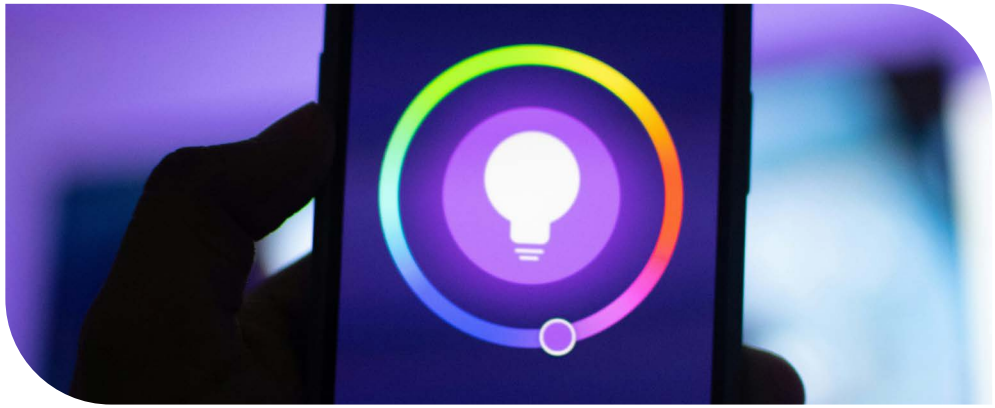
Slow dimming, rather than switching, could be considered to act as a prompt to encourage users to exit the facility safely at the end the session.

App-based platforms often use familiarly-designed interfaces, making them intuitive for staff and volunteers without technical backgrounds.

A hierarchy of operation is possible by passwords and user groups to ensure no unauthorised operation is possible.

Additionally, well-designed lighting controls help maintain luminaire longevity by:

- Reducing overuse of lighting;
- Avoiding operating lighting at higher than necessary levels (e.g. Class II vs. Class III levels);
- Increased user comfort when lighting is controllable;
- Optimising operational conditions to help manage and schedule usage;
- Providing maintenance alerts - some systems provide real-time diagnostics, helping staff address faults promptly and extend luminaire life;
- Prolonging the lifetime of the system, thereby reducing maintenance downtime and associated risks (e.g. working at height).



2.10.6 Multi-court facilities

Configuring lighting systems to operate efficiently, whether managing a single court in isolation or all courts collectively, will maximise the benefits of well-designed lighting controls.

By enabling highly-specific granular control, facility managers can tailor lighting levels to suit the specific requirements of each court, thereby reducing unnecessary energy consumption, particularly when some courts are not in use.

Alternatively, when multiple courts are active for the same activity, the controls can ensure uniform and appropriate illumination across the entire facility.

Note that edge courts are more likely to suffer from a drop-off in lighting levels unless this is compensated for in the design and optimisation of the lighting control system.

Conversely, when multiple courts are active, the controls can ensure uniform and appropriate illumination across the entire facility, enhancing playability and safety.

This flexibility and targeted operation can significantly reduce energy and operational costs, increase luminaire lifespan through minimised wear, and optimise user comfort, playability and safety.

While switching off lighting on unused courts may offer an energy saving benefit, the appearance of darkness on adjacent courts may be visually uncomfortable or even unsettling for some.

Providing a low-level background illumination of unused courts should be considered to balance the visual scene.

For further guidance, see Part B 1.2 Multi-sports facilities.

2.11 Luminaire location

Good lighting planning aligns height, position and control to achieve clear illumination where it's needed, and limit unwanted light beyond the field of play.

Refer to NGB guidelines for details on luminaire placement relative to court markings and the field of play and consider how their positioning aligns with player viewing directions to avoid glare.

For example, in badminton, luminaires should be placed each side of the court, and in football there are zones where luminaires should be avoided to prevent glare to the strikers and for corner kicks.

2.11.1 Internal luminaires

Key items to consider for locating internal luminaires include:

- **General considerations and placement:** The placement of lighting within internal spaces should be carefully considered to achieve both functional and aesthetic goals. Lighting should align with any particular NGB requirement relative to the court layout and complement the spatial layout, ensuring adequate illumination for tasks (e.g. judge benches) in surround areas while avoiding glare or shadows;
- **Coordination with building fabric:** Lighting design should integrate seamlessly with the building's architecture and finishes. Coordination with ceilings, walls, and structural elements ensures that luminaires do not conflict with other systems such as heating, ventilation and air conditioning (HVAC) or sprinklers. Early collaboration with architects and engineers helps maintain design intent and avoids costly adjustments later;

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- **Mounting height, access, and maintenance:** Selecting appropriate mounting heights is essential for uniform light distribution and ease of maintenance. Luminaires should be positioned to allow safe access for cleaning and lamp replacement, particularly in high-ceiling areas. Consideration of maintenance strategies improves safety and avoids operational challenges;
- **Quantity vs power:** Balancing the number of luminaires with their power output is critical for energy efficiency and visual quality. Over-lighting wastes energy and can cause discomfort, while under-lighting compromises functionality. Designers should consider the optimal luminaire quantity and power (e.g. avoid small numbers of high-power luminaires, vs larger numbers of lower power luminaires);
- **High level trapping:** Where luminaires are suspended below the soffit, it may be necessary to consider measures to prevent trapping of playing objects above the luminaires. This may be solved by the form factor of the luminaire (narrow profile or rounded / sloped top) or by secondary protection measures;
- **Impact resistance:** In areas prone to impact from sports equipment, impact-resistant luminaires are essential. Luminaires should be robust enough to withstand accidental knocks or deliberate damage without compromising safety or performance. The IK rating (BS EN 62262) of a product informs the user on its protection against impact. Luminaire protective cages or guards may also be considered;
- **Shadow patterns:** Care should be taken when suspended equipment such as nets are provided. Narrow linear luminaires or downlights above can result in distracting shadow patterns on the floor, and they may also be more prone to glare, due to the compact dimensions of the lens or diffuser.
- Narrow dimension luminaires sources will produce harsh shadows from any obstruction mounted beneath. Larger / wider and diffusing luminaires, and even some uplight, may help avoid this phenomenon;
- **Swimming pools:** Special considerations apply to environments like swimming pools, where moisture and corrosion resistance are vital and special precautions are required to maintain electrical safety. Specialist advice should always be sought. Lighting should comply with IP ratings (BS EN 60529) for wet areas to help ensure electrical safety. Access for maintenance also needs careful consideration.

  For further guidance, refer to the Sport England's Swimming pools guidance.

2.11.2 External luminaires

Key items to consider for locating external luminaires include:

- **Horizontal location:** Sports lighting masts or structures should be installed outside of safety run-off areas to help provide consistent illumination along the edge of the field of play, and enhance participant safety;
- **Collision avoidance:** Lighting columns and associated equipment should also be placed outside of safety run-off areas to avoid collision risks. Where this is not possible, protective measures such as impact-absorbing padding should be installed.
  Where sports lighting is retrofitted to existing pitches and it is not possible to locate the lighting outside the run-off areas, special dispensation must be sought from the relevant NGB / League, including their approval of the column protection measures, before a planning application is submitted;

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- **Glare avoidance zones:** NGBs advise on critical areas where sports lighting should be avoided. These may be zones either side, above or behind the goal line. Refer to the sport specific guidance published by the NGB, BS EN 12193 and LG4;
- **Elevated mounting heights:** Mounting height should be sufficient to achieve uniform vertical and horizontal illuminance and to minimise shadows. The locations of the luminaires should be a minimum of 25° (measured from the centre of the field of play to the lowest luminaire).
  Luminaires should be positioned so that beam angles do not cause discomfort glare to players, and ideally the peak intensity of the luminaire should not exceed 65° tilt from nadir.
  On very large playing areas, e.g., athletics fields, or where the masts may be rooted behind spectator stands, it may be advantageous to consider a cranked mast to avoid excessive height and tilt angles, improve efficiency, reduce spill light and reduce daytime visual impact;
- **Impact resistance:** In areas prone to impact from sports equipment or vandalism, impact-resistant luminaires are essential. Luminaires should be robust enough to withstand accidental knocks or deliberate damage without compromising safety or performance. The IK rating (BS EN 62262) of a product informs the user on its protection against impact. Luminaire protective cages or guards may also be considered;
- **Ensure symmetrical coverage:** For uniformity, luminaires should be arranged in balanced clusters, typically at the corners and along the sides for football and evenly spaced around the oval for athletics. This supports a good uniformity gradient and reduced shadowing problems. Avoiding low mast numbers will help manage glare and spill light by avoiding high tilt angles;
- **Typical mast quantities:**
  - Tennis court: 4-6 masts;
  - Football pitch: 8 masts;
  - Athletics field: 8-12 masts.

Figure A18 Appropriate mounting heights and aiming

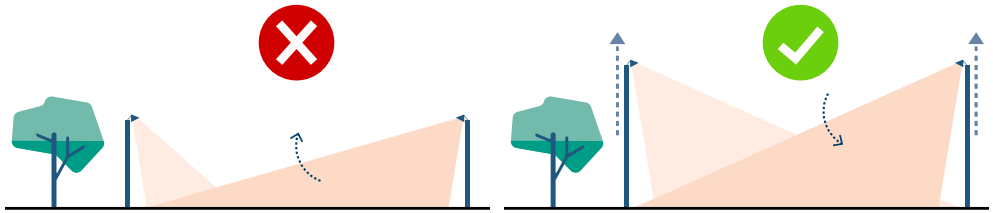
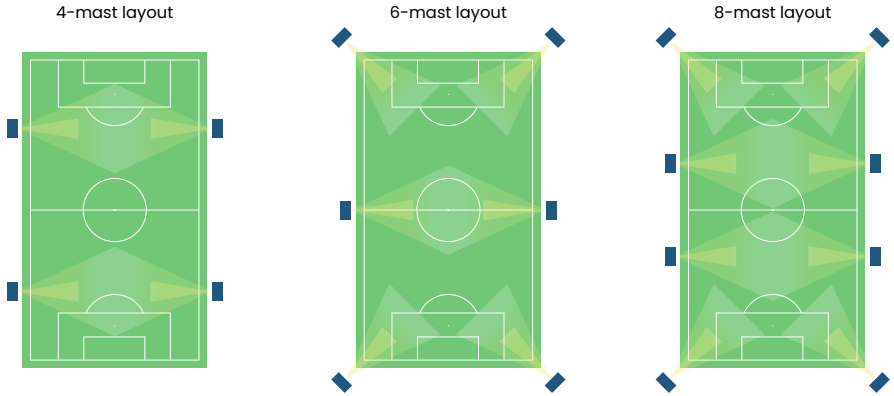


Figure A19 Example mast locations



2.11.3 Lighting masts

Designing sports lighting structures involves balancing functionality, safety, and long-term maintainability.

Options such as raise-and-lower systems, base-hinged columns, telescopic masts, and headframes each present a unique challenge.

The design of masts should satisfy the requirements of BS EN 40 (Lighting Columns), PD 6547 (Guidance on the Use of BS EN 40), and ILP PLG07 (Professional Lighting Guide 07, High Masts for Lighting and CCTV).

Procurement may be lengthy and should account for lead times on specialist components where more than a fixed mast is required.

Foundations may be a substantial investment and should be engineered to withstand dynamic loads from wind and vibration as well as the sports lighting equipment.

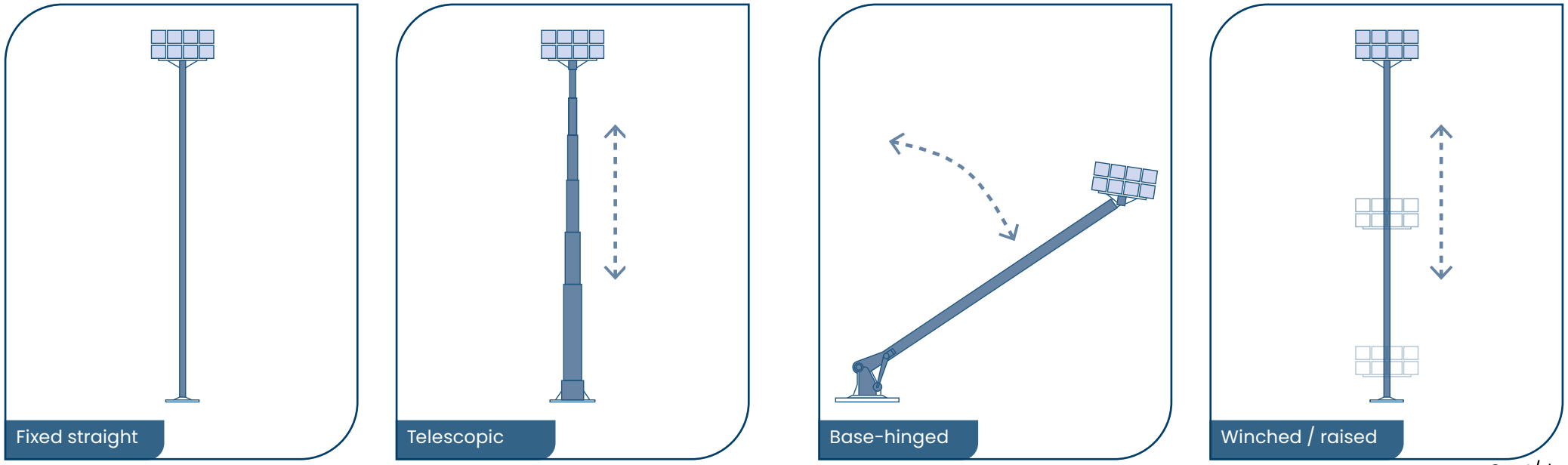
Planning considerations include daytime visual impact, obtrusive light control, and compliance with local regulations.

Maintenance strategies should always be considered to provide safe access for luminaire maintenance or replacement and electrical testing, while minimising disruption to sports activities.

Poor planning in these areas can lead to increased lifecycle costs, safety risks, and operational downtime.

The practicalities of lighting structures, raise lower, base hinged telescopic, headframes etc. are outlined in Table A8 on the following page.

Figure A20 Lighting mast types



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Table A8 Lighting mast selection considerations

Mast type	Pros	Cons
Fixed	• Simple, robust design. • Low maintenance. • Cost-effective for permanent installs.	• Requires elevated access equipment and space beside each mast to park it. • Longer downtime for servicing. • Not ideal for restricted sites.
Telescopic	• Retractable design reduces daytime visual impact. • Usually raises and lowers in minutes via hand-crank or electric winch, • Maintenance at low level.	• More expensive than fixed masts. • Requires regular servicing. • Mechanical issues may cause downtime. • May require power supply. • May help resolve visual impact planning concerns.
Base-hinged	• Can lower mast to ground for safe maintenance. • No need for platforms. • Faster servicing.	• Higher initial cost. • Needs clear space to lower. • Requires specialist hydraulic equipment to lower the mast. • More complex foundation. • May help resolve visual impact planning concerns.
Winched / raised	• Luminaires lowered to ground via winch for safe maintenance. • Safe, quick maintenance. • Ideal for tight spaces.	• More moving parts, higher maintenance. • Higher up-front cost. • Requires regular cable / winch checks.

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When upgrading lighting systems, existing masts can be reused if they remain structurally sound, compliant with standards, and effective for sports lighting, glare control, and light pollution mitigation.

Environmental factors like fatigue and corrosion may affect their safety over time. Specialist advice and tests, such as non-destructive inspections and load assessments, are essential to assess mast condition.

Access to original specifications supports accurate risk assessment and refurbishment decisions. Non-Destructive Testing (NDT), carried out by a BINDT-certified professional at Level 2 or higher, should be documented with tester credentials in the report.

When upgrading lighting systems, existing masts can be reused if they remain structurally sound, compliant with standards, and effective for sports lighting, glare control, and light pollution mitigation.

2.11.4 Seasonal lighting

Though not commonplace, some external lighting systems may be designed for seasonal use. For example, a football field used during the winter, can then be used for cricket in the summer. Because the football field is smaller than the cricket field, the lighting infrastructure, column foundation sockets, cables and ducts are permanently installed.

The football floodlighting is demounted during the summer, moved into storage and the foundations etc. are covered. It is recommended that specialist designer and contractor is employed to design and manage these systems.

The performance design principles in this guidance should still be applied, and planning permission will be required to capture the multi-season use and lighting variations (see Part A 3 Planning).



Winter: Lights around the football pitch



Summer: Without lights for cricket

2.11.5 Temporary lighting

Where sports lighting is temporarily required for either normally unlit facilities, or where existing lighting provision is unsuitable, a temporary lighting system may be required. It is recommended that a specialist temporary lighting contractor is employed to design, install, manage and remove such systems after the event is finished.

General Permitted Development allows temporary sports lighting for up to 28 days, subject to the planning designation and constraints of the site (see Part A 3.5 Statutory regulations).

Early consultation with the LPA is advised to confirm whether permitted development rights apply, whether there are other restrictions on use to be considered, and to agree any conditions relating to hours of operation, lighting levels, glare, ecological sensitivity, or neighbour amenity (see Part A 3.1).

All temporary lighting equipment and associated infrastructure should be fully removed following the event, and the site reinstated to its original condition.

The lighting design principles described in this section still apply.

Temporary lighting designs should be proportionate to the event, minimise obtrusive light, and be switched off outside event and operational hours.

General Permitted Development allows temporary sports lighting for up to 28 days, subject to the planning designation and constraints of the site.



Example of a portable telescopic LED floodlight

2.12 Post-occupancy considerations

The long-term success of a lighting scheme continues beyond installation and the first year of use is particularly critical as the users become familiar with their installation.

Setting out a strategy during the design stages for post-handover installation management is key to supporting the construction and completion stages, accessibility for all users, and the long-term success of a scheme.

An Accessibility & Inclusion (A&I) file should be started at the beginning of a project. It may be a compilation of electronic or paper documents (or a mix of both) that are generated during the development and lifetime of a facility.

For further guidance on the A&I file, refer to AISF Part A.

2.12.1 Strategy

It is important to factor this cost into the project budget and ensure the contractor honours this in the 12 months defects period normally associated with a construction project.

The strategy should consider the following:

- **Plan for post-Installation performance:** recognise that the success of a lighting scheme extends beyond installation. The first year of use is critical as users adapt to the system. Incorporate post-installation support costs into the project budget and ensure contractual obligations cover the 12-month defects liability period;
- **Integrate post-occupancy checks:** schedule early inspections to identify and correct minor issues, such as misaimed luminaires, before they escalate into energy inefficiencies or user complaints. Use these checks to maintain peak system performance, reduce energy waste, extend equipment lifespan, safeguard warranties, and delivers long-term financial benefits;
- **Check and monitor for light obtrusion impacts:** regularly assess lighting installations for any unintended spill or glare affecting neighbouring properties, or wildlife habitats, and implement mitigation strategies if necessary;
- **Prioritise safety and compliance:** post-handover, plan six-month check to confirm the lighting levels meet standards for sports activity, and identify shortfalls early, reduce the risk of accidents for users, players, staff, and spectators, and respond to nuisance to neighbours. Confirm structural installation of mounts and electrical components to prevent risks such as falling luminaires or electrical faults;
- **Safeguarding:** plan to ensure the environment remains safe and reliable for users, players, staff, and spectators through proactive maintenance and compliance checks.

An example first-year post occupancy checklist is provided on the following page for consideration in the design strategy.

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Figure A21 Example of a first-year post occupancy checklist

- **Health and safety**
  - All requirements should be considered when servicing lighting;
  - If a high-level maintenance vehicle or working platform is used, adequate protection of the playing surface should be provided.
- **Initial commissioning check** (immediately after installation)
  - Check for flickering or dimming lights;
  - Ensure mountings and brackets are secure;
  - Verify lux levels and uniformity against design specs;
  - Confirm aiming angles and alignment of luminaires;
  - Look for cracked lenses, water ingress, or corrosion;
  - Test control systems and dimming functions;
  - Report on illumination performance (if required by local planning authority or NGB).
- **Quarterly performance check**
  - Review aiming, respond to any concerns from neighbours, respond to any aiming failures (e.g. knocked out of alignment by football);
  - Tighten bolts and fasteners to maintain structural integrity.
- **Mid-year performance audit** (6 months)
  - Re-check light levels to detect any significant lumen depreciation and variations in uniformity performance. Report to manufacturer;
  - Review any lighting controls or scene setting and optimise where necessary (e.g. avoid over-lighting, reduce excessive time-out on occupancy detectors);
  - Update maintenance logs and address any warranty issues.
- **Annual full service** (end of year)
  - Comprehensive inspection of all luminaires, drivers, and control gear. Liaise with manufacturer if there is any implication on equipment warranty;
  - Illuminance testing and recalibration of each court/pitch etc;
  - Re-aiming, updating of control scenes, if needed;
  - Safety certification and compliance check, check for water ingress, electrical safety;
  - Inspect and clean the luminaire (if necessary).



2.12.2 Illuminance measurement and monitoring

Routine checks of illumination levels and lighting uniformity play a crucial role in operating sports lighting, for performance and maintenance. These measurements provide early indications of performance degradation and help show that maintenance has been performed correctly and efficiently.

LED luminaires fail differently to traditional lamps, and this heighten the importance of checking light depletion over time to ensure safe and sufficient light continues to be delivered, and the end of life of the light sources can be predicted.

In sports halls with multiple playing areas, illuminance readings should be taken across the entire space. However, it is recommended to conduct monitoring surveys for each playing area individually, following the sport-specific guidelines.

This is especially important if different sports use separate switching regimes or have distinct performance requirements. In this case the evaluation should take place for each sport.

Outdoor lighting strategies depend on the facility type. For instance, at tennis clubs where each court has its own switching regime, the required lighting level should be consistent across all courts whether used in isolation or as a group.

Conversely, pitches used for hockey, football, or training might require two or three specific lighting levels, which should be checked separately, usually using one measurement grid for the whole pitch.

Choosing the right measurement grid affects accuracy and results. If the grid does not cover the edges and corners of the playing area, those locations might be poorly lit despite overall compliance assessments.

Generally, horizontal illuminance is measured at ground level, while vertical illuminance is measured at one meter above the ground (consult the NGB for advice). The sensor head orientation should be verified, ideally with a spirit level, since improper alignment introduces measurement errors in both horizontal and vertical planes.

Accurate readings depend on avoiding errors caused by shadows from the observer, which can be prevented by using instruments with remote sensing heads attached to extension rods. Shadows lead to falsely low readings, while highly reflective clothing worn by the observer may also cause errors.

For precision, light meters should be calibrated annually as per manufacturer instructions and calibration records retained



Image credit: Arup

2.12.3 Maintenance activities

All lighting schemes, both indoor and outdoor, should be operated under a cyclic maintenance programme.

An effective cleaning and maintenance regime will ensure that the installation continues to operate at maximum possible efficiency throughout its life cycle.

An effective maintenance programme will include:

- Cleaning of luminaires at intervals appropriate for the frequency of use of the lighting system and the ambient pollution levels. Systems in an urban or coastal area may need more frequent cleaning than in a rural environment;
- Planned maintenance or servicing of equipment in accordance with manufacturers' recommendations relating to light output depreciation (see Part A 2.4.1 Circular lighting). Note that it will be necessary to keep a record of the lighting system operating hours;
- Keeping records of all maintenance performed. These records can help show the development of problems or faults before they become catastrophic.

Figure A22 Main elements in an outdoor sports lighting system

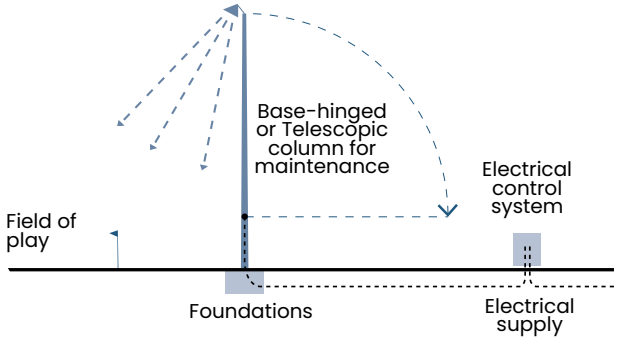




Image credit: Abacus Lighting Limited

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Maintenance access should only be undertaken by appropriately trained and qualified caretaking staff in accordance with a location-specific Risk Assessment and Method Statement.

Alternatively, an appropriately qualified electrical / lighting maintenance company with the required access equipment can be employed.

Typical maintenance activities may include:

- The lens, diffuser or cover glass external to each luminaire should be kept clean. With LED components, the reflector or optic are often integral components which may not require servicing. The manufacturer's advice should always be sought on the appropriate cleaning products and regime;
- Where external lighting has serviceable components, they are likely reached via an access lid. Always check the condition of lid seals during maintenance, and ensure the luminaire is completely dry before closing. To minimise corrosion, it is essential to keep the interior of luminaires moisture-free, as moisture can impair the operation of the luminaire and lead to early failure;
- Luminaire aiming may occasionally need adjustment. When a system is installed, each luminaire is aimed to direct light to a particular area of the pitch, or of a particular court, in accordance with the lighting design. After a long period, the aim may be shifted by vibration, impact or high winds.

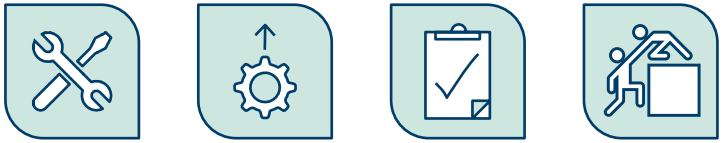




Image credit: Abacus Lighting Limited

Maintenance access should only be undertaken by appropriately trained and qualified caretaking staff in accordance with a location-specific Risk Assessment and Method Statement.

3 Planning

This section provides guidance on the planning considerations relevant to the design of lighting schemes for sports facilities.

3.1 Introduction

Sport England's planning function covers every LPA in England and offers a pre-planning application service, whether it affects outdoor or indoor sport facility provision or new facilities that are being developed, for example, through a housing project.

Any development involving new sports lighting or upgrades to existing sports lighting on a playing field, MUGA, or artificial grass pitch should be referred to Sport England for consultation as a statutory consultee for the LPA.

Typically, Sport England would assess such proposals in the context of 'Exception 2' as set out in the Playing fields policy and guidance.

Sport England is also likely to consult with the relevant sport's NGB for specific technical advice relating to a particular sport.

Where new playing fields with sports lighting are proposed and the application is to be considered non-statutory, Sport England will still apply its Playing fields policy when assessing the planning application:

Sport England encourages you to consult its planning function prior to the submission of a planning application, where there is a proposal to introduce sports lighting as part of the development to support existing or new playing fields.

Sport England also strongly advises that the applicants engage with the relevant NGB when designing lighting schemes for any sport facility.

This guidance is designed to help the project be planned and delivered in a positive and well-informed way.

An external sports lighting planning application (not part of any other development) would normally fall into Sport England's Planning Policy E2, subject to complying with other playing field factors, and can be confirmed at a pre-planning application stage with Sport England.

A pre-application is highly recommended, in addition to consultation with the Environmental Health Officer (EHO).

Consultation with the NGBs, project stakeholders and the community will help reduce risks and make sure different views are considered, and this should include a discussion about events and possible future use.

Keeping this conversation going through the design and construction stage will help the project respond to the concerns raised during the consultation.

Even with this approach, it should be understood that some changes may still be needed once the project is finished.

Cont/d...

Table A9 Planning application preparation plan

Stage	Considerations / actions
1. Establish need and strategic justification	• Identify the sporting need for lighting (extended training hours, league requirements, winter capacity constraints). Also reference playing pitch strategies or NGBs strategies; • Gather evidence from club usage records, booking demand, unmet need, and NGB standards; • Show how lighting aligns with local sport strategies, active places data, and local authority facility plans, e.g., their Playing Pitch Strategy (PPS); • Demonstrate community benefits (grassroots growth, accessibility, inclusion, safeguarding); • Consult with the NGB on all aspects the above for their advice on how to proceed; • Consult with a planning advisor and the local planning authority to understand what information may be required according to local planning policy, or strategic development plans etc; • Look at recent planning decisions in the area and appeal decisions.
2. Site appraisal	• Map the site, boundaries, adjacent land uses, and sensitive receptors (residential properties, wildlife habitats, highways); • Confirm any designations: Green Belt, Conservation Area, AONB, listed buildings, ecological zones, Dark Sky places; • Identify existing infrastructure (pitches, utilities, access routes); • Assess topography and potential for light spill or glare.

Cont/d...

Table A9 Planning application preparation plan cont/d...

Stage	Considerations / actions
3. Technical feasibility and design options	• Engage a qualified sports lighting engineer to prepare: • Proposed column heights and locations; • Luminaire type and orientation; • Illuminance designs compliant with NGB standards (e.g. FA, RFU, LTA); • Switching / controllability options; • Evaluate "do nothing", "minimal lighting", and "optimal compliance" options.
4. Light spill, glare and environmental impact assessments	• Prepare specialist reports (as identified by the planning officer) which may include: • Lighting Impact Assessment, with: • Horizontal and vertical illuminance plots; • Light spill modelling to property boundaries; • Glare rating calculations; • Obtrusive light assessment to ILP GN01 or latest (see Figure A23 on page 83); • Mitigation measures integrated into the design; • Lighting controls and management strategies, periods of use; • Define an operational management plan (secured by condition if necessary). • Ecology assessment (bat activity, habitats sensitive to light); • Landscape and Visual Impact Assessment; • Biodiversity net gain assessment; • Noise assessment (by specialist acoustician, lighting for extended hours attract more users, later in the night, noise attenuation measures may require planning permission).

Cont/d...

Table A9 Planning application preparation plan cont/d...

Stage	Considerations / actions
5. Engagement and consultation	• Hold pre-application meetings with planners and lighting consultants; • Engage neighbours and community groups with visualisations and FAQs.
6. Finalise detailed design package	• Prepare precise plans for submission: • Site layout plan with column locations; • Elevations showing column heights; • Manufacturer specifications for luminaires; • Light spill diagrams (horizontal and vertical planes); • Cables and trenches (if required); • Construction method statement and access routes.
7. Planning statement and policy compliance	• Summarise the need and benefits. Explain compliance with: • Local Plan lighting and environmental policies; • National Planning Policy Framework (NPPF); • ILP lighting guidance; • Relevant NGB facility guidance; • Present how residential amenity, ecology, and landscape impacts are mitigated; • Provide a heritage statement if applicable; • Strategic need from PPS.

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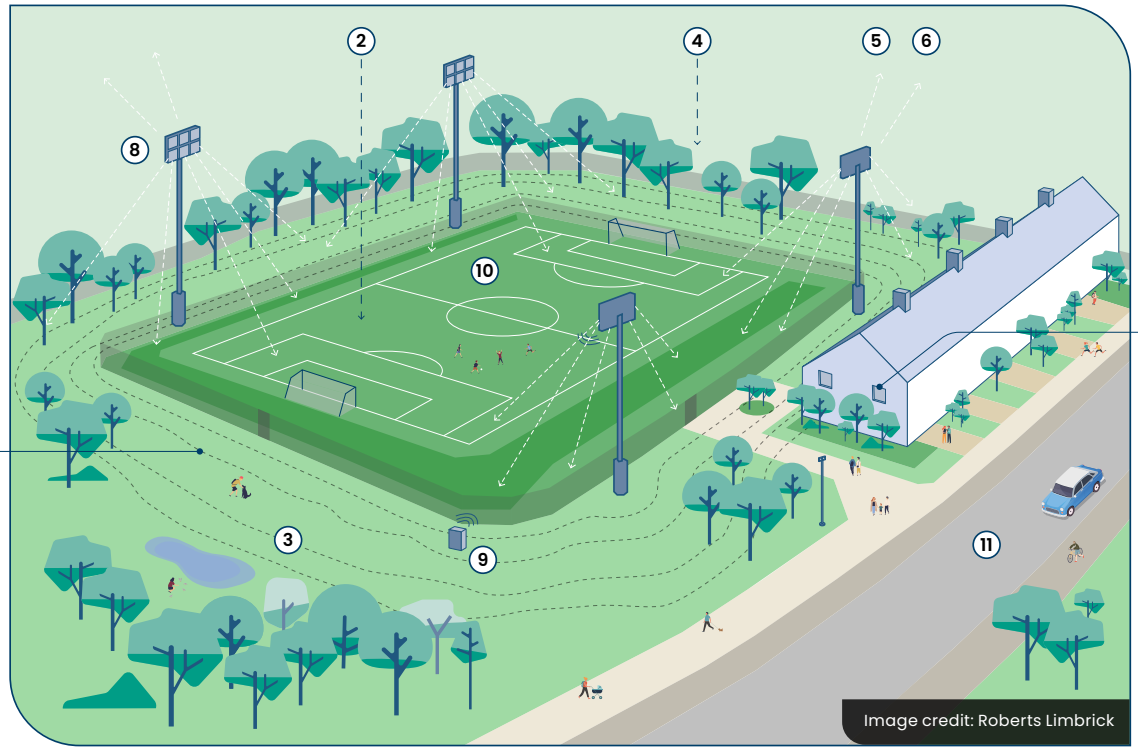
Table A9 Planning application preparation plan cont/d...

Stage	Considerations / actions
8. Supporting documentation checklist	• Include (as required by consultation with LPA): • Planning Statement; • Design and Access Statement; • Lighting Impact Assessment; • Ecology Report, including biodiversity net gain assessment; • Landscape and Visual Impact Assessment; • Noise Statement; • Management / Operational Plan; • Community Engagement Summary; • Drainage or ground investigation (if trenching required).
9. Submission and post-submission management	• Review the application against local validation requirements; • Submit via the Planning Portal with correct fee; • Respond to any LPA queries or additional information requests; • Prepare material for committee decision if needed; • Visualisations, sections, summary of benefits; • Agree planning conditions wording (hours of use, controls, illuminance levels, monitoring).

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Figure A23 Obtrusive light assessment - scope of study

All assessments should be compliant with ILP GN01, ILP PLG04, and consider cumulative lighting from surrounding sources and in combination effects where applicable.



1 Baseline survey

Capture the existing nocturnal lighting conditions and character, and justify the selected Environmental Zone used on the assessment.

2 Playing area illuminance calculations

Provide horizontal and vertical plane illuminance calculations for the playing area (as per the sports guidance).

3 Ground level light spill

Provide horizontal and vertical plane light spill at ground level extending from the playing area to the 1 lux contour, or lower (e.g. 0.2 lux) if required by the ecologist.

4 Vertical light spill - site boundary and ecology

Vertical light spill at the site boundary, and in front of any identified sensitive ecology habitats, calculated up to at least the height of the sports lighting masts.

5 Upward light ratio (ULR)

Upward light ratio calculations.

6 Upward flux ratio (UFR)

Upward flux ratio calculations (if near astronomical observatories).

7 Data tabulation and comparison

All survey, calculation and impact assessment data should be tabulated to indicate:

- Baseline values;
- Calculated values;
- In combination values;
- Comparison with ILP GN01 limiting thresholds for the environmental zone.

8 Mitigation measures and integrated design

Integrated mitigation measures including shielding, precise aiming, controls, curfews, dimming and optimised lighting levels to minimise spill, glare and sky glow should be defined.

9 Lighting controls and management strategies

Lighting controls and management strategies such as curfews, scheduling, dimming and automatic switch-off should be defined to minimise unnecessary operation.

14 Lighting management plan

Provide an operational lighting management plan that outlines the baseline, operational performance, design, mitigation, and residual impact.
It should also provide enforceable controls on operating hours, lighting levels on the pitch and surrounding receptors to protect nocturnal amenity and biodiversity.

13 Vertical light spill onto residential windows

Vertical plane light spill onto every residential window facing the sports lighting.
Vertical illuminance increase should not exceed 50% of the baseline conditions.

12 Visible source intensity

Source intensity should be calculated for every luminaire to every residential window (and any other receptors identified by the LPA) using the ILP GN01 method considering distance from source and visible luminaire area.

11 Threshold increment

Threshold increment calculations for adjacent roads.

10 Glare rating calculations

Glare rating calculations on the playing area, and to any observers identified by the LPA.

3.2 Local authority engagement

Planning permission is always needed for external lighting installations, including upgrades from older lamp technology to LED. Authorities assess issues such as light spill onto neighbouring properties, visual impact of tall columns, and extended operating hours. Addressing these early reduces the risk of rejection or expensive revisions.

Early engagement with the LPA is essential for sports lighting projects. It ensures compliance, avoids costly delays, and builds community support throughout the pre-application, planning application and planning determination process.

Employing a planning consultant can help secure consent and decide whether specialists are required, who they are, and whether an Environmental Impact Assessment (EIA) is required. The planning consultant can also help to negotiate and agree planning conditions in draft before they are imposed, for example benefitting the hours of use of lighting.

Environmental and ecological factors are critical. External lighting can disturb wildlife and habitats, so consulting an ecologist early helps integrate mitigation measures into the design and programme. Compliance with technical standards is also vital; authorities expect adherence to guidelines such as ILP GN01, BS EN 12193, and LG4. Early alignment avoids costly redesigns later.

Local site issues should be considered in design and planning. Liaison with the LPA helps understand policies on night-time environments, sustainability, and light control.

Overspill diagrams and Ordnance Survey (OS) mapping data are often required to show light spread and protect neighbour amenity. Each site is unique, so early surveys of surroundings and viewpoints are essential for a successful project.

Early engagement with the LPA is essential for sports lighting projects. It ensures compliance, avoids costly delays, and builds community support.

Statutory consultation will be managed by the LPA, and this refers to the legally required process of consulting specific bodies, organisations, or individuals before deciding on a planning application.

This requirement is set out in planning law and ensures that certain stakeholders, such as environmental agencies, highways authorities, or heritage bodies, are formally invited to comment on proposals that may affect their area of responsibility.

3.2.1 Temporary sports lighting

This guidance is primarily focused on the design of permanently installed lighting systems. Liaison with the LPA and EHO will be required to confirm with a temporary planning permission is required under a General Permitted Development Order (see Part A 3.5 Statutory regulations).

This may require details such as event duration, lighting layout and justification of lighting levels, mounting arrangements, lighting control and operating hours, and proposed dates for installation, removal and site reinstatement.

Consideration should be given to impacts on neighbouring amenity, ecology (for example bats and wildlife), highway safety, noise, and visual appearance and consultation is recommended with the local community (see the following section 3.3).

3.3 Community consultation

Community and user group consultation is a vital part of the approval process. Engaging residents early builds trust and addresses concerns about glare, curfew times, and light spill, leading to smoother approvals and fewer objections.

Consulting user-groups will help build the support case by showing the local area demand for lighting the facility.

Early local consultation ensures neighbours are informed before changes become difficult. It gives them an opportunity to raise concerns and influence proposals, rather than hearing about plans for the first time when the local planning authority seeks their views.

The sports offered can shape assumptions about who uses the facility. Certain sports are associated with specific age groups and behaviours, which often raises concerns about noise and nuisance, especially if lighting extends usage into the evening.

By involving residents at the outset, these issues can be addressed proactively. This approach not only improves community relations but also simplifies the planning process by reducing objections and avoiding costly revisions later.

Ensure specific users, such as sight loss representatives and people with neurodivergent conditions are taken into account, alongside sporting groups and the wider local community.

For further guidance, see AISF Part G Consultation and engagement.



Community Consultation Topics

- **Use of recognised standards;**
- **Agreed environmental lighting designation (rural / village / urban / city);**
- **Sustainability ambitions;**
- **Perceived human and / or ecological impact;**
- **Local baseline ambient lighting character;**
- **Control of light obtrusion effects;**
- **Promoting a standard design method.**

3.4 Information for the planning authority

For an external lighting project (either sports lighting or associated infrastructure such as car parking and access roads), the LPA will need to understand the potential impact of a sports lighting system on the surrounding environment and inhabitants.

This section outlines the information which will likely be requested and the specialist advice that should be sought to prepare it.

The LPA will need a statement to support the strategic need for the sports lighting. This may include reference to planning policies and local plans, support from user groups, and address concerns raised by previous planning applications in the region which may have been refused or appealed.

3.4.1 ILP guidance documents

To mitigate against light obtrusion effects requires a consistent approach for all parties, from the Client and Designer to the Planning Officer.

Two key guidance documents, both published by the ILP and freely available to download are:

- GN01 The Avoidance of Obtrusive Light;
- GN08 Bats and Artificial Lighting.

Reference to ILP GN01 is critical, as it provides detailed guidance on matters such as common law nuisance, statutory nuisance, exemptions and legal responsibilities. It also introduces planning guidance that seeks to protect existing illuminated uses from restrictions resulting from nearby new developments.

A structured approach is necessary to demonstrate that an external lighting design will avoid light obtrusion effects, which addresses regulatory, technical, and environmental requirements.

If a Lighting Impact Assessment (LIA) is required, this will need support by a specialist lighting consultant, and the process is described by the ILP in their Professional Lighting Guide 4 (PLG04) - Guidance on Undertaking Environmental Lighting Impact Assessments (2013).

The ILP PLG04 provides structured guidance for assessing environmental impacts of lighting. It addresses key stages including planning, design, evaluation, and mitigation of issues such as light pollution and glare.

It is also designed to help lighting designers, planners and environmental officers in understanding how artificial lighting can affect the surrounding environment and local communities.

For further information, see Part A 3.4.6.

3.4.2 Understanding the context

ILP GN01 defines maximum thresholds for light obtrusion characteristics depending on the existing environmental conditions, and it defines them by five zones ranging from E0 (protected dark sky place) to E4 (town / city centre).

For further guidance, see Part A 2.6.5 Obtrusive light.

It is important that the designer engages early with the planning officer to agree on the appropriate zone designation.

Local planning policy, mapping tools (e.g. Light pollution map) and site surveys will also help select the appropriate zone.

3.4.3 Planning history

Researching the planning history of a sports lighting system is key to understand any conditions attached to previous consents, such as curfews, light levels, or ecological mitigation.

Over time, these conditions can be overlooked or remain unfulfilled, creating compliance risks and risking enforcement action. It can also undermine community relations and expose the lighting operator to legal challenges.

A thorough review ensures design decisions respect existing obligations, avoids costly retrofits, and supports a robust planning strategy that minimises risk and reputational damage.

A planning history checklist can include:

1. **Previous Planning Approvals Including appeal approvals:**
   - Identify all historic consents for the site and confirm if sports lighting was included;
   - Learning from recent refusals or recent appeals and permissions granted.
2. **Conditions Attached to Consents:**
   - Check for restrictions on operating hours, light levels, curfews, and seasonal use.
3. **Design Specifications:**
   - Review any requirements for aiming angles, shielding, or luminaire type;
   - Environmental mitigation.
4. **Confirm obligations for wildlife protection, dark-sky compliance, or landscaping:**
   - Monitoring and reporting.
5. **Verify if light spill assessments or compliance reports were required and submitted:**
   - Community engagement.
6. **Note any commitments to neighbour consultation or complaint resolution:**
   - Enforcement history;
   - Look for past breaches, enforcement notices, or unresolved compliance issues.
7. **Legal Agreements:**
   - Check for Section 106 obligations or other binding agreements linked to lighting.
8. **Strategic justification – PPS and Local plans / design briefs:**
   - Check for business case from PPS and local development plans to support the lighting application.



3.4.4 Perceptions of change

Upgrading a sports lighting system is often perceived as a straightforward, like-for-like equipment replacement. However, switching to newer technology can result in noticeable differences in light spill, glare and colour temperature, making the change more significant for the neighbouring residents and wildlife than it might initially seem.

In practice, such upgrades rarely involve simply swapping out equipment, and the new system is experienced in a distinctly different way.

It is important for all stakeholders to appreciate how these changes will be perceived. For instance, while the design illuminance levels may remain unchanged, the older metal-halide lamps are likely to have degraded over time, causing the new LED system to appear much brighter even when the target illuminance is technically the same.

A shift in colour temperature is also frequently observed, with new LED systems often selected with a cool-white light. This can happen unintentionally, as cool-white LEDs tend to be more efficient, or intentionally, as cooler light is often considered preferable for sports environments.

Nevertheless, this shift can have a considerable impact on the surroundings when compared with the existing.

Therefore, it is recommended that any upgrade is assessed in the context of the existing installation. For example, if the current system uses 4000K lamps, this specification should form the basis for the new LED system.

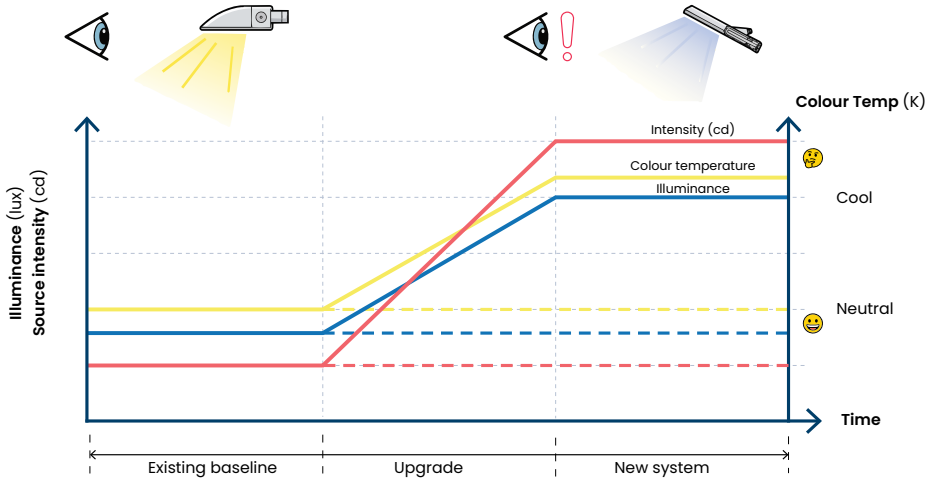
Similarly, if the existing lighting comprises horizontally mounted asymmetric luminaires, the new design should seek to replicate this approach rather than introducing tilted luminaires.

Where required, NGBs are prepared to make reasonable adjustments to their illumination recommendations, prioritising this approach in lieu of adverse impacts on the site context and neighbours, which could risk local objections and worst-case lead to the loss of sports lighting facilities altogether.

Any alterations to the lighting strategy, including changes in optical performance or colour temperature, are likely to be regarded as significant modifications by nearby residents.

Therefore, it is vital to proactively address the concerns of the local community as outlined in Part A 3.3, ensuring that the transition is managed thoughtfully and with due consideration for the surrounding environment and those living nearby.

Figure A24 Perceived impact of change



3.4.5 Timing and duration of use

The effect of sports lighting on its surroundings is shaped as much by how long it operates as by its brightness. While high light levels are necessary for sports activity, extended hours can amplify disturbance.

A balanced approach, adjusting operating times alongside intensity through consultation with neighbours and ecology specialist, may offer a practical compromise, meeting sporting needs while respecting community and environmental concerns.

It is recommended that a schedule of operating times is provided to support the planning application. This should include an estimate of annual energy consumption, informed by the proposed schedule and lighting system design and this will further assist the local authority in assessing the environmental impact of the proposal.

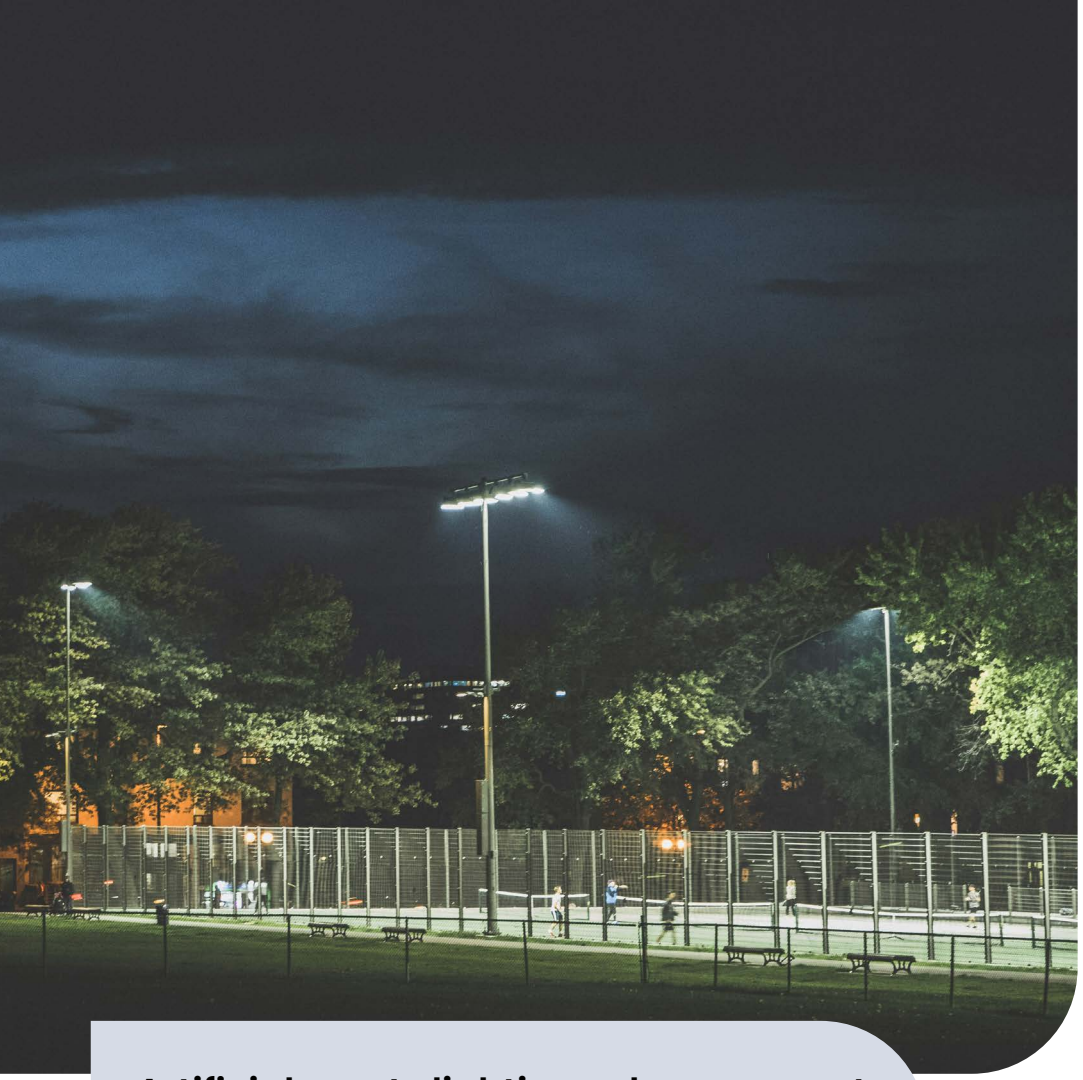
3.4.6 Conduct a lighting impact assessment

A lighting impact assessment should follow the methodology set out in the ILP PLG04. The outcome should be a detailed report which includes:

- A site context analysis to describe the nocturnal scene, justify the appropriate environmental designation and identify residential and ecological receptors;
- Findings of the baseline lighting survey;
- Primary, secondary and tertiary mitigation;
- Details of the proposed lighting system including luminaire type, cowls / shields (if required), colour temperature, aiming and tilt angles, mounting height, hours of operation, cowls, control system and curfew;
- Predicted illumination calculations of the field of play and resultant light obtrusion effects. This should be completed using industry standard software which includes a reflected light calculation (e.g. Dialux, Relux, AGi);
- Field of play calculations should demonstrate the playing area does not significantly exceed the maintained average illuminance requirement;
- Spill light should be calculated on the horizontal plane extending beyond the field of play, and on the vertical plane at the windows of neighbouring properties, and ecological habitats, to the extents agreed with planning officer;
- Light obtrusion calculations including light source intensity at each observer location, upward light ratio and upward flux ratio (as per GN01) if the site is located near/within protected dark sky areas or observatory;
- An assessment of the receptor sensitivity, significance of the light obtrusion effect in combination with the baseline, impact, effect of mitigation, cumulative and residual effects.

A lighting impact assessment should also be mentioned in any Equality Impact Assessment, as the lighting quality impacts on many different user groups including people with sight and hearing impairments, neurodivergence / visual hypersensitivity.

For further guidance, see Sport England's AISF Part A 2.1 Inclusive design, and the infographic Figure A23 on page 83.



Artificial sports lighting schemes must comply with statutory regulations to ensure they are safe, environmentally responsible, and fit for purpose.

3.5 Statutory regulations

Artificial sports lighting schemes must comply with statutory regulations to ensure they are safe, environmentally responsible, and fit for purpose.

Compliance helps prevent issues such as excessive glare, light spillage, and ecological disturbance, which can negatively impact nearby residents, road users, and wildlife.

Regulations also ensure that lighting levels are appropriate for the level of play and visibility requirements, while meeting planning, health and safety, and energy efficiency standards.

Adhering to these legal frameworks not only protects stakeholders but also supports sustainable development and reduces the risk of enforcement action or costly redesign.

Key statutory regulations for artificial sports lighting in the UK typically include:

- Town and Country Planning Act (1990);
- National Planning Policy Framework (NPPF) and Planning Practice Guidance;
- The Building Regulations 2010 (Part L);
- The CDM Regulations 2015;
- Building Safety Act (2022);
- Health and Safety at Work etc. Act (1974);
- Environmental Protection Act (1990);
- Wildlife and Countryside Act (1981).

These are outlined further in the following sections 3.5.1 to 3.5.8.

3.5.1 Town and Country Planning Act (1990)

The primary legislation governing the planning system in England and Wales which sets out when planning permission is required for developments, including external lighting installations that materially affect the external appearance of a building or land.

See: https://www.legislation.gov.uk/ukpga/1990/8/contents

- **The Town and Country Planning (General Permitted Development) (England) Order 2015 (GPDO)**

  This grants "permitted development rights" for certain minor works, including some external lighting, without the need for a full planning application. However, lighting in sensitive areas (e.g. conservation areas, listed buildings, AONBs) may still require full permission.

  See: https://www.legislation.gov.uk/uksi/2015/596/contents

3.5.2 NPPF and Planning Practice Guidance

The NPPF provides national policy on planning, including the need to limit light obtrusion and protect dark skies.

Local planning authorities are advised to consider the impact of lighting on amenity, wildlife, and landscape character.

See: https://www.gov.uk/government/publications/national-planning-policy-framework--2

3.5.3 The Building Regulations 2010 (Part L)

Approved Document Part L, Conservation of fuel and power, sets the standards for the energy efficiency of buildings, including requirements for the efficiency and control of external lighting.

See: https://www.legislation.gov.uk/uksi/2010/2214/contents

3.5.4 The CDM Regulations 2015

The Construction (Design and Management) Regulations 2015 (CDM 2015) were introduced to improve health, safety, and welfare in the UK construction industry.

It sets out clear roles and responsibilities for all parties involved in construction projects, aiming to improve health and safety at every stage.

The regulations apply to all types and sizes of construction work, requiring risks to be identified and managed from design through to completion.

Lighting designers should design to minimise risks during installation, operation, and decommissioning, and coordinate with other duty holders to ensure compliance with health and safety standards throughout the project lifecycle.

See: https://www.legislation.gov.uk/uksi/2015/51/contents and https://www.hse.gov.uk/construction/cdm/2015/overview.htm

3.5.5 Building Safety Act (2022)

Emergency lighting is vital for safe evacuation during power loss or emergencies, illuminating escape routes and exits.

The Building Safety Act reinforces compliance and emergency lighting systems should meet BS 5266-1 standards.

https://www.legislation.gov.uk/ukpga/2022/30/contents

Compliant design, installation, and maintenance are essential to meet regulatory obligations and protect occupants. Emergency lighting is not just a technical requirement; it is a critical life safety measure aligned with the Act's goal of safer buildings.

3.5.6 Health and Safety at Work etc. Act (1974)

This act defines the fundamental structure and authority for the encouragement, regulation and enforcement of workplace health, safety and welfare within the UK.

This ensures lighting installations are designed, installed, and maintained safely for users, operator and the public.

See: https://www.legislation.gov.uk/ukpga/1974/37/contents

3.5.7 Environmental Protection Act (1990)

Under the Environmental Protection Act 1990, as amended by the Clean Neighbourhoods and Environment Act 2005, artificial light emitted from premises can be classed as a statutory nuisance.

A statutory nuisance occurs when light unreasonably and substantially interferes with the use or enjoyment of property or is prejudicial to health.

Light obtrusion (also called 'light pollution') is increasingly scrutinised in planning applications. Local authorities often have policies requiring evidence that impacts on people and wildlife have been considered.

Data should be included in applications to evidence the effectiveness of mitigation and light spill control. Specialist help is likely to be required to provide this evidence in accordance with the guidance set out in ILP GN01.

The following laws mean that if artificial light significantly interferes with the enjoyment of property or poses a risk to health, local authorities have a duty to investigate and can issue abatement notices.

For more information on light obtrusion, see Part A 2.6.5.

The two key Acts of Parliament that govern light obtrusion as a statutory nuisance in the UK are:

- **Environmental Protection Act 1990**

  This Act sets out the statutory nuisance regime under Section 79, which includes nuisances that are "prejudicial to health or a nuisance."

  See: https://www.legislation.gov.uk/ukpga/1990/43/contents

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- **Clean Neighbourhoods and Environment Act 2005**

  This Act amended the Environmental Protection Act 1990 to explicitly include artificial light emitted from premises as a statutory nuisance. It also introduced enforcement powers for local authorities and private individuals to act.

  See: https://www.legislation.gov.uk/ukpga/2005/16/contents

Biodiversity net gain (BNG) is a legal requirement in the UK, introduced under the Environment Act 2021, to ensure that development projects leave the natural environment in a measurably better state than before.

BNG applies to most new developments in England that require planning permission (see Part A 2.4.2).

3.5.8 Wildlife and Countryside Act (1981)

In addition, under the Wildlife and Countryside Act 1981, all bats and their roosts are protected, and it is illegal to harm, disturb, or destroy roosts.

The extent of the bat habitat which could be affected by lighting will include the roosts and commuting spaces.

Lighting installations should avoid impacting sensitive wildlife habitats.

See: https://www.legislation.gov.uk/ukpga/1981/69/contents

Example of sports light obtrusion



Image credit: Arup

4 Operational costs

This section outlines the key considerations for assessing the design, operation, replacement, and maintenance costs associated with lighting schemes for sports facilities.

4.1 Introduction

The initial purchase cost of an artificial sports lighting system may seem high, and this will need to include the design cost of the lighting system, but the on-going costs associated with running the system should not be underestimated either.

When design proposals and alternative systems are being assessed, running and replacement costs as well as maintenance costs should be identified and included alongside the initial capital costs in any financial assessment.

It is important to make sure that, when choosing lighting levels, they are matched to requirements, considering NGB recommendations, and technical body recommendations.

Selection of higher than necessary lighting levels means higher than necessary energy costs, as well as increasing the costs of procurement, installation, maintenance and replacement.

Outdoor sports lighting schemes generally involve significant capital expenditure and require high usage levels to justify the initial outlay.

Increased facility use may also necessitate further investment in infrastructure, such as energy supply systems, expanded car parking and other amenities.

These costs should be carefully incorporated into any assessment of the project's financial viability.

The on-going cost of ownership represents the combined cost of operating the lighting installation and maintaining it in good working condition over its life, and comprises:



- **Energy costs:**

  The cost of the electricity required to operate the lighting system, alongside the associated operational carbon emissions arising from energy consumption over the system's lifetime;



- **Maintenance costs:**

  The cost of the labour, materials and plant equipment needed to keep the luminaires in good condition, replacing limited-life components as required;



- **Sinking Fund:**

  A fund established to ensure that when there is a need for replacement of major components of the system, or of the complete system, sufficient finance is available.

4.2 Energy costs

The benefits of minimising energy use and costs are obvious, overall operating costs are reduced, and environmental impact can be minimised.

The careful selection of lighting and controls equipment at the design stage is the first step to ensuring good energy efficiency. They should match requirements and be inherently energy efficient.

The next step is to ensure that switching and control arrangements are such that only the necessary illuminance levels are provided over relevant areas and only during the periods required.

For further information on lighting controls, see Part A 2.10.

In accordance with Approved Document Part L (Conservation of fuel and power), suitable energy metering and, where applicable, sub-metering of lighting circuits should be provided to enable the monitoring, management and verification of lighting energy use throughout operation.

Agreement with the electricity supply company of the most appropriate electricity tariff is a further step.

4.2.1 Energy tariffs

Energy charges are normally made up of any standing charge made by the energy supplier, plus a per-unit charge for each kilowatt hour (kWh) of electrical energy used.

Calculation of energy costs should be considered a fundamental part of the project design process.

The illumination level, the luminaire types and the layout will all have an impact on the overall efficiency of the system. In some cases, a more sophisticated lighting scheme may have benefits in terms of economy of operation.

Electricity tariffs are usually categorised by payment interval, which can be quarterly or monthly.

Quarterly tariffs normally apply to relatively small consumers and are comparatively straightforward in format. They often comprise two components: a standing charge and a unit (kWh) charge based upon energy usage.

Monthly tariffs may be more involved and often apply to larger supplies. Use of Comparison Websites may be helpful in selecting a supplier and tariff.

When calculating the expected electrical energy costs for a lighting installation the power factors should be considered.

Modern LED drivers may have built in power factor corrector, or circuitry designed to optimise it above 95%, and this should be a consideration when selecting equipment.

Having taken all possible steps to minimise energy use and costs, the realisation of the benefits to be accrued becomes the responsibility of the facility operator.

Careful control and management are essential, to ensure that the luminaires are only used at the lighting level required, are only on when needed and are only on in the areas being used.

4.3 Maintenance costs

Maintenance costs are associated with:

- Cleaning;
- Repairing and luminaire servicing;
- System testing and certification.

The importance of a regular maintenance regime cannot be overestimated. Failure to carry out routine and regular maintenance will inevitably lead to declining performance of the system, increasing instances of failed or under-performing luminaires, and ultimately to a system which is unsafe.

It will also fall below the expectations of users and players, who may migrate to other facilities where better playing conditions are available. Maintenance issues should therefore be considered throughout the project design stages.

Accessibility is a requirement for the contractor, and poor access will increase maintenance costs. Equally, the choice of lighting equipment will impact on operational costs.

In many cases, a maintenance regime can be designed to take in multiple operations per contractor visit. Such a regime will minimise maintenance staff costs and site access equipment can be used more efficiently.



Failure to carry out routine and regular maintenance will inevitably lead to declining performance of the system, increasing instances of failed or under-performing luminaires, and ultimately to a system which is unsafe.

4.4 Sinking fund - lifecycle costs

A typical sports lighting system is likely to have a life expectancy of some 20 - 25 years before it requires full replacement, but within this period individual components will have shorter lifespans.

Adequate budget allowance should be made for all such costs. This is often referred to as a 'sinking fund'.

Luminaires have a life expectancy related to actual hours of use, but the life expectancy of other components will depend on a range of factors:

- Wear and tear in normal use;
- Environmental conditions;
- Misuse;
- Adequacy of maintenance.

The sinking fund, which should be set up when the lighting systems are first installed, should be sufficient to meet these predictable replacement costs as they arise.

Contributions to the sinking fund should be regular and realistic.

The size of the contributions can be worked out from the tendered costs of the lighting system, or from a quotation obtained for the purpose, either of which will need to be sufficiently detailed to allow the elements of the system to be costed separately.

See the following section 4.5 Efficiency and lifecycle for details.

Note that the life expectancies quoted above are minimum figures and that many suppliers would quote significantly longer average life expectancies.

Luminaire life is affected by quality of the materials and the manufacturing process, by the quality of the seals, by location and pollution levels, but most of all by design.

The life of some luminaires can be as short as 10 years, though others may last much longer. In selecting a luminaire, reports from owners of similar systems can be useful.

In coastal locations, life is likely to be shorter than elsewhere.

Column life is determined mainly by the quality of the galvanising as outlined in BS EN 1461 (Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods).

Galvanising is expected to last at least 25 years but can be specified to support a much longer design life which may influence column material selection or thickness and corrosion protection (galvanisation / paint) systems to deliver a longer lasting product.

Column condition can be checked, both visually and instrumentally for the condition of the galvanising, and mechanically for the mechanical strength of the column and the stability of the foundation.

4.5 Efficiency and lifecycle

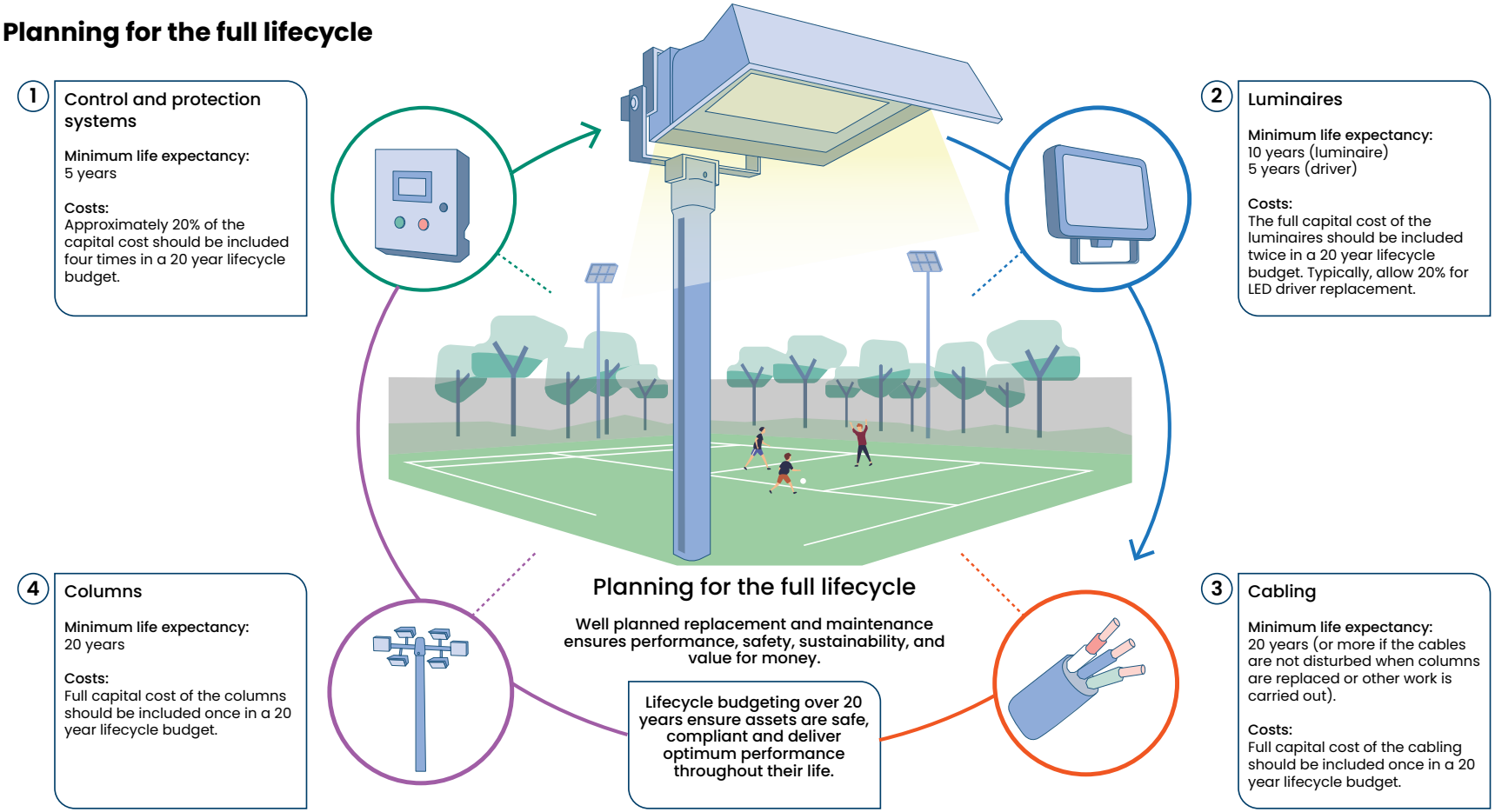
Consideration of the total lifecycle cost of a proposed lighting installation should lead to the selection of a system giving the best value for money.

This may not necessarily be the system having the lowest initial capital cost.

Warranties should be examined and assessed carefully. An attractively long warranty is of little use if its conditions mean that no replacement will be carried out until long after the performance of the lighting system has fallen below acceptable levels.

See Part A 2.9.7 Luminaire specification for further information on system longevity.

Figure A25 Planning for the full lifecycle



Part B

Indoor sports lighting

1 Multi-sports halls

This section provides guidance on lighting applications for multi-sports halls, highlighting how requirements vary depending on the range of sports being accommodated.

1.1 Introduction

Lighting applications for sports halls involve particular characteristics that are dependent on the range of sports accommodated. However, general objectives for lighting include:

- The provision of a safe, enjoyable environment for users and players;
- The illumination of the full volume of the field of play for players and match officials, court markings, and key features such as nets and goals;
- The provision of suitable and sufficient lighting for spectators.

The geometry and layout of a sports hall, together with the materials, colours and surface finishes of internal fabrics, all influence the quality of the final lighting. For this reason, lighting installations should be considered an integral part of the initial architectural design, alongside all other building services.

Because of their reflectance and colour, the walls, floor and ceiling also affect lighting levels and quality, which in turn influences the design and operating cost of the hall's lighting system.

Playing surfaces in sport should, theoretically, appear to have a constant brightness when viewed from all appropriate directions. In practice, however, the extent to which this can be achieved depends largely upon the qualities of the playing surface, including its spectral reflectance and any surface texture, as well as the manner in which it is illuminated.

Further Sport-specific guidance for many major indoor sports, including design guides and technical data sheets, is available from Sport England and the relevant NGBs.

1.2 Multi-sports facilities

Design of the lighting installation for multi-sports halls is a complex matter in which the conflicts between the requirements of different sports need to be resolved.

For further guidance, see Sport England's Sports Halls: Design and Layouts Guidance, Developing The Right Sports Hall and Affordable sports halls.

Many larger sports halls program several different sports at the same time to maximise the time and space allocation within the sports hall. This has the potential to produce a conflict of interests in respect of simultaneous lighting requirements.

A lighting control system (see Part A 2.10) should allow for flexibility to select different configurations satisfy the demands of differing sports that may be played at one time and accommodate for varying levels of competition.

Trying to meet the lighting requirements for every possible sport in a hall can result in multiple, expensive systems to purchase and operate, many of which may see limited use.

Early consultation should focus on establishing a reasonable baseline for design, considering the most likely activities.

Incorporating dimming technology and simple lighting controls can help manage compromises and provide flexibility for multi-sports use.

For lighting levels relevant to specific indoor sports, see Part D 2.

2 Specialist sports halls

This section provides guidance on lighting applications for specialist sports halls, outlining how requirements vary according to the specific sport being accommodated.

2.1 Introduction

Specialist sports halls should be designed around lighting quality, not simply achieving a target illuminance.

Good lighting brings together appropriate illuminance, uniformity, glare control, colour rendering and balanced. These qualities help create a visual environment that is safe, legible and enjoyable for players, coaches, officials and spectators.

This is particularly important for sports such as badminton and indoor cricket, where users need strong visual acuity to track small, fast-moving objects at speed, often through the air and across changing backgrounds.

A considered, sport-specific approach will therefore support judgement of speed, distance and trajectory across the full three-dimensional playing volume.

The lighting strategy should respond to the sport, level of play, court layout, viewing directions, playing object, background reflectance, surface finishes and user needs.

Specialist sports halls should not be treated as generic illuminated spaces, as each activity places different demands on the visual environment.

Luminaire placement should be carefully coordinated with the building form, court markings, ceiling height, sports equipment, services and normal player sightlines.

Distributed arrangements of lower-powered luminaires can help create smoother uniformity, reduce harsh contrasts and provide more comfortable visibility across the playing area.



Worcester Arena
Image credit: Roberts Limbrick

Common issues to avoid include poorly positioned luminaires, distracting glare, uneven illumination, strong shadows, insufficient vertical light and lighting that is added late as a separate fit-out rather than integrated into the sports hall design.

Daylight should be embraced as a positive part of a high-quality specialist sports environment.

Well-designed daylighting, combined with daylight-linked lighting controls, can support wellbeing, make spaces feel brighter and more welcoming, and reduce reliance on artificial lighting during daytime operation.

The most successful schemes combine daylight and electric lighting as a coordinated system, helping to provide visual comfort, energy efficiency and consistent performance throughout the year.

2.2 Badminton

Badminton requires very carefully designed lighting to enable the game to be played to a good level. When designing the lighting for badminton halls, it is essential to appreciate how the game is played.

The shuttlecock can move at very high speeds over the net, requiring maximum light reflectance from its white feathers. The white shuttlecock can best be seen when illuminated against a darker background.

The path of the shuttlecock is often high above the net and sufficient vertical illuminance within the overall volume of the field of play should therefore be provided.

Because players frequently look upwards to track the shuttlecock, luminaires positioned directly within their field of view can create glare and reduce visibility. Their location should therefore be carefully coordinated with the movement of play. Luminaires should not be directly positioned over the court.

Doors and windows to other lit areas are all a potential distraction and arrangements should be made for such light sources to be temporarily screened or switched off.

Badminton requires lighting throughout the full volume of the field of play and for the luminaires to be grouped centrally around the net. Any luminaires towards the rear of the court should be turned off (or controlled) to darken the background to give a contrast with the white shuttlecock.

It is essential to consider lighting early in the design process so that the luminaire and locations can be co-ordinated with the court layout and background colours. Lighting and colours should be considered as an entity.



It is essential to consider lighting early in the design process so that the luminaire and locations can be coordinated with the court layout and background colours.

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Badminton England's requirements are based on their experience of creating the optimum lighting conditions for the sport based on:

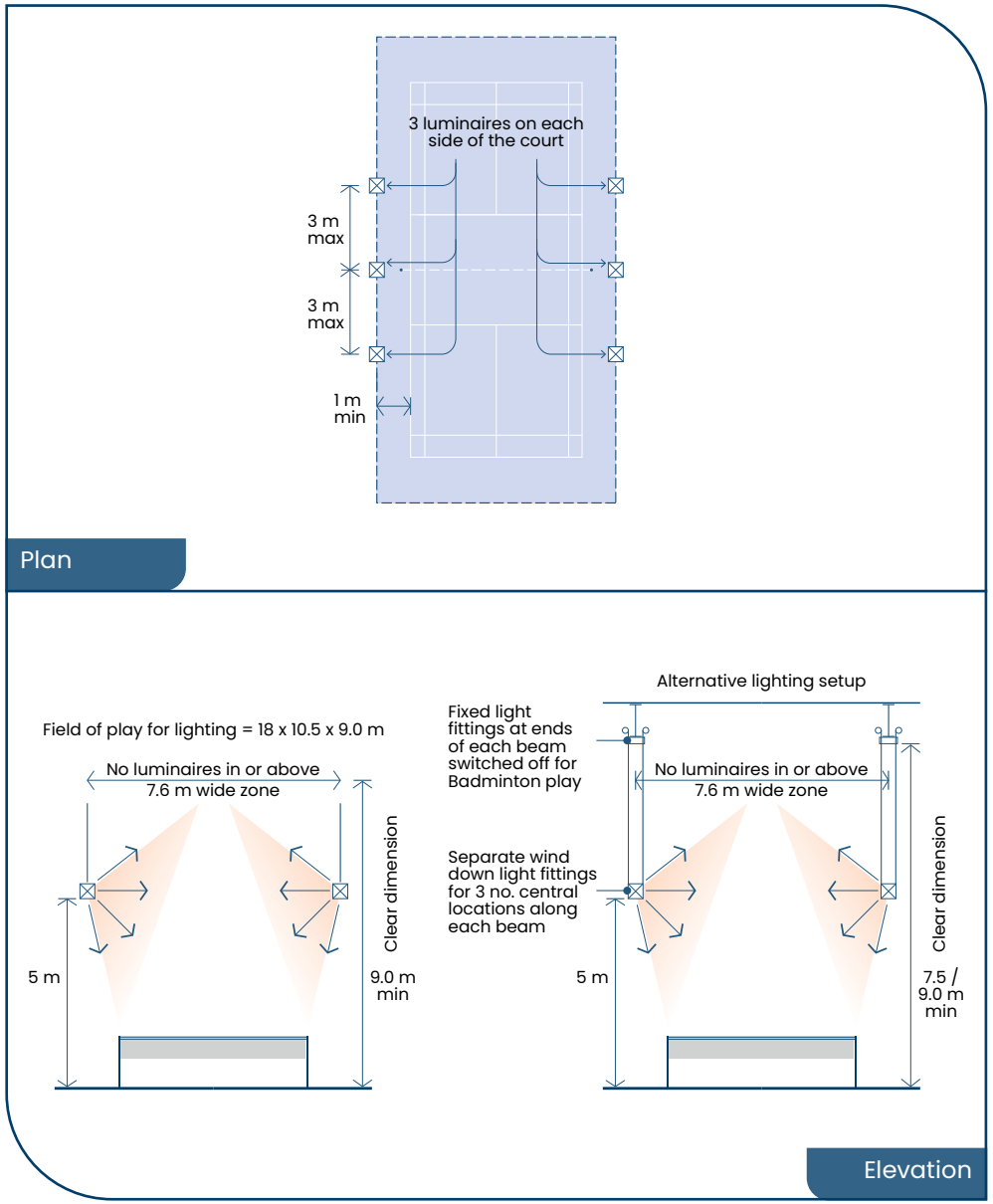
- A preferred height above the floor of 5 m for the luminaires;
- Luminaires located symmetrically on each side of court and net;
- Luminaires being > 1 m from the side lines of the court for high performance centres and 0.75 m for other centres (with 1.5 m between courts);
- Luminaires having glare control, not limited to the luminaire photometry but also considering the background surface reflectance;
- Maximum illumination at the net area of the court;
- Background wall colours having reflectance of 30-50%, e.g.:
  - Blue (86 BG 43/321) or green (30 GG 40/290) for dedicated badminton halls;
  - Blue green (53 GG 50/360, 87 GG 51/291, 10 GG 48/366) for multi-sport halls;
- Ceiling reflectance being 70-90%.

In a multi-sports environment, luminaires mounted at 5 m above floor level are likely to cause a conflict for sports such as volleyball, trampolining and basketball that require a greater clear height.

A solution is to incorporate separate wind-down light fittings for badminton play. Luminaire switching arrangements enabling separate control of luminaires at the back of each court, may be preferable to avoid distraction.

For further information, refer to Sport England's Sport-specific guidance on Badminton, and Badminton Design Guidance.

Figure B1 Badminton England's lighting setup



2.3 Indoor bowls

Indoor bowls centres should be carefully designed to ensure that the lighting supports both the quality of play and the overall experience for users, players and visitors.

Good artificial lighting is essential, as it affects not only how well the game can be played, but also the comfort and atmosphere within the centre.

Lighting should be integrated into the planning and design of the facility. The choice of surface colours and materials should work with the lighting scheme to create attractive and practical spaces.

Suitable lighting makes it easier for players to see the jack (small white ball) and the positions of the woods (bowls) around it, and to follow the movement of the jack / wood across the green, which may extend up to 40 m. This is important for both enjoyment and fair play.

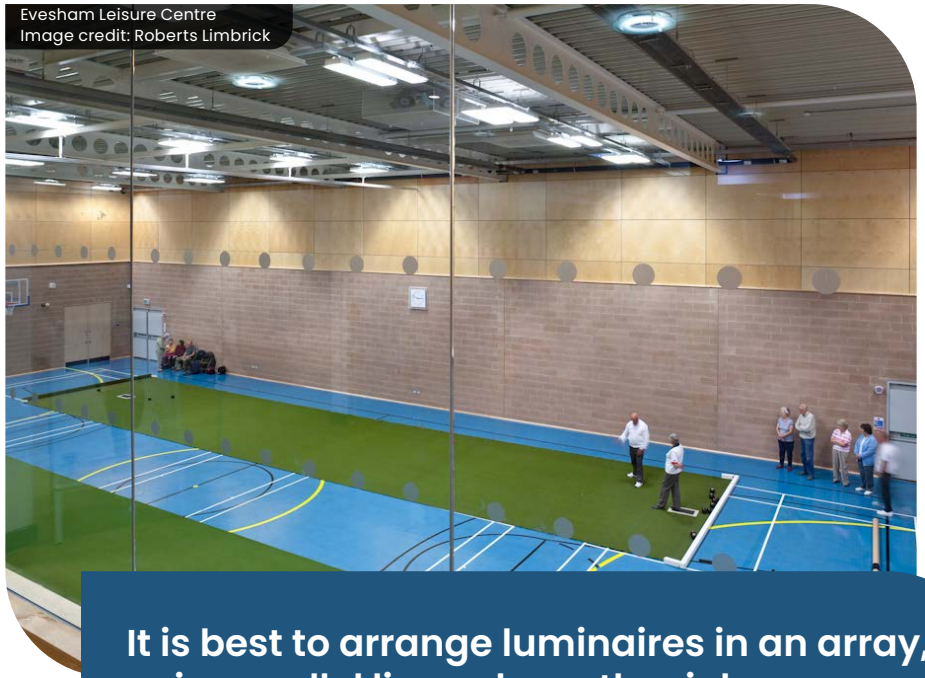
As indoor bowls is played on a large open area, having consistent illuminance across the entire playing surface is crucial. The surface of the green itself can reflect light differently depending on its material and texture, so lighting should be set up to minimise visible differences in brightness.

To achieve this, the English Indoor Bowling Association Ltd (EIBA)[1] guidance recommends an illuminance gradient of no more than 5% per metre to maintain visual consistency.

Luminaires should be carefully placed and selected to ensure even lighting and to avoid causing glare that can distract or discomfort players.

It is best to arrange luminaires in an array, or in parallel lines above the rinks as this allows only the rinks in use to be lit, potentially saving energy.

The luminaires should be installed between 4.5 and 6 m above the playing surface, providing enough height for even coverage but not so high as to cause shadows or bright spots.



Evesham Leisure Centre
Image credit: Roberts Limbrick

It is best to arrange luminaires in an array, or in parallel lines above the rinks as this allows only the rinks in use to be lit, potentially saving energy.

1 See: http://www.eiba.co.uk/

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To minimise glare, use baffles or louvres on luminaires only when necessary and after considering options like using more low-power luminaires or avoiding compact, high-intensity luminaire form factors, without compromising energy efficiency.

Lighting controls should be easy to use, with options for the whole area to be lit, or with subdivided rinks illuminated (and this may require some adjacent rink lighting to maintain high uniformity for the rinks in use).

The lighting system should offer excellent visibility and comfort for all, with a very high level of uniformity across the rinks. This prevents shadows and overly bright areas that could affect the game.

The reflectance of surfaces around the bowls green is also important. It is recommended that:

- End and side walls have a reflectance of 70% (with a minimum of 40%);
- The ceiling has a reflectance of 90% (minimum 60%); and
- The bowls carpet has a reflectance of 30%.

These values help create a bright, comfortable environment.

Natural lighting can be used to make the space feel less enclosed, but it should be managed so it does not create glare or uneven lighting on the playing surface.

Sunlight should not fall directly onto the bowls playing surface and daylight should only enter from above, with shading devices if necessary to prevent glare.

For further information, refer to Sport England's Sport-specific guidance on Indoor bowls.

2.4 Indoor cricket

Cricket can take place indoors as both an indoor game and as a training activity within a netted area. Both require high levels of lighting so that users, players, coaches and spectators can safely follow the players' actions and the rapid movement of the ball.

The cricket ball can reach very high speeds and requires quick player reactions at close quarters.

All phases of play need to be seen clearly: the run up, the movement of the bowler's arm and the delivery of the ball need to be seen by the batter; the bowler and fielders need a clear view of the wicket, batter and the flight of the ball.

The lighting system needs to provide sufficient and suitable light such that players, coaches, match officials spectators and other users can all track the relatively small, fast moving, hard cricket ball when in play.

This is not just a question of achieving enough light, but also a high standard of uniformity, without structural shadows and without excessive glare that could endanger players.

Indoor cricket requires bright, uniform, high-contrast lighting to ensure clear ball tracking, rapid visual response and safe play at high speeds.

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The SLL LG4 and BS EN 12193[1] recommend different levels of lighting for indoor cricket and for cricket nets, but the England and Wales Cricket Board (ECB)[2] make no distinction between lighting requirements for practice nets and play.

This reflects the potential for indoor sports spaces to be used flexibly for a range of training and game activities in addition to the more traditional cricket net format.

There is also a strong preference for the use of natural daylight in sports halls used for cricket and with this approach, careful shading and coordination with the playing areas is required to ensure an even distribution of light and the avoidance of all direct sunlight.

The artificial lighting should also reproduce daylight conditions as far as possible. This is often achieved with an array of high-level luminaires.

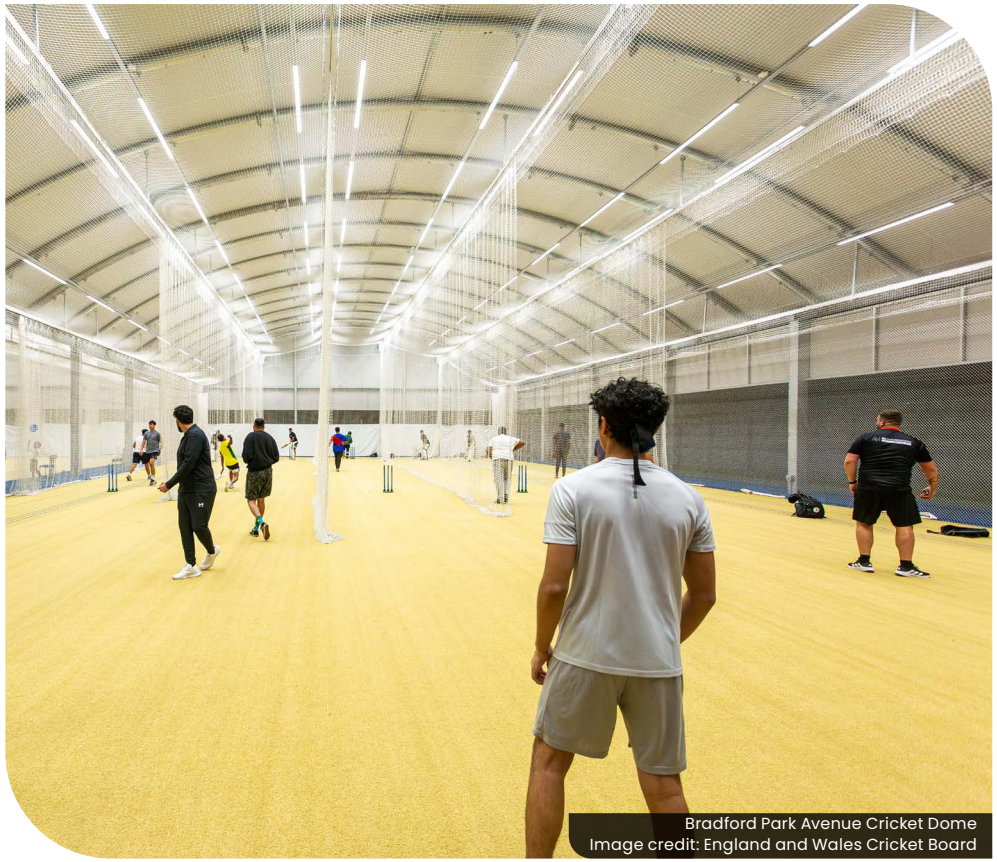
The luminaires should run parallel on either side of the wicket and in line with the direction of play.

Glare should be controlled, and the emphasis should be on multiple lower-powered luminaires than few higher-powered luminaires in the array, mounted below light-coloured ceiling that reduces the contrast.

Careful coordination of the locations of the lighting, heating system, net tracks and the wicket will be necessary to avoid shadows and achieve uniformity of light distribution.

The recommended reflectance of the walls and ceiling is 70%.

Refer to Sport England's Sport-specific guidance on Indoor cricket for further information on the integration of cricket into the facilities within a multi-purpose sports hall.



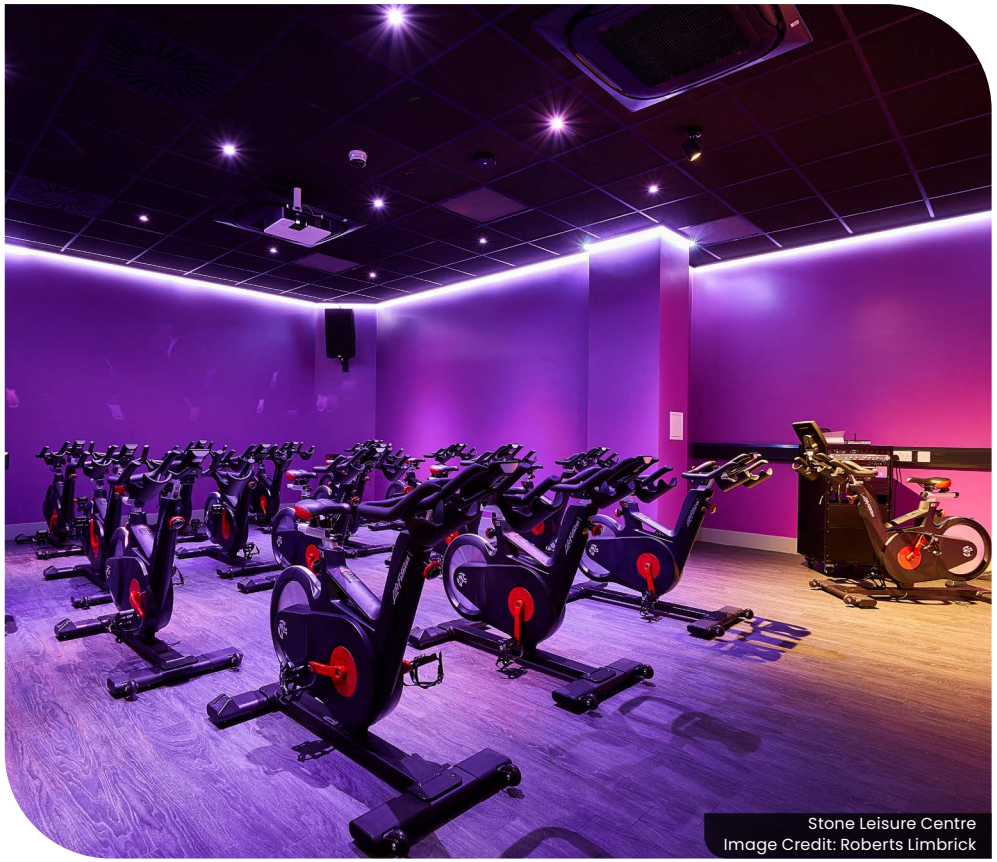
Bradford Park Avenue Cricket Dome
Image credit: England and Wales Cricket Board

1 BS EN 12193 specifies requirements for artificial lighting in sports facilities to ensure optimal visual conditions for players, spectators and broadcast purposes.
2 The ECB is the governing body for cricket across England and Wales - see: https://www.ecb.co.uk/

2.5 Fitness centres

Fitness centre users should be able to concentrate on their training in safety without distraction from the lighting installation.

The ambient lighting level should be adequate for the safety of the users. Good artificial lighting design can also enhance the visual appearance and appeal of the space and create an attractive environment.



Stone Leisure Centre
Image Credit: Roberts Limbrick

The guidance for lighting of fitness centres should consider the following:

- Luminaires should be carefully located to avoid direct glare, particularly when the exercise requires the use of equipment in a horizontal position. Many attractive fitness spaces make good use of natural lighting and external views;
- Exercise areas should be lit with no harsh direct lighting shining in users' faces. Lighting design should take account of any mirrored surfaces;
- Dimmer switches or scene setting may be useful for yoga, antenatal and relaxation classes. Some clubs may require more sophisticated lighting systems (e.g. colours or strobes linked to music) for certain classes, demonstrations, competitions and social events.
  The use of a lighting a control system can be effective in helping to create the desired ambience and can also help to reduce running costs when daylight is available;
- Lighting control system should be accessible to staff only;
- Basement spaces, where no natural light is available and where ceilings are often low, can require particularly careful lighting design.

Sport England's Fitness and exercise spaces guidance provides information on the overall design and layout of fitness centres including recommendations on the use and control of natural lighting.

2.6 Indoor hockey

Indoor hockey is a fast-paced sport requiring players to track a small ball travelling at high speed while making rapid decisions and precise passes.

Lighting plays a critical role in ball visibility, player recognition and spatial awareness, helping participants perform safely and accurately throughout training and competition.

Luminaires should be arranged in a regular, symmetrical pattern across the sports hall to provide consistent lighting over the pitch and run-off areas. Even spacing helps minimise shadows and illuminance variations, ensuring players experience uniform visual conditions regardless of their position on the court.

Luminaires should be carefully aimed to achieve overlapping beam coverage and smooth light distribution across the playing surface.

Extreme aiming angles should be avoided, helping maintain good visibility of players and the ball while reducing shadows, brightness contrasts and potential visual distractions.

Lighting should provide uniform illumination, good colour rendering and stable visual conditions across the entire playing area.

Players should be able to accurately judge the speed, direction and position of the ball while clearly seeing teammates, opponents, markings and other key elements.

Glare can significantly affect performance by reducing players' ability to track the ball and assess movement. Lighting should therefore use optics and shielding that limit direct views of bright light sources, creating a comfortable environment that supports concentration and visual accuracy.

Lighting equipment should be installed outside the required clear playing volume and positioned to avoid interference with sports equipment and building services.

Mounting locations should be coordinated with the hall structure to maintain lighting performance while preserving uninterrupted play.

Luminaires should be suitable for sports hall environments and capable of resisting impacts from balls and other equipment.

Robust construction, secure fixings and impact-resistant covers can increase durability and reduce maintenance requirements while preserving lighting performance and player safety.

Note: The illuminance values quoted in British Standards and CIBSE guidance are intended to provide a general framework for sports lighting design. However, England Hockey has specific recommendations that differ from those documents. The final design criteria should be established through consultation with Hockey England and the facility operator at an early stage of the project.



2.7 Indoor tennis, padel and pickleball

Artificial lighting is an important element in the creation of indoor tennis facilities that are attractive to users of all ages and abilities.

A good level of illumination and contrasting background colours are required so players, coaches and spectators can follow the flight of the ball. The reflectance values of the floor and wall finishes should be fully co-ordinated into the design and the selection of the lighting system.

Luminaires are typically ceiling-mounted or suspended at 6-8 m, using linear or high-bay LED luminaires.

Asymmetric luminaires typically offer the most efficient and uniform lighting scheme across the court.

They should be installed above the court edges and parallel to the sidelines so they are not within the clear height zone of the court, above the field of play or within players' normal sightlines.

This also applies to any natural lighting and usually involves placing the luminaires and rooflights above the spaces between or beside the courts.

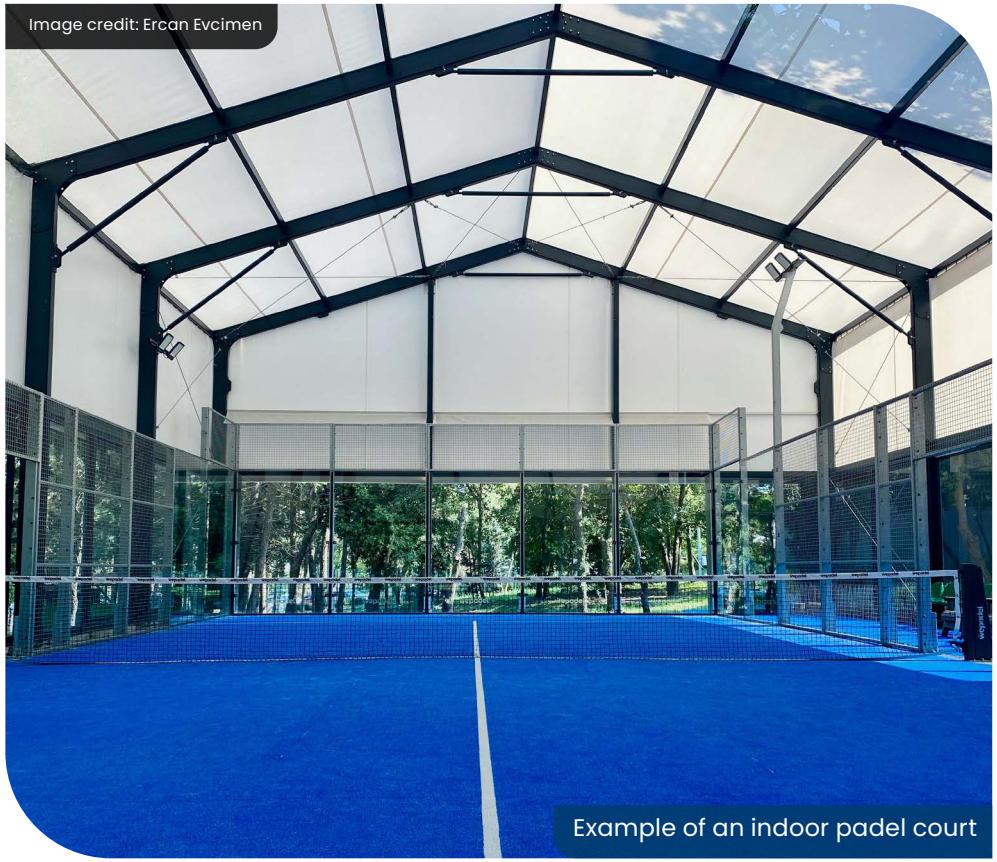
Care should be taken to avoid glare caused by the location of luminaires, or by the contrast between light source and the surfaces of the hall.

Protection of the luminaires from damage should be provided by the application of permanent proprietary guards or louvres in accordance with the manufacturer's recommendations.

In addition to satisfying the fundamental requirements of function, safety and economy, the design should minimise future maintenance needs and running costs.

A good level of illumination and contrasting background colours are required so players, coaches and spectators can follow the flight of the ball.

For further information, refer to the Lawn Tennis Association (LTA)[1] website: www.lta.org.uk.



Example of an indoor padel court

1 The LTA are the governing body of tennis in Great Britain.

2.8 Indoor volleyball

The Fédération Internationale de Volleyball (FIVB)[1] recommends that volleyball and sitting volleyball requires consistent, glare free lighting. This may only be achieved within a "black box" environment.

Modern lighting systems with switchable illumination levels may provide a low-cost lighting system that meets the requirement of indoor sports.

Volleyball is particularly sensitive to direct overhead lighting, especially over the net area. Players need to look up to watch the descent of the ball and lighting in the net area can be distracting if badly placed or inappropriate light sources are used.

It is essential to consider lighting early in the design stage so that layout and lamp type can be co-ordinated with the courts and background colours.

The current recommended lighting levels are:

- 1000-1500 lux for play at international level;
- 500 lux at club and county level; and
- 300 lux for recreational play.

In each case the uniformity (minimum to average) ratio should be a minimum of 0.7.

Technical guidance notes produced by the English Sports Council recommend that the levels for multi-purpose halls should also be increased to 500 lux, and the fittings switched to provide for two or three lower levels of illumination.

All lighting must be protected against ball impact.

FIVB recommendations:

- The FIVB recommends a minimum illumination level of 300 lux for indoor volleyball courts, with the ideal level being 500-700 lux. This can be achieved through a combination of overhead and perimeter lighting;
- In terms of lighting uniformity, the FIVB recommends that the ratio of minimum to maximum illumination on the court should be no more than 1:3.



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1 The FIVB is the governing body responsible for all forms of volleyball on a global level.

Colour temperature of volleyball court lights:

- For sports lighting applications, including for volleyball courts, it is generally recommended to use a colour temperature of around 4000 – 5000K. This provides good visibility while minimising eye strain;
- Lower colour temperatures, such as 2700K or 3000K, may be too warm and cause players to experience visual fatigue. Higher colour temperatures, such as 6000K or higher, may be too cool and cause players to experience discomfort or difficulty seeing the ball.

Location and height of luminaires:

- The height and location of the luminaires can affect the illumination levels on the court, as well as the amount of shadows and glare;
- In general, luminaires should be mounted as high as possible while still providing adequate coverage of the court. This helps to minimise shadows and allow the light to be more evenly distributed across the playing surface;
- The FIVB recommends a mounting height of at least 12 m for indoor courts and at least 8 m for outdoor courts;
- In order to provide even illumination across the court, the luminaires should be placed around the perimeter of the playing area. This can be achieved through the use of pole-mounted luminaires or wall-mounted luminaires.

Glare and shadows on the volleyball court:

- Glare and shadows can be a problem on a volleyball court if the lighting is not properly designed and layout out. Glare is caused by light reflecting off of shiny or reflective surfaces, such as the ball or the playing surface, and can make it difficult for players to see the ball or each other. Shadows can be caused by objects or players blocking the light, and can also affect visibility on the court;
- To minimise glare and shadows on a volleyball court, designers should consider the direction and intensity of the light. Luminaires should be placed and angled in such a way as to minimise direct light on the court and players. The use of diffusers or other types of light-scattering materials can also help to reduce glare;
- In addition, the use of perimeter lighting can help to reduce shadows on the court. This can be achieved through the use of wall-mounted luminaires or pole-mounted luminaires placed around the perimeter of the playing area.

For further information, refer to Volleyball England's Facilities Strategy Technical Guidelines, and to Sport England's Sport-specific guidance on Volleyball.

For FIVB, World and Official Competitions, also refer to FIVB Official Volleyball Rules and FIVB Official Beach Volleyball Rules.

3 Swimming pools

This section provides guidance for teams designing lighting schemes for swimming pools.

3.1 Introduction

Effective lighting in swimming pool facilities plays a vital role in creating a safe and enjoyable environment, supporting coaches, lifeguards and poolside supervisors, and elevating the visual environment.

Beyond simply illuminating the space, well-planned lighting contributes to safety by reducing the risk of slips, drowning, and accidents, aids in the clear identification of pool edges, depths, and hazards, and provides adequate visibility for effective poolside supervision and bather monitoring.

Lighting should also support compliance with recognised operational safety assessments, including submerged casualty visibility testing (commonly referred to as the "submerged casualty visibility test" or "brick test"), ensuring that all areas of the pool tank can be clearly observed from designated supervisor positions.

It also shapes the ambience, influences comfort and enhances architectural features. However, designing for pool lighting presents challenges, such as managing high humidity, meeting stringent safety standards, and accommodating diverse activities ranging from competitive swimming to leisure use.

When approaching a pool lighting project, it is crucial to balance energy consumption, maintenance obligations, upfront costs, and the need for adaptable solutions.

Successful designs consider the architectural context, user expectations, and long-term operational reliability, ensuring a welcoming and functional space that meets all requirements.

Comprehensive design information is provided in Sport England's Swimming pools guidance, however, the key points are outlined in this section.



Melksham Community Campus
Image credit: Fotohaus

3.2 Common problems and solutions

Challenges in swimming pool lighting include corrosion of luminaires and supports, difficult access for maintenance, and interference from other building services.

Metals, even those deemed corrosion-resistant, can degrade rapidly in humid pool environments without high-quality surface protection like specialised paints or deep anodising for aluminium.

Avoiding contact between dissimilar metals is key to prevent galvanic corrosion.

Failing to protect the luminaire housing and mounting brackets can become a safety hazard and result in costly repairs and reduced operational lifespan.

If side lighting or overhead gantry access is impractical, consider modular mounting systems or telescoping devices for safe fixture servicing.

Assess all installation components, including brackets and fixings, to ensure long-term durability and ease of access.

3.3 Using daylight

The integration of natural daylight into indoor swimming pools offers benefits including reduced energy costs, improved well-being, and a dynamic, attractive atmosphere.

Rooflights, glazed façades, and clerestories can help introduce daylight, reducing reliance on artificial lighting during daytime hours. However, uncontrolled daylight may lead to excessive glare, uneven illumination, and uncomfortable thermal gains, which can compromise safety and user comfort.

Designers should carefully consider window placement, glazing orientation, and the use of shading devices or diffusing materials to ensure balanced light levels and prevent direct sunlight from interfering with visibility.

Solutions may include automated blinds, strategic landscaping, and combining translucent and opaque materials to modulate light entry.

A key thinking point is the need to adapt daylighting strategies to changing seasonal and weather conditions, ensuring consistent illumination and optimal energy performance throughout the year.



Canada Water Leisure Centre
Image credit: Fotohaus

3.4 Glare

Reflected glare from the water surface, tiled glossy walls, from natural or artificial light is a persistent concern in pool environments, potentially leading to discomfort, impaired vision, and elevated risk of drowning for both swimmers and supervisors.

Luminaire placement is an important consideration in reducing reflections from the water surface which may prevent viewing beneath the surface.

Solutions will need to be developed which may include any of the following:

- Selecting luminaires with diffusers or louvres;
- Employing direct / indirect lighting strategies; and
- Using matt or textured finishes for interior surfaces to reduce specular reflections.

Investing in advanced artificial and natural 3D lighting simulations may be worthwhile to identify potential glare hotspots and inform mitigation strategies.



Andover Leisure Centre
Image credit: Fotohaus

3.5 Luminaire selection

Choosing appropriate luminaires for swimming pool halls requires careful attention to performance, placement, access, and maintenance.

Opting for multiple low-powered luminaires provides more uniform illumination and helps reduce intense specular reflections, as opposed to a few high-powered units which may create bright spots or shadows.

This approach will allow a flexible light distribution and redundancy in case of luminaire failure. However, it may attract higher capital costs.

Maintenance is a key consideration for luminaire placement. Locating luminaires above the pool should be avoided unless a safe and convenient access method can be provided, perhaps via gantries, raised floors, or simply by using linear side-lighting luminaire arrangements.

Luminaires with high longevity characteristics (see Part A 2.9.8 Maintenance factor) may be a prudent investment where access is challenging.

Luminaires in the pool hall should have a high ingress protection rating; IP65 or higher, and IP68 when fully submerged.

3.6 Lighting techniques

Lighting techniques typically comprise overhead lighting or side-lighting arrangements.

Direct lighting gives precise illumination and does offer good penetration into the pool water without veiling glare towards lifeguards but can be uncomfortable for backstroke swimmers.

Indirect lighting, creates softer, more diffused effects that reduce glare and enhance aesthetics, though it should be carefully considered as it is likely to demand greater energy use and more luminaires.

Side lighting is beneficial when overhead access is limited, allowing for easier maintenance and flexible positioning, yet may struggle to evenly illuminate large spaces.

Integral luminaire louvres may be required to prevent a direct view into the light source by users on the opposite side of the pool.

A hybrid approach, blending several techniques, often yields good results, but requires careful planning to avoid overlap or wasted energy.

Considering architectural features, such as ceiling height and surface finishes when choosing lighting methods is recommended.

3.7 Underwater lighting

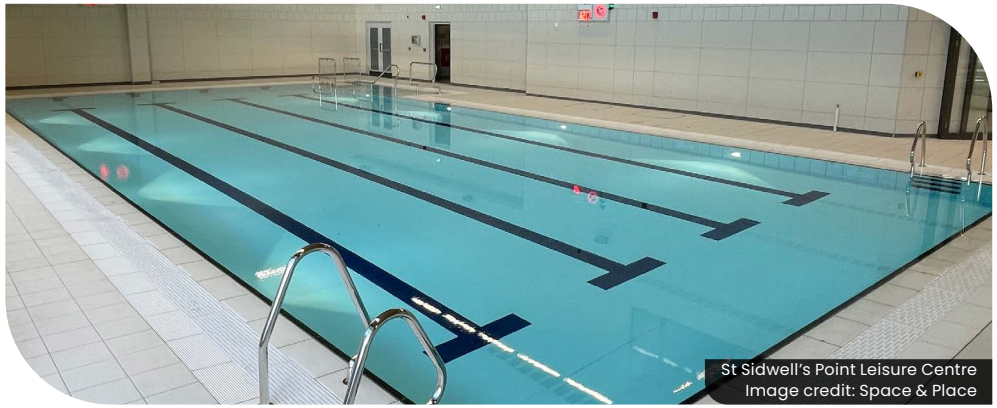
Underwater lighting can enhance safety, may facilitate observation of a swimmers' technique, and may help manage veiling reflections for clearer visibility beneath the surface.

However, such systems are likely to be complex to install and maintain, requiring robust waterproofing and careful placement to avoid glare or uneven coverage.

Alternatives, such as dry niche luminaires may be installed behind watertight portholes or walk-in ducts around the pool sides, offering easier maintenance and reduced risk of water ingress, but may limit design flexibility. They still require corrosion protection.

Wet niche luminaires are recessed into pool walls and provide seamless integration, though they demand more extensive waterproofing and routine inspection. However, these luminaires are typically lower powered and may be insufficient in large pools.

In either case, lighting solutions will require regular maintenance and inspection schedules, use of corrosion-resistant materials or treatments, and should be designed for easy removal and servicing.



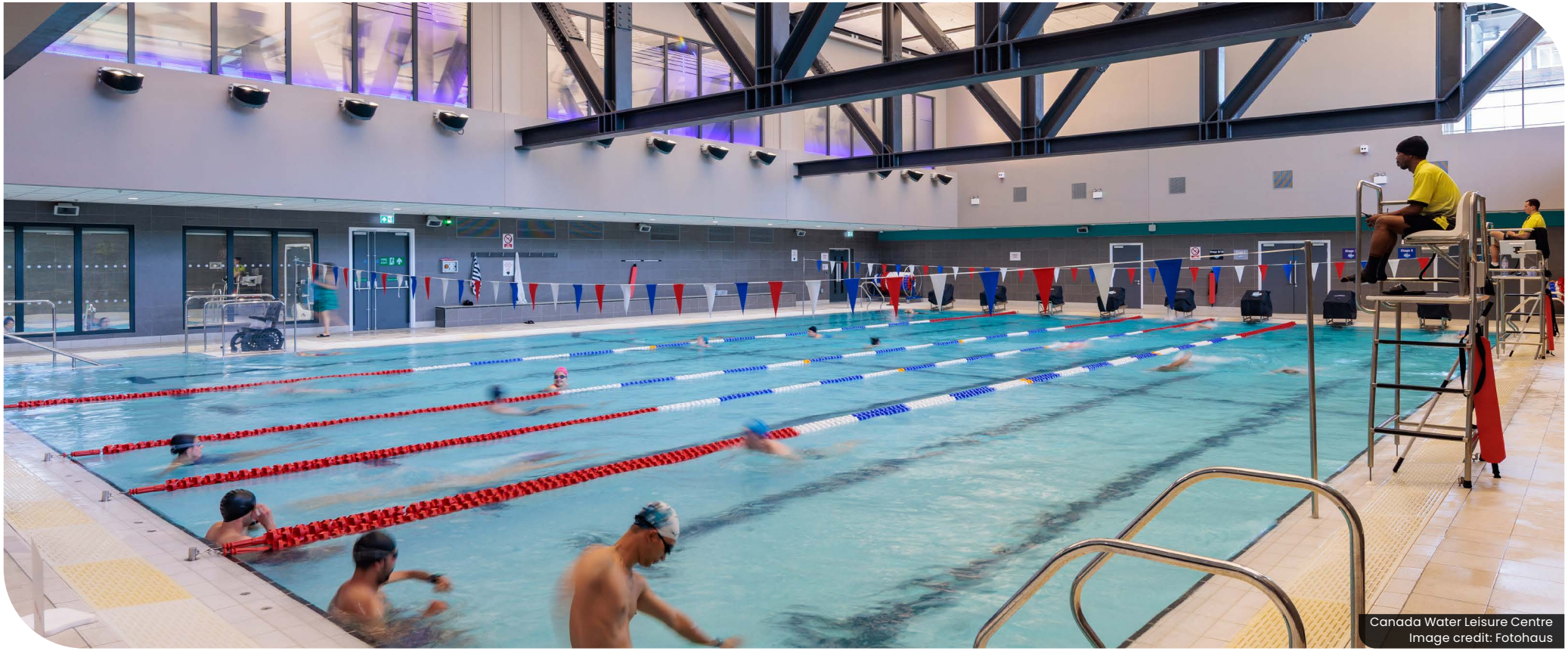
St Sidwell's Point Leisure Centre
Image credit: Space & Place

3.8 Colour quality

Colour quality in pool lighting influences aesthetics, visibility, and safety.

High colour rendering ensures accurate representation of skin tones, water clarity, and materials, aiding supervision and diagnosis of potential hazards.

See Part A 2.9.4 Colour rendering for further guidance.



Canada Water Leisure Centre
Image credit: Fotohaus

4 Sports domes

This section provides guidance on lighting applications for sports domes.

4.1 Introduction

Sports domes have evolved significantly since their early origins in military radomes of the 1940s, when pressurised fabric structures were first developed for radar protection.

By the late 1960s and 1970s, air-supported halls began to appear offering low-cost, rapidly deployable indoor training environments.

Today's domes use durable, translucent membranes and improved climate systems, creating bright, efficient, all-weather sports facilities.

Sports domes are typically lightweight enclosed structures designed to host a variety of athletic activities year-round. They are often constructed using specialised high performance membrane materials designed to be strong, airtight, weather resistant and durable.

These materials provide durability, weather resistance, and thermal performance, but they also influence how light behaves inside the space.

Highly reflective surfaces can enhance brightness and reduce the number of luminaires required, while darker or absorbent materials demand higher lumen output and careful fixture placement to maintain uniformity and avoid shadows.

Understanding this relationship between structure and lighting is critical for achieving safe and visually comfortable conditions for players and spectators.



Image credit: Andrei Kuzniatsou

4.2 Sports domes and light pollution

The daytime, daylight penetration benefit of sports domes needs to be considered alongside the nighttime impact.

Sports domes allow sports activity later into the evening, in all weathers and opportunities for training of season outdoor sports such as cricket. At night they can create a striking visual presence.

Therefore, the glowing effects of their plastic envelope should be managed to avoid excessive light obtrusion effects.

Light obtrusion assessment of internal lighting may be overlooked in sports applications with attention more focused on powerful external sports lighting systems.

The number of 'roof only' and 'open sided' structures is increasing and the light obtrusion and will likely require a more complex analysis which considers the visibility of the light sources and the internal reflective surfaces from exterior viewpoints.

In all cases, professional advice will be required due to the complexity of accurately modelling translucent structures for obtrusive light effects.



Table B1 Sports dome typical material comparison

Material	Typical uses	Light transmission	Relative cost (indicative)
PVC-coated polyester	Air-supported sports domes; temporary or semi-permanent.	Low-moderate (5-15%), diffuse.	Low
PVDF-enhanced PVC	Permanent or higher performance sports domes.	Low-moderate (5-15%), diffuse.	Low-Medium
ETFE film	Permanent enclosures; multi-sports facilities.	High (up to 90%), clear, glare and solar control via fritting / layering.	High
PTFE-coated fibreglass	Large permanent domes; long-span tensile roofs.	Moderate (10-20%), even, diffuse.	High
Multi-layer composite systems	Climate-controlled or energy-optimised domes.	Variable; can range from translucent to near-opaque.	Medium-High

4.3 Lighting challenges and opportunities

Unlike open-air venues, sports domes trap light, creating unique challenges for designers.

The enclosed environment requires precise control of light distribution to prevent glare and dark zones, especially for fast-paced sports where visual clarity is essential.

LED lighting is typically provided at high level in the form of an array of downlight luminaires.

Fixture placement and mounting height are critical, as domes often feature high ceilings that demand powerful luminaires and strategic aiming to achieve uniform coverage across expansive playing surfaces, so glare avoidance is an important factor in the lighting design.

The enclosed environment requires precise control of light distribution to prevent glare and dark zones, , especially for fast-paced sports where visual clarity is essential.

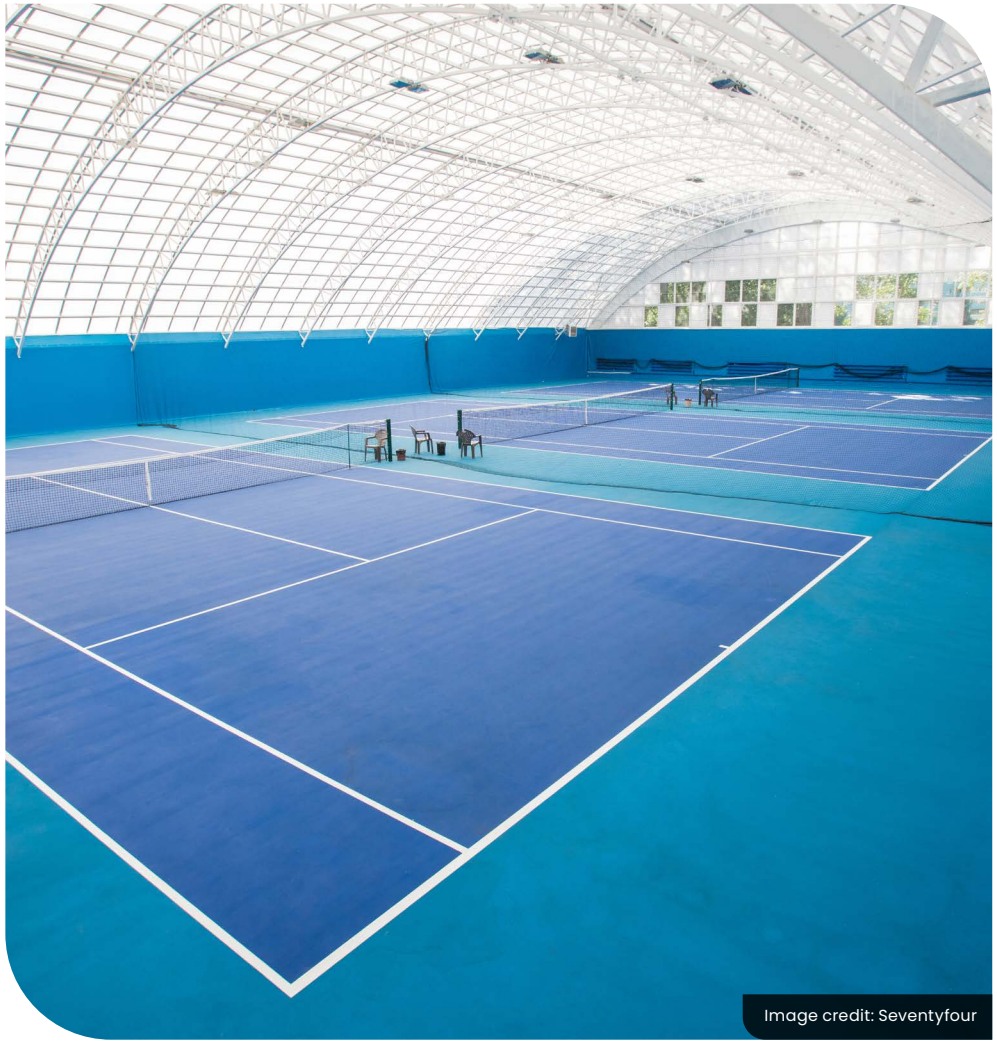


Image credit: Seventyfour

4.4 Balancing daylight and artificial lighting

Sports domes often allow daylight access to enjoy the benefits of daylight. Their designers often use translucent membranes or strategically placed fenestration to admit daylight while maintaining uniformity on the playing surface, however control methods should also be considered.

For further guidance, see Part A 2.5 Daylight.

Lighting controls should automatically be linked to daylight availability to optimise its use, and balanced with the nighttime transition to enable a seamless playing experience.

For further information, see Part A 2.10 Lighting controls.

Lighting controls should automatically be linked to daylight availability to optimise its use, and balanced with the nighttime transition to enable a seamless playing experience.



St George's Park
Image credit: Critical Tortoise

Part C

Outdoor sports lighting

1 Range of applications

This section provides guidance on the increasing demand for sports lighting and explains how it can enhance the usability and overall value of outdoor sports facilities.

1.1 Introduction

Sports lighting has become more common and accessible in recent years, driven by the growing demand for extended usage into the evening.

Modern LED systems make it practical and cost-effective to illuminate outdoor pitches, enabling local sports clubs to train and compete after daylight hours. This trend not only supports community engagement and active lifestyles but also creates new revenue streams for facility owners through pitch rentals, maximising utilisation of the facility.

Outdoor sports lighting is now regularly seen at:

- Artificial grass pitches (AGP)[1];
- Natural turf pitches (NTP)[2];
- Multi-use games areas (MUGA);
- Tennis courts;
- Athletics tracks;
- Golf driving ranges.

Outdoor sports lighting provides an important way of extending the use and the overall value of outdoor sports facilities. In the summer period, England enjoys long hours of daylight that give the opportunity to take part in sports and leisure activities during the long summer evenings.

In contrast, the winter daylight can be as short as 7 hours a day and can restrict opportunities for outdoor sports to short periods during the weekends.

In numerical terms, outdoor sports lighting can extend the playing hours by up to 1500 hours annually, and this can allow people to train or play evening matches 7 days a week, all year round.

Further Sport-specific guidance for many major outdoor sports, including design guides and technical data sheets, is available from Sport England and the relevant NGBs.

Guidelines for other sports are provided in the following sections.

For further guidance, see Part A 2.6.5 Obtrusive light.

For lighting levels relevant to specific outdoor sports, see Part D 3.

Outdoor sports lighting provides the potential for an additional 1000 - 1500 hours of use every year.

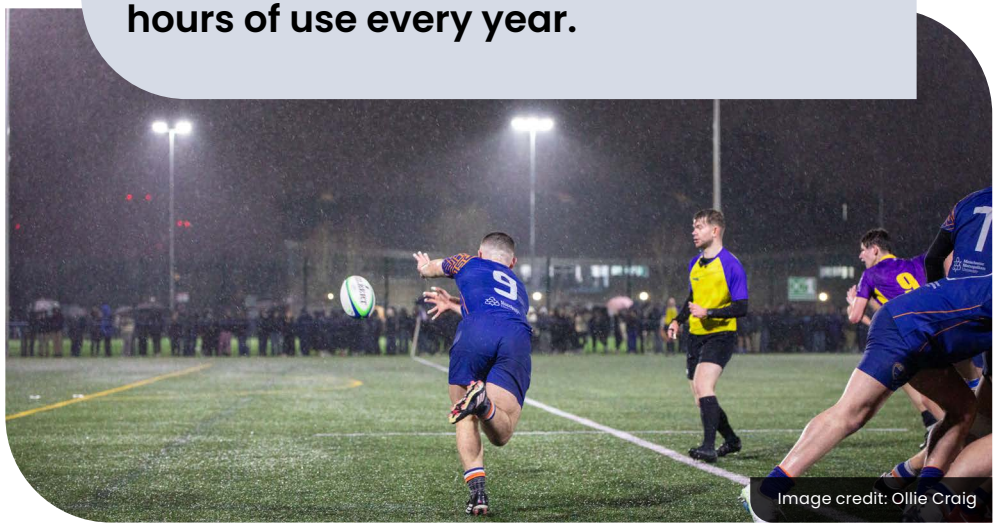


Image credit: Ollie Craig

1 Artificial grass pitches can also be referred to as Artificial or synthetic turf pitches.

2 Natural turf pitches can also be referred to as Natural grass pitches.

1.2 Feasibility

Before deciding to install sports lighting, it is important that the cost benefits of the lighting are considered.

The increased use, flexibility and additional income should be balanced against the initial capital cost and thereafter, the on-going energy costs, costs of maintenance and the additional management costs necessary to maximise these benefits.

The formulation of profiles of a typical week's use during the playing seasons, before and after the installation of the lighting, can help in this assessment.

Such profiles should include:

- Club matches, training and coaching sessions for all adult and junior teams;
- The likely casual use of the facility by other clubs, teams and individuals - the sports or leisure department of the LPA should be able to help in this respect;
- Use by local educational establishments.

Comparing the 'before' and 'after' profiles can help to predict the likely levels of additional income and expenditure that providing sports lighting will generate and will help clarify whether such provision is likely to be financially viable.

The increased use, flexibility and additional income should be balanced against the initial capital cost.



Image credit: Miken

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It will also make clear whether there is a realistic probability that additional sporting opportunities will be created.

Such opportunities may arise from:

- Enabling the use of outdoor facilities all year round by members of the local community currently precluded, e.g., those in full-time employment;
- Enabling the use of outdoor facilities all year round for activities currently taking place indoors, thus freeing up this space for other activities and user groups.

To ascertain whether a need for illuminated sports facilities has been identified for the area, it may also be helpful to consult the local planning authority's Recreation Strategy or the Regional Recreation Strategy[1].

For further information, refer to Sport England's Facilities Planning Model (FPM).

Also see Sport England's Strategic Outcomes Planning and Leisure Services Delivery (SOPG) guidance documents to help make effective investments into facilities and services, as well as capital projects.



Steven Burke Sports Hub
Image credit: Joss Guest Photography

1 Regional recreation strategies aim to enhance the quality of life and promote active lifestyles within communities.

2 Design principles

This section provides guidance on procuring a sports lighting system and determining the optimal configuration for a site.

2.1 The overall system

Procurement of a sports lighting system will involve the cooperation of a number of separate sub-disciplines to ensure that many different factors are considered.

Table C1 below outlines key factors.

Table C1 System considerations

Factor	Consideration
Planning, landscaping, orientation and layout	The location of the pitch to give optimum use of available space and avoid sensitive planning issues.
Lighting	Choice of luminaire mounting height, location and configurations to achieve the required illumination on the playing area and avoid light pollution.
Column	Structural stability of columns and foundations to suit site conditions.
Electrical	Design of the electrical installation; cabling, power distribution, control and safety systems.
Maintenance	Selection of all components and the arrangement of the whole to allow cost effective maintenance and the replacement of components at the end of their life. For further guidance, see Part A 2.12.3 Maintenance activities.

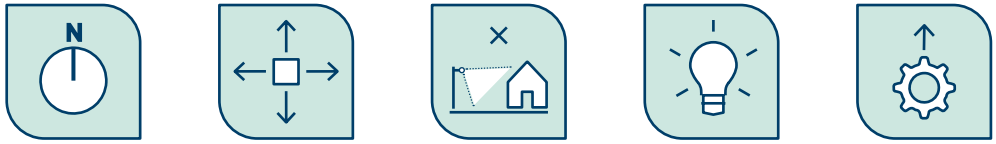




Image credit: Powerleague Arnold

2.2 Site configuration

It is important that appropriate analysis and feasibility work is undertaken to establish the optimum configuration of the site. The aim should be to identify all the issues that might influence the overall project.

Issues should be identified and considered at an early stage in the process. The LPA will require evidence that the possible effects of the proposed lighting on the neighbours and the surrounding landscape, whether rural or urban, have been considered and are acceptable.

For example:

- Neighbouring housing may raise concerns about light shining into bedrooms or gardens;
- Nearby highways and roads can be affected by lighting;
- Visibility of lighting columns / masts from surrounding areas during the daytime.

Well-designed and properly installed sports lighting should minimise light spillage, manage glare and maintain uniformity by optimising column positions, aiming angles and luminaire selection.

Landscaping, together with the careful orientation and positioning of a pitch within the site can also help reduce the daytime visibility of columns.

Table C2 outlines other key factors to consider (see page 134).

For further guidance, see Part A 2.6.5 Obtrusive light, and refer to ILP GN01.

Figure C1 Sectional view of lighting viewed from a distance

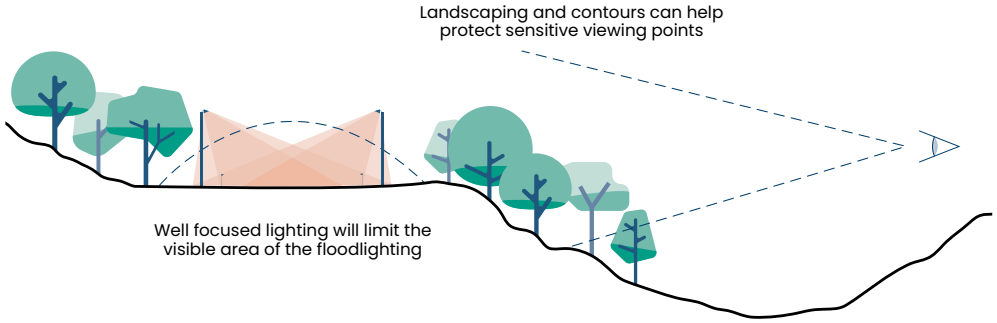
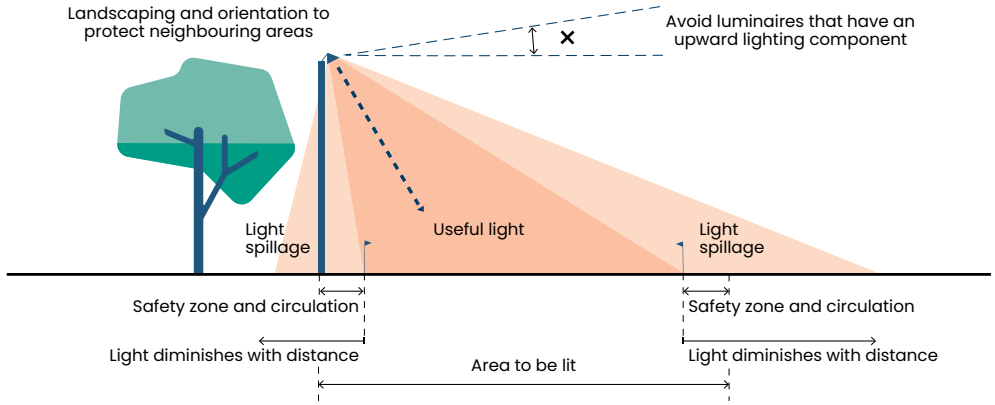


Figure C2 Sectional view of light from an individual column



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Table C2 Site considerations

Factor	Consideration
A survey of the ambient nighttime lighting level at key point around the site	If ambient lighting levels around the site are already high, disturbance from the proposed sports lighting will be less significant. However, the thresholds described in GN01 are for total obtrusive light levels, i.e., the sports lighting and other sources in combination.
The optimum orientation of the playing areas	Choice of luminaire mounting height, location and configurations to achieve the required illumination on the playing area and avoid light pollution.
Critical distances from the pitch to the site boundary	Selecting the right location and orientation of the pitch within the site can help to minimise any overspill or obtrusive effects of the lighting on neighbours and surroundings.
The adequacy of the existing electricity supply	Clearly, the electrical supply should have the capacity to power the proposed lighting, as well as the existing loading on the site (the lighting, possibly heating, refrigeration, cooking, air conditioning etc.). To know whether the supply has the capacity, the existing supply will need to be inspected; the existing loads will need to be assessed, and the requirements of the proposed lighting system added. If the supply capacity is less than the total (with a margin for safety and future expansion), an upgrade to the power supply will be needed. It is important to know this at an early stage in the project as power supply upgrades can be very expensive, and an appropriate financial provision will need to be in the project costs.
Subsoil conditions and foundations for columns	The design and dimensions of the concrete foundations for the lighting columns will need to be based on the soils and wind exposure characteristics of the site. The chemical properties of the soils are also important, since they can affect the type of cement needed in the concrete. The mechanical properties of the soils are important, since they will determine the dimensions of the foundation.

3 Sport examples

This section provides an overview and guidance on the specific requirements for selected sports.

3.1 Introduction

Artificial sports lighting plays a pivotal role across a wide range of outdoor sporting environments, enabling events to take place beyond daylight hours and enhancing visibility for both players and spectators.

The examples included in this section demonstrate that effective lighting solutions should be specifically designed to meet the unique demands of each individual sport.

For specific requirements for any other sports, for example Football and Rugby, please refer to Part D 3 of the guidance.



Tennis Club Dornbirn
Image credit: Thorn Lighting Ltd

3.2 Athletics

Athletics fields can be complex environments to illuminate, requiring effective visibility for users, players, officials, and spectators without impairing visibility and creating significant obtrusive light.

Since these venues typically accommodate modest seating capacities and multiple sports, lighting systems should be versatile, robust, and carefully engineered to avoid visual discomfort and maintain safety.

A key requirement is the strategic location of the luminaires. Sports lighting is commonly mounted on perimeter masts, either at the four corners or ideally in six to eight locations along the long sides of the stadium.

Their height and offset distance should ensure that light reaches all areas of the playing surface uniformly, without casting disruptive shadows.

The minimum mounting height is recommended to be above a line subtended 25° from the centre of the field.

These mounting heights produce appropriate aiming angles, ensuring that light reaches central zones and that high-flying objects, such as javelins, hammers, and discus, remain visible throughout their trajectories.

This is critical for athlete safety and officiating accuracy.

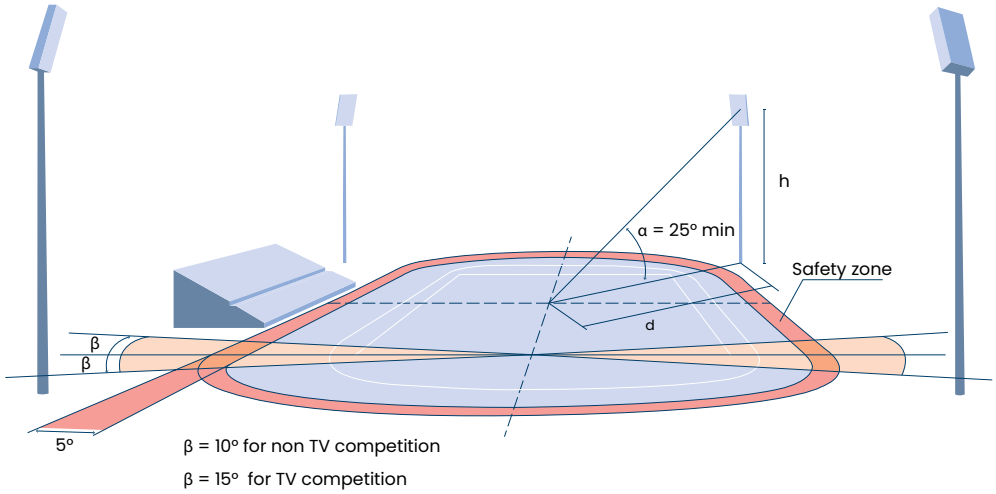
Viewing distance has a significant impact on lighting requirements. In athletics venues, where spectators are often located far from the field of play, illuminance levels should be adequate to ensure clear object recognition and sufficient contrast over longer distances.

Ensuring adequate vertical and horizontal illuminance prevents athletes and spectators from experiencing visual adaptation issues when tracking fast-moving or airborne objects.

Visibility is further supported by achieving high lighting uniformity across the field. Irregular lighting can cause athletes to misjudge speed, distance, or the position of opponents and equipment.

Designers should avoid placing lighting where structures such as roofs or stands could obstruct beams or create zones of high contrast.

Figure C3 Floodlight positioning



Cont/d...

Athletics lighting should provide high vertical illuminance and uniform visibility along long-distance tracks, jumps and field event areas.

The system should also minimise glare, particularly for events involving elevated lines of sight, like long jump or pole vault, where athletes frequently look upward. Thoughtful luminaire placement and shielded optics help maintain comfortable and consistent visual conditions.

Lighting athletics tracks that are not enclosed presents considerable challenges, particularly in preventing excessive light spill and avoiding glare for distant viewers.

It is important to note that illuminating the space above an athletics track can be extremely costly. Therefore, where it is not practical to illuminate the entire area above the track for certain events, it may be preferable to avoid lighting and schedule activities during daylight hours instead.



Athletics lighting should provide high vertical illuminance and uniform visibility along long-distance tracks, jumps and field event areas.



Image credit: Musco Sports Lighting, LLC

3.3 Hockey

Outdoor hockey is a fast, skill-based sport that requires players to track a small ball travelling at high speed over long distances.

Accurate passing, receiving, shooting and decision-making depend on clear visibility across the entire pitch. Lighting should support player performance, visual comfort and safety while providing consistent conditions in all weather and during evening use.

Luminaires should generally be mounted on perimeter lighting columns positioned outside the pitch run-off areas, with columns arranged symmetrically around the playing area to provide uniform coverage and minimise shadows, while ensuring the lighting layout does not obstruct views from the pitch, spectator areas and officials' positions.

Lighting should be aimed across the pitch rather than steeply downward, providing balanced horizontal and vertical illumination. Careful aiming helps players judge the speed, height and direction of the ball while reducing shadowing.

Lighting should provide high uniformity, good colour rendering and appropriate illuminance for the level of play.

Overlapping beam distributions should be used to achieve smooth and consistent lighting throughout the playing area.

Lighting should provide high uniformity, good colour rendering and appropriate illuminance for the level of play. Players should be able to identify the ball, teammates, opponents and pitch markings quickly and accurately.

Consistent lighting conditions support performance, improve safety and create a more enjoyable playing experience.



St Peter's School, York
Image credit: Surfacing Standards Ltd

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Glare can affect player performance, particularly when tracking high aerial balls or looking towards goals.

Sports lighting should incorporate effective optical control and be aimed to minimise direct views of bright light sources. Good glare management improves visual comfort while maintaining the visibility needed for fast-paced competitive play.

Lighting columns should be positioned beyond the required safety run-off areas and located so they do not interfere with play, maintenance access or spectator circulation.

They should not obstruct sightlines from the pitch or viewing areas, and column locations should also consider future pitch operations and maintenance requirements.

Lighting columns, brackets and luminaires should be robust enough to withstand outdoor environmental conditions and occasional ball impact.

Equipment should be securely mounted and protected against corrosion, vibration and weather exposure.

Access arrangements should allow safe maintenance while minimising disruption to pitch activities.

Note: The illuminance values quoted in British Standards and CIBSE guidance are intended to provide a general framework for sports lighting design. However, England Hockey has specific recommendations that differ from those documents. The final design criteria should be established through consultation with Hockey England and the facility operator at an early stage of the project.



3.4 Lacrosse

Effective lighting for Lacrosse often requires flexibility to accommodate multi-sport use and varying activity levels.

Given that Lacrosse shares dynamics with sports such as cricket and hurling, vertical illuminance and shadow minimisation are critical for tracking airborne balls.

Flicker-free LED systems are essential to prevent visual discomfort and ensure accurate ball perception during fast-paced play.

Most evening sessions are dedicated to training, accounting for approximately 90% of activity, which requires moderate illuminance levels. However, match days demand significantly higher lighting standards, often under pressure from limited field availability, which can lead to games being played in poor light conditions.

Scheduling of the match events may be a critical consideration before making a significant investment into lighting infrastructure.

Establishing the brief involves determining what light is needed and when, supported by a clear site plan. A preferred layout includes eight masts positioned to achieve uniform coverage across the pitch, with attention to vertical and horizontal illuminance.

Luminaires should be impact-resistant to withstand ball strikes and designed to minimise glare. Safety considerations should also avoid luminaire flicker effects.

For indoor formats such as Box Lacrosse, uniformity and glare reduction are as important, similar to requirements for indoor hockey.

Lighting strategies should be developed in consultation with the NGB to align with evolving standards and the needs of emerging Lacrosse formats. International examples, such as professional leagues in the USA and Australia, may provide useful benchmarks.

As Lacrosse continues to grow globally, adaptable lighting systems that support multi-sport scheduling and high-performance requirements will be essential for ensuring safe competitive play.



Lacrosse lighting requires bright, uniform coverage and high ball-tracking clarity to accommodate fast aerial play and long-range passes.

3.5 Multi-use games areas (MUGAs)

A community MUGA may well stand unused for much of the day, when children are at school and the employed are at work, and be used predominantly in the evenings and at weekends.

Without lighting, the use which is possible in winter is severely restricted.

Lighting design for a MUGA focuses on providing safe, consistent illumination while remaining flexible for different sports. Lighting placement is therefore critical.

Sports lighting is typically positioned around the perimeter, outside the playing zone, to avoid glare and shadows on the court.

A symmetrical layout, usually with columns placed in pairs along the long sides, helps deliver balanced illuminance. This ensures players can see both fast-moving objects and each other clearly.

Mounting heights generally range from 6–15 m, depending on pitch size and required lighting class. Higher mounting points may better reduce glare and improve uniformity by allowing a wider, softer spread of light.

Luminaire locations should be chosen to minimise both direct and spill light.

Columns should also be set back sufficiently to avoid creating obstacles close to the field of play, while still close enough to ensure correct aiming angles for the luminaires.

Asymmetric LED luminaires will help direct light precisely onto the playing surface, reducing upward light and improving energy efficiency.

Figure C4 AGP with 8 x 15 m masts

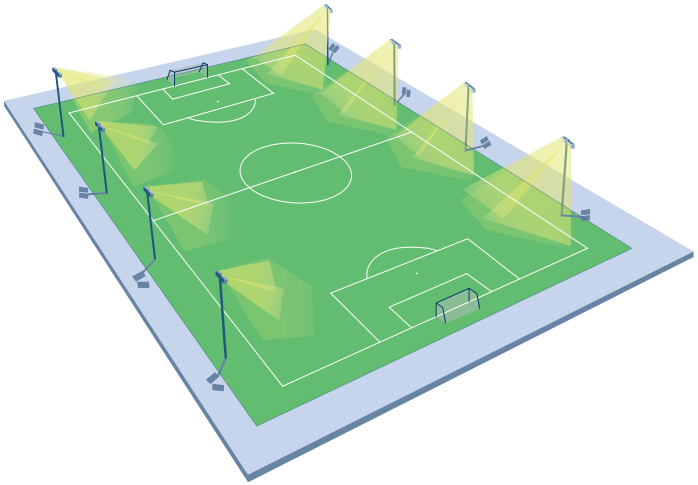




Image credit: Jordan Coleman

MUGAs are often located in suburban areas and careful design is required to avoid adverse impacts on neighbouring houses.

Selecting luminaires with a range of shields (front and back spill control) and louvre accessories is recommended.

Factory integrated light spill controls are becoming more common and worth considering as a lower maintenance, permanent solution.

Effective lighting controls are essential for a MUGA. Using multi-level switching or smart control systems allows operators to adjust light levels to suit the sport being played, improving flexibility, comfort, and energy efficiency.

The lighting design should always meet the needs of the sport with the highest lighting requirement (as long as it is a regular use requirement).

For further guidance, see Part A 2.6.5 Obtrusive light, Part A 2.8.4 Uniformity of illumination, and Part A 2.11.2 External luminaires.

Also refer to Sport England's guidance on Artificial sports surfaces.





Battersea Park Recreation Ground
Image credit: Surfacing Standards Ltd



Battersea Park Recreation Ground
Image credit: Surfacing Standards Ltd

3.6 Tennis, padel and pickleball

As with many other outdoor sports, lighting gives the opportunity to play tennis for an increased amount of time through the year and encourage and support participation, coaching and development for all levels of play.

3.6.1 Lighting requirements for tennis

The height and positioning of lighting columns are critical to achieving optimal lighting performance while minimising obtrusive light and glare.

Typical column heights range from 6-10 m, and luminaires should be installed at low tilt angles (less than 35°, and ideally horizontal with zero upward light) to reduce light spill, especially in venues close to neighbouring properties.

Additional accessories such as louvres and shields can be fitted to further control light distribution. The choice of luminaire and mounting height should be tailored to the specific site and environmental context.

There are several common lighting layouts for tennis courts, each with its own advantages and disadvantages:

- **A side-lit scheme:** may provide good glare control and uniformity but will require more columns and space;
- **A corner-lit scheme:** may be more cost-effective and suitable for multi-court layouts but may require careful aiming to avoid glare;
- **A combined corner and side-lit scheme:** may permit lower columns and lower power lighting but can be more expensive to install.

The selection of layout should consider site constraints, cost, and lighting performance requirements.

The Lawn Tennis Association (LTA)[1] sets clear performance standards for tennis court lighting to ensure safe and enjoyable play. Lighting systems should provide high-quality colour rendition and minimise glare, sky glow, and spillage.

The uniformity of the lighting across the field of play is an important factor.



1 The LTA are the governing body of tennis in Great Britain.

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The addition of lighting will likely require changes to venue management, including court allocation and booking systems. Facilities should consider how lighting will be operated, whether manually, automatically, or via app-based systems (see Part A 2.10 Lighting controls).

Lighting levels should reflect the prescribed playing areas as recommended by the LTA for different standards of play.

Illuminance is measured at the playing surface. The standards apply on a court-by-court basis, irrespective of the control switching arrangements.

However, it should be stressed that the lighting levels are recommended figures and that individual requirements may vary and be considered in context with the surroundings, especially if upgrading from metal-halide to LED.

For further guidance, see Part A 2.9 and Part A 3.4.4.

For further information, also refer to the LTA website: www.lta.org.uk.

3.6.2 Lighting for padel and pickleball

Lighting a padel court requires careful planning to ensure uniform illumination, player safety, and compliance with standards.

Typically, lighting columns with asymmetric luminaires are placed outside the playing cage, most commonly on the sides of the court.

Luminaire arrangements, quantity and tilt angles should be selected to minimise shadows, light spill and glare.

There is an increasing trend in changing existing tennis courts into padel courts.

A stakeholder and user group consultation and review of the existing lighting scheme should be considered to appraise its suitability for padel, and if necessary make adjustments to the lighting scheme.

The recommended mounting height is usually between 6-8 m, providing even coverage across the court.

For further information, refer to the SAPCA Code of Practice for the Construction of Padel Courts.



3.7 Outdoor and beach volleyball

While sports lighting specifically for Volleyball and Beach Volleyball courts is uncommon in the UK, the facilities may be shared with other sports, and the following recommendations should inform the design.

Lighting for outdoor and beach volleyball should provide a comfortable and visually consistent environment that enables players to accurately track the ball, judge its speed and trajectory, and move safely around the court.

Volleyball places particularly demanding requirements on lighting because players frequently look upwards to track serves, sets and attacking shots above the net.



Good visibility depends not only on achieving sufficient illumination of the playing volume, but on maintaining a uniform visual environment across the entire playing area and surrounding run-off zones.

Sudden transitions between bright and dark areas can make it more difficult to follow the flight of the ball and can affect player comfort and performance. Consistency of illumination across both horizontal and vertical planes should therefore be a design objective.

Beach volleyball requires additional consideration due to the reflective nature of the sand surface and the exposed outdoor environment. The light-coloured playing surface can increase perceived brightness and affect visual contrast, making uniform lighting and effective glare control particularly important.

Where floodlighting is provided, designs should minimise bright spots and excessive contrast across the court and run-off areas, ensuring players can comfortably track the ball against both the sand surface and the night sky while maintaining good visual conditions for spectators.



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Glare control is a critical aspect of volleyball lighting design. Luminaires should be positioned and aimed to minimise direct views of bright light sources during normal play, particularly in the vicinity of the net where players most frequently look upwards.

Careful mounting arrangements, controlled optics and consideration of player sightlines are essential to provide comfortable playing conditions and reduce visual distraction.

Volleyball England identifies lighting above the net area as particularly sensitive and recommends that lighting layouts are coordinated with court geometry from the earliest design stages.

Where possible, courts should be orientated in a north-south court orientation to minimise the effects of low-angle sunlight on player vision.

Particular attention should be given to achieving a uniform, glare-controlled playing environment in which players can comfortably track the ball across the full extent of the court and free zones.

Lighting controls should enable operation at different settings to suit varying levels of play while supporting energy-efficient operation.

The final lighting design should be developed in consultation with the facility operator and relevant NGB.

For further information, refer to Volleyball England's Facilities Strategy Technical Guidelines, and to Sport England's Sport-specific guidance on Volleyball.

For FIVB, World and Official Competitions, also refer to FIVB Official Volleyball Rules and FIVB Official Beach Volleyball Rules.



Where possible, courts should be orientated in a north-south court orientation to minimise the effects of low-angle sunlight on player vision.

Part D

Further information

1 Key references

This section outlines simplified definitions of key lighting terminology and provides a selection of reference materials, including publications, websites, and other useful links.

1.1 Introduction

Sport England uses broad, cross-sport levels of play within its planning and design guidance to ensure facilities align with local needs and are effectively supported through the planning system.

National Governing Bodies (NGBs) define sport specific tiers and technical expectations for competition and training.

BS EN 12193 then provides the common technical framework for lighting performance (Classes I–III).

The CIBSE / SLL Lighting Guide 4 (LG4) sits between these, aligning explicitly with BS EN 12193 while integrating NGB requirements and offering practical, sport by sport design, specification and maintenance advice for UK projects.

Together, these systems ensure:

- Facilities meet community and strategic needs (Sport England);
- Facilities meet competition requirements (NGBs);
- Lighting design is technically compliant and safe (BS EN 12193).

This Part D 1 outlines simplified definitions of key lighting terminology and provides a selection of reference materials, including publications, websites, and other useful links.

Part D 2 and Part D 3 includes recommendations for indoor and outdoor sports lighting respectively, and these sit alongside a summary of illumination requirements from BS EN 12193 and CIBSE / SLL LG4 in Part D 4.

1.2 Definitions

A set of commonly used lighting engineering terms and their simplified definitions, e.g., colour rendering, colour temperature, and disability glare, emphasising their importance in sports environments and broadcasting, are outlined in Table D1 (see page 151).

A further list of standard abbreviations and their explanations are also provided in Table D2 (see page 155).

For a more detailed glossary of lighting terminology, reference should be made to BS EN 12193 and CIBSE / SLL LG4.

National Governing Bodies (NGB) should be involved from the outset to ensure lighting solutions are appropriate and meet minimum lighting standards.

Table D1 Simplified definitions

Term	Definition
Colour rendering	Colour rendering refers to how accurately a light source shows the colours of objects compared to natural light. Good colour rendering ensures that team kits, lines, and signals appear vivid and accurate, which is crucial for fair play and quick decision-making. The Colour Rendering Index (CRI) scores light sources from 0 to 100. Higher numbers mean better, more natural colour appearance. A CRI >70 is generally acceptable for community sports. Excellent colour rendering is critical for TV Broadcast and CRI >90 is more appropriate. Note: there may be a compromise in efficiency, a higher CRI may be less efficient.
Colour temperature	Colour temperature describes the appearance of light produced by a source and is measured in Kelvin (K). Lower colour temperatures (<3000K) have a warm yellowish-white light. Higher colour temperatures (>4000K), have a cool, bluish-white light. The more dominant blue wavelength is associated with cool-white light and is known to have a more stimulating effect, so is often used in sporting environment. However, it is also known to have a more detrimental impact on nocturnal species such as bats. Cool white light >5000K is used for TV broadcast.
Disability glare	Disability glare is a visual issue caused by bright or uncontrolled light that scatters inside the eye, reducing contrast and making it hard to see clearly. It causes more than discomfort and actually interferes with vision. As the eye ages, disability glare can become a more significant visual challenge.
Discomfort glare	Discomfort glare is a visual disturbance caused by overly bright or poorly positioned light sources that create a sense of visual strain or annoyance. While it does not reduce visibility, it can lead to eye fatigue, reduced concentration, and discomfort, particularly in environments with high contrast or reflective surfaces.
Diversity (Electrical)	In an electrical system, the ratio of the sum of the individual maximum demands to maximum total demand. The maximum electrical load on an electrical system will be less than the total of the demands of the individual components of the system, because not all items of equipment will be in use at the same time. See also 'Uniformity'.

Cont/d...

Table D1 Simplified definitions cont/d...

Term	Definition
Field of play (FOP)	General term for the defined space in which the sports activity takes place. (Also see terms used in BS EN 12193 for 'principal area' and 'total area'). The field of play is the official, NGB defined activity area where sport takes place, while safety zones are the surrounding unobstructed spaces required to protect safe movement beyond the playing lines.
Glare	Excessive brightness or intensity in the visual field. This is described by Glare Rating (R_{GL}). A maximum acceptable Glare Rating of R_{GL}<40 is typical for external lighting and for indoor spaces where the lighting is >10 m high. See BS EN 12193 and LG4 for more information.
Illuminance	The amount of light falling on a surface. Expressed as 'lux' (lumens per square metre).
Illuminance gradient	The rate at which illuminance on a surface varies with position. Expressed as percent per metre. For instance, for Indoor Bowls, the difference in illuminance at two points 1 metre apart on the rink must not be more than 5% (CIBSE Guide).
Isolux diagram	A plan drawing, usually of the Playing Area, with lines linking points of equal illuminance, similar to the contour lines on a map that link points of equal height above sea level. When extended to include the Total Playing Area and beyond these diagrams can be used to show the extent and intensity of light spillage.
Light Reflectance Value, LRV	Light Reflectance Value (LRV), is the amount of light reflected from a surface, expressed as a percentage of the amount of light falling on it. LRV is measured using the method described in BS 8493.
Lumen	The unit of luminous flux, i.e., the rate at which a source produces light.
Luminaire	A general term for a light fitting.
Lux	The unit of measurement of illuminance. One lux equals one lumen per square metre.

Cont/d...

Table D1 Simplified definitions cont/d...

Term	Definition
Maintenance Factor (MF)	A factor used to predict the worst-case performance of a lighting system at any point in its life, provided it is properly looked after. A detailed definition of MF is included in the County Surveyors' report on the topic (concerned mainly with road lighting), available for download from the ILP website.
Minimum maintained (average) illuminance (E_{ave})	The value below which the (average) illuminance in the specified area should not fall at any time during the life of a (properly-maintained) lighting installation. It is the illuminance level at which maintenance should be carried out. The method for determining average illuminance, based on readings over a prescribed grid, is dealt with in CIBSE / SLL LG4.
Principal Area (PA)	The playing area needed for a sport – typically the area bounded by the outer line of the pitch or court markings, though sometimes additional space outside the lines is needed as well, for instance for tennis, volleyball, women's lacrosse. In tennis, the term Principal Play Area (PPA) is used.
Reference area	The area over which lighting performance is specified or measured.
Reflectance / reflection factor	The proportion of light falling onto a surface which is reflected back off that surface. See Light Reflectance Value (LRV).
Safety lighting	That part of the emergency lighting that provides illumination for the safety of people involved in a potentially dangerous process or situation and to enable proper shut down procedures for the safety of the operator and other occupants of the premises (known as 'high-risk task area lighting' in BS 5266-7 / EN 1838).
Sky Glow	Brightening of the night sky over inhabited areas, caused by artificial lighting.
Standby lighting	That part of the emergency lighting which may be provided to enable normal activities to continue.
Threshold Increment (TI)	The measure of disability glare expressed as the percentage increase in contrast required between an object and its background for it to be seen equally well with the source of glare present.
Total Area (TA)	The area encompassing the playing area plus a specified area around it, normally to provide safety margins or run-offs. In tennis, the term Total Play Area (TPA) is used and TA is the area of the whole of the courts' enclosure.

Cont/d...

Table D1 Simplified definitions cont/d...

Term	Definition
Total Light Output Ratio (TLOR)	The fraction of the light produced by the lamp which leaves the luminaire in any direction. TLOR is, in effect, the efficiency of the luminaire.
Upward Light Output Ratio (ULOR or ULR)	The fraction of the light produced by the lamps which leaves the luminaires above the horizontal. ULOR, sometimes called ULR, should always be zero for a properly-installed, well-designed sports lighting installation.
Uniformity	The evenness of the distribution of light over the court surface. There are two definitions of Uniformity, known as U1 and U2. U1 is defined as the ratio of the minimum illuminance in the area to the maximum illuminance in the area (E_{min} / E_{ave}). U1 is also sometimes known as Diversity - see the definition of diversity above. U2 is defined as the ratio of the minimum illuminance in the area to the average illuminance over the area (E_{min} / E_{ave}). The uniformity of light is as important as the level of illumination. Light should be spread evenly over the whole area, including behind the baselines, outside the sidelines, and above the playing area.

Table D2 Abbreviations

Abbreviation	Term	Short description
AGP	Artificial Grass Pitch[1]	A surface of synthetic fibres replicating natural grass for sports.
AONB	Area of Outstanding Natural Beauty	A protected scenic landscape.
AMDS	Automated Monitoring and Detection Systems	Underwater person-detection system for use in swimming pools.
BREEAM	Building Research Establishment Environmental Assessment Method	A building sustainability rating methodology.
BS	British Standard	UK technical standard.
BS EN	British Standard European Norm	UK adopted EU standard.
BSI	British Standards Institution	The UK's national standards body.
CCT	Correlated Colour Temperature	Colour appearance of white light measured in Kelvins (K).
CDM	Construction (Design and Management) Regulations	UK construction safety regulations.
CIBSE	Chartered Institution of Building Services Engineers	Professional body for building services.
CLO	Constant Lumen Output	An LED driver technology which maintains the output of the luminaire accounting for degradation in performance over time.
CRI	Colour Rendering Index	A measurement of how accurately a light source displays colours in comparison to natural light (see Ra).

1 Artificial grass pitches can also be referred to as Artificial or synthetic turf pitches, but in this guidance, AGP is adopted.

Cont/d...

Table D2 Abbreviations cont/d...

Abbreviation	Term	Short description
DfE	Department for Education	UK Government education department.
ECB	England and Wales Cricket Board	Cricket governing body.
EIA	Environmental Impact Assessment	A mechanism for assessing the impact of a development in comparison with the baseline and used to inform planning decisions.
EPC	Energy Performance Certificate	Building energy rating label for a product.
EPD	Environmental Product Declaration	Environmental performance statement.
HSG	Health and Safety Guidance	HSE safety guidance document.
IK	Impact Protection (IK rating, BS EN 62262)	Impact resistance rating.
ILP	Institution of Lighting Professionals	UK professional lighting industry body.
IP	Ingress Protection (IP rating, BS EN 60529)	Dust / water protection rating.
KPI	Key Performance Indicator	Performance measurement metric.
LED	Light Emitting Diode	Efficient light source used in all modern luminaires.
LG	Lighting Guide (e.g. LG4)	CIBSE lighting guidance.
LLMF	Lamp Lumen Maintenance Factor	Lamp output over time.
LMF	Luminaire Maintenance Factor	Luminaire performance over time.

Cont/d...

Table D2 Abbreviations cont/d...

Abbreviation	Term	Short description
LPA	Local Planning Authority	Local planning decision body.
LSF	Lamp Survival Factor	Light source failure probability.
LRV	Light Reflectance Value	Surface reflectance measure.
MAUR	Minimum Adjacent Uniformity Ratio	Lighting uniformity measure.
MUGA	Multi-Use Games Area	Multi-sport outdoor facility.
NGB	National Governing Body	National organisation governing sports practice and facilities.
NPPF	National Planning Policy Framework	UK planning policy framework.
NTP	Natural Turf Pitch[1]	Natural grass playing surface grown in soil.
OS	Ordnance Survey (mapping data)	National mapping data provider.
PAS	Publicly Available Specification (e.g. PAS 6463)	A fast-track standard developed and published under BSI guidance.
PPA	Principal Playing Area	Main sports playing zone.
PWM	Pulse Width Modulation	LED dimming control method.

1 Natural turf pitches can also be referred to as Natural grass pitches, but in this guidance, NTP is adopted.

Cont/d...

Table D2 Abbreviations cont/d...

Abbreviation	Term	Short description
R_a	Symbol for the general Colour Rendering Index	The general CRI value calculated as the average colour rendering performance over eight standard test colours (also see CRI).
R_{GL}	Glare Rating	Measure of glare from lighting used for assessment of sports lighting installations.
RSMF	Room Surface Maintenance Factor	Room surface cleanliness factor, tables of suitable factors can be found in the CIBSE lighting guides.
SAPCA	Sports and Play Constructors Association	Sports surface industry body.
Sky Glow	Brightening of the night sky over inhabited areas, caused by artificial lighting	Upward light pollution.
SLL	Society of Light and Lighting	UK professional lighting industry body.
STP	Synthetic Turf Pitch	Artificial grass pitch . (See AGP).
TM	Technical Memorandum (e.g. CIBSE TM12)	CIBSE technical guidance.

1.3 Lighting codes, standards and guides

Table D3 below provides a selection of useful reference materials, including lighting publications, factfiles and other helpful links.

Table D3 Useful lighting publications

Publication	Comment	Publisher
Sports Lighting	CIBSE Lighting Guide 4 (LG4)	CIBSE / SLL
Daylighting: A Guide for Designers	CIBSE Lighting Guide 10 (LG10)	CIBSE / SLL
Protecting the night-time environment	CIBSE Lighting Guide 21 (LG21)	CIBSE / SLL
Design, Creativity and Compliance	CIBSE Lighting Guide 23 (LG23)	CIBSE / SLL
Creating a circular economy in the lighting industry	CIBSE Technical Memoranda TM66	CIBSE / SLL
Embodied carbon in building services	CIBSE Technical Memoranda TM65.2	CIBSE / SLL
Factfile 14: Maintenance factors and LED luminaires	CIBSE / SLL Lighting Factfile 14	CIBSE / SLL
Factfile 17: Temporal lighting artefacts (flicker)	CIBSE / SLL Lighting Factfile 17	CIBSE / SLL
Factfile 19: Lighting for Neurodiversity	CIBSE / SLL Lighting Factfile 19	CIBSE / SLL
Commissioning Code L	Guidance on commissioning of lighting systems	CIBSE / SLL

Cont/d...

Table D3 Useful lighting publications cont/d...

Publication	Comment	Publisher
The Outdoor Lighting Guide	Includes a short section on sports lighting.	ILP
The Avoidance of Obtrusive Light	ILP Guidance note 01 (GN01). Free website download.	ILP
Bats and Artificial Lighting	ILP Guidance note 08 (GN08). Free website download.	ILP
Light and lighting - Sports lighting	BS EN 12193	British Standards Institution
Light and lighting - Lighting of work places. Indoor / Outdoor work places	BS EN 12464 Parts 1 and 2	British Standards Institution
Emergency Lighting - Code of Practice Standard and Application	BS 5266 and BS EN 1838	British Standards Institution
Guidance Notes for Floodlighting	Sport England guidance.	Sport England
Floodlighting of Outdoor Sports Facilities	Formerly known as National Playing Field Association	Fields in Trust
SAPCA Codes of Practice	Code of Practice for Contractors Working on the Installation and Retrofitting of Sports Lighting	SAPCA

Additional information and guidance covering specific sports can be located using the website links provided in Table D4 below.

Table D4 Sources for sport-specific guidance

Sport	National Governing Body (NGB)	World Governing Body
Aquatics (Swimming, Diving, Water Polo, Artistic)	Aquatics GB	World Aquatics
Archery	Archery GB	World Archery
Athletics	England Athletics / UK Athletics	World Athletics
Badminton	Badminton England	Badminton World Federation (BWF)
Basketball	Basketball England / British Basketball Federation	FIBA
Beach Volleyball	Volleyball England	FIVB
Boxing	England Boxing	International Boxing Association (IBA)
Canoeing	British Canoeing	International Canoe Federation (ICF)
Cricket	England and Wales Cricket Board (ECB)	International Cricket Council (ICC)
Cycling (Road / Track / MTB / BMX)	British Cycling	Union Cycliste Internationale (UCI)

Cont/d...

Table D4 Sources for sport-specific guidance cont/d...

Sport	National Governing Body (NGB)	World Governing Body
Equestrian	British Equestrian	Fédération Équestre Internationale (FEI)
Fencing	British Fencing	Fédération Internationale d'Escrime (FIE)
Football	The Football Association (FA)	FIFA
Golf	England Golf / The R&A (rules)	International Golf Federation (IGF)
Gymnastics	British Gymnastics	Fédération Internationale de Gymnastique (FIG)
Handball	British Handball	International Handball Federation (IHF)
Hockey	England Hockey / Great Britain Hockey	International Hockey Federation (FIH)
Ice Skating (Figure / Speed)	British Ice Skating	International Skating Union (ISU)
Indoor Bowls (Flat and shortmat)	English Indoor Bowling Association	World Bowls
Judo	British Judo	International Judo Federation (IJF)
Lacrosse	England Lacrosse	World Lacrosse
Lawn Bowls	Bowls England	World Bowls
Modern Pentathlon	Pentathlon GB	Union Internationale de Pentathlon Moderne (UIPM)

Cont/d...

Table D4 Sources for sport-specific guidance cont/d...

Sport	National Governing Body (NGB)	World Governing Body
Netball	England Netball	World Netball
Rowing	British Rowing	World Rowing (FISA)
Rugby League	Rugby Football League (RFL)	International Rugby League (IRL)
Rugby Union / Sevens	Rugby Football Union (RFU)	World Rugby
Shooting (Target)	British Shooting	International Shooting Sport Federation (ISSF)
Squash	England Squash	World Squash Federation (WSF)
Table Tennis	Table Tennis England	International Table Tennis Federation (ITTF)
Taekwondo	British Taekwondo / GB Taekwondo (performance)	World Taekwondo
Tennis and Padel	Lawn Tennis Association (LTA)	International Tennis Federation (ITF)
Triathlon	British Triathlon Federation	World Triathlon
Volleyball	Volleyball England	FIVB
Weight lifting	British Weight Lifting	International Weight lifting Federation (IWF)
Wrestling	British Wrestling	United World Wrestling

2 Indoor sports

This section summarises the BS EN 12193 recommendations for indoor sports lighting, along with additional notes on key design considerations.

2.1 Introduction

A summary of the recommendations in BS EN 12193 for **indoor sports lighting** is provided in the following Table D5 with additional notes on key design issues.

Where not otherwise stated in the Table, the 'Classes' used in BS EN 12193 correspond approximately with Sport England's 'Levels of play' categories as follows:

- BS EN 12193 **Class III** approximates to Sport England '**Community**';
- BS EN 12193 **Class II** approximates to Sport England '**Club**'.

The focus of this guidance is on Community and Club sports.

It is anticipated that a specialist design team will be appointed to design Class I standard facilities. Therefore Class I recommendations are provided for information only.

The BS EN 12193 recommendations are provided for information only.

As described in Part A, early consultation with stakeholders, NGBs, facility operators, local planning authorities, and neighbouring communities, is critical to ensure the appropriate lighting conditions are agreed and applied in the design.

Note that the Colour Rendering Index, measured in 'R_a', in BS EN 12193 is between R_a 60 and R_a 80 depending on class, however Sport England recommends a minimum of R_a 80 for all classes.

The focus of this guidance is on Community and Club sports. It is anticipated that a specialist design team will be appointed to design Class I standard facilities.



Warsop Health Hub
Image credit: Fotohaus

Table D5 Indoor sports facilities

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Aerobics	Table A.3	III	200	0.5			40	60	
		II	300	0.6			40	60	
		I	500	0.7			35	80	
Archery	Table A.5	III	200	0.5	1000	0.8	40	60	Average vertical illuminance on target, 1000 lux at 25 m and 2000 at 50 m, with vertical plane uniformity 0.8. See requirements for vertical illuminances at distances from the target CIBSE Lighting Guide 4.
		II	200	0.5	1000	0.8	40	60	
		I	200	0.5	1000	0.8	35	80	
Athletics	Table A.3	III	200	0.5			40	60	Vertical illuminance of 1000 lux at finish line for photo recording equipment. Glare from luminaires above pole vault shall be avoided.
		II	300	0.6			40	60	
		I	500	0.7			35	80	
Badminton	Table A.1	III	300	0.7			40	60	No luminaires should be above the court. See NGB recommendations 30% vertical illumination. CIBSE Lighting Guide 4. Badminton World Federation (BWF) recommend minimum 1000 lux for international competition. Badminton England recommend 500 lux for all other levels of play.
		II	500	0.7			40	60	
		I	750	0.7			35	80	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D5 Indoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Basketball	Table A.2	III	200	0.5			40	60	No luminaires should be above the 4 m diameter circle around the basket.
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Billiards	Table A.11	III	500	0.8			40	80	
		II	500	0.8			40	80	
		I	750	0.8			35	80	
Boccia / Pétanque / Boules	Table A.8	III	200	0.5			40	60	
		II	200	0.7			40	60	
		I	300	0.7			35	80	
Bowling (10 pin)	Table A.5	III	200	0.5	1000	0.8	40	60	Average vertical illuminance on target, 1000 lux at 25m and 2000 at 50 m, with vertical plane uniformity 0.8.
		II	200	0.5	1000	0.8	40	60	
		I	200	0.5	1000	0.8	35	80	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D5 Indoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Bowls (Flat and short mat)	Table A.9	III	300	0.5			40	60	Illuminance gradient should not be more than 5% per metre to avoid a banding effect that can occur with low mounting heights of fittings & reflectance from the mat. EIBA notes a requirement for uniformity of 0.9, and surface reflectance should be: End walls (70%); Side walls (70%); Ceiling (90%); Bowls Carpet (30%).
		II	500	0.8			40	60	
		I	500	0.8			35	80	
Boxing (Ring)	Table A.10	III	500	0.5	See notes		40	60	Vertical average illuminance should be at least 50% of horizontal average illuminance at a height of 1.5 m. Training areas should be at least horizontal illuminance of 300 lux.
		II	1000	0.8	See notes		40	80	
		I	2000	0.8	See notes		35	80	
Cricket	Table A.1	III	300	0.7			40	60	The ECB does not consider BS EN 12193 Class II or Class III lux levels suitable for indoor cricket – see ECB recommendations.
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Cricket (Nets)	Table A.1	III	300	0.7			40	60	The ECB does not consider BS EN 12193 Class II or Class III lux levels suitable for indoor cricket nets – see ECB recommendations.
		II	500	0.7			40	60	
		I	750	0.7			35	80	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D5 Indoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Curling (House)	Table A.12	III	300	0.7			40	60	Average horizontal illuminance on rink 200 lux for all classes with uniformity 0.7.
		II	300	0.7			40	60	
		I	300	0.7			35	80	
Cycling (Track)	Table A.2	III	200	0.5	See notes		40	60	Illuminance is taken on the surface of the track. The vertical illuminance at the finish should be 1000 lux for photo-finish equipment and officials.
		II	500	0.7	See notes		40	60	
		I	750	0.7	See notes		35	80	
Dancing	Table A.3	III	200	0.5			40	60	
		II	300	0.6			40	60	
		I	500	0.7			35	80	
Darts	Table A.7	III	50		300				Illuminance calculated / measured on the oche.
		II	100		500				
		I	200		750				

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D5 Indoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Equestrian	Table A.3	III	200	0.5			40	60	
		II	300	0.6			40	60	
		I	500	0.7			35	80	
Fencing	Table A.1	III	300	0.7	200	0.7	40	60	
		II	500	0.7	300	0.7	40	60	
		I	750	0.7	500	0.7	35	80	
Fistball	Table A.2	III	200	0.5			40	60	
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Floorball	Table A.2	III	200	0.5			40	60	
		II	500	0.7			40	60	
		I	750	0.7			35	80	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D5 Indoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Football, Futsal 5 / 6-a-side	Table A.2	III	200	0.5			40	60	SLL LG04 additionally proposes uniformity of vertical illuminance on the goal, 0.7 min/ave for Class I and II, 0.5 for Class III.
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Go Karting	Table A.2	III	200	0.5			40	60	
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Gymnastics	Table A.3	III	200	0.5			40	60	
		II	300	0.6			40	60	
		I	500	0.7			35	80	
Handball	Table A.2	III	200	0.5			40	60	
		II	500	0.7			40	60	
		I	700	0.7			35	80	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D5 Indoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Hockey	Table A.1	III	300	0.7			40	60	England Hockey requires consultation with the design team to agree on the appropriate illumination levels, which may not align with BS EN 12193. Refer to Table D11.
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Judo	Table A.2	III	200	0.5			40	60	
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Korfball	Table A.2	III	200	0.5			40	60	No luminaires should be above the 4 m diameter circle around the basket.
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Martial arts (Kendo, Karate)	Table A.2	III	200	0.5			40	60	
		II	500	0.7			40	60	
		I	750	0.7			35	80	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D5 Indoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Netball	Table A.2	III	200	0.5			40	60	No luminaires should be above the 4 m diameter circle around the basket.
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Racketball	Table A.1	III	300	0.7			40	60	No luminaires within 1 m of wall.
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Rollerskating	Table A.3	III	200	0.5			40	60	
		II	300	0.6			40	60	
		I	500	0.7			35	80	
Rhythmic gymnastics	Table A.3	III	200	0.5			40	60	
		II	300	0.6			40	60	
		I	500	0.7			35	80	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D5 Indoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Shooting	Table A.5	III	200	0.5	1000	0.8	40	60	Average vertical illuminance on target, 1000 lux at 25 m and 2000 at 50 m, with vertical plane uniformity 0.8.
		II	200	0.5	1000	0.8	40	60	
		I	200	0.5	1000	0.8	35	80	
Snooker	Table A.11	III	500	0.8			40	80	
		II	500	0.8			40	80	
		I	750	0.8			35	80	
Speed skating	Table A.3	III	200	0.5			40	60	
		II	300	0.6			40	60	
		I	500	0.7			35	80	
Squash	Table A.1	III	300	0.7			40	60	No luminaires within 1 m of wall.
		II	500	0.7			40	60	
		I	750	0.7			35	80	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D5 Indoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Swimming	Table A.6	III	200	0.5	See notes		35	60	These are general requirements only. Special requirements can be needed for individual pools. No underwater lighting should be used for racing and water polo. 600 lux on turning and staring blocks (FINA recommendation for International competitions only). For diving, the vertical grid starts 2 m above and in front of the diving board to water level and is 3 m wide. The grid is placed along the side of the board. Horizontal:Vertical average for diving is 0.5 for Class III and II, 0.8 for Class I.
		II	300	0.7	See notes		40	60	
		I	500	0.7	See notes		40	80	
Table tennis	Table A.1	III	300	0.7			40	60	
		II	500	0.7			40	60	
		I	750	0.7			35	80	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D5 Indoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Tennis / Padel / Pickleball (indoor)	Table A.4	III	300	0.7	See notes		40	60	No luminaires should be positioned in that part of the ceiling which is directly above the area limited by the marked area extended to 3 m behind the base lines. A safety zone around both entrances of width 2 m, height 4 m and extending 4 m from the centre to both sides is to be kept clear of any obstacles. LTA specify minimum maintained average illuminance of 750 lux (0.7 uniformity value) within the PPA and 600 lux (0.6 uniformity value) within the TPA. LTA specify minimum maintained average illuminance of 600 lux within the PPA and 500 lux within the TPA.
		II	500	0.7	See notes		40	60	
		I	750	0.7	See notes		35	80	
Tug of War	Table A.2	III	200	0.5			40	60	
		II	500	0.7			40	60	
		I	750	0.7			35	80	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D5 Indoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Volleyball	Table A.2	III	200	0.5			40	60	Volleyball England advises 300 lux for Class III. Refer to Part B 2.8. Luminaires should be mounted as high as practicable while providing adequate court coverage, and be positioned and angled to minimise shadows, direct light and glare, with diffusers or other light-scattering materials used where appropriate to ensure even illumination across the playing surface.
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Wall climbing	Table A.3	III	200	0.5	200	0.5	40	60	
		II	300	0.6	300	0.6	40	60	
		I	500	0.7	500	0.7	35	80	
Weight lifting	Table A.2	III	200	0.5			40	60	
		II	500	0.7			40	60	
		I	750	0.7			35	80	
Wrestling	Table A.2	III	200	0.5			40	60	
		II	500	0.7			40	60	
		I	750	0.7			35	80	

Sport England recommends a minimum of R_a 80 for all classes.

3 Outdoor sports

This section summarises the BS EN 12193 recommendations for outdoor sports lighting, along with additional notes on key design considerations.

3.1 Introduction

A summary of the recommendations in BS EN 12193 for **outdoor sports lighting** is provided in the following Table D6 with additional notes on key design issues.

Where not otherwise stated in the Table, the 'Classes' used in BS EN 12193 correspond approximately with Sport England's 'Levels of play' categories as follows:

- BS EN 12193 **Class III** approximates to Sport England '**Community**';
- BS EN 12193 **Class II** approximates to Sport England '**Club**'.

The focus of this guidance is on Community and Club sports.

It is anticipated that a specialist design team will be appointed to design Class I standard facilities. Therefore Class I recommendations are provided for information only.

The BS EN 12193 recommendations are provided for information only.

As described in Part A, early consultation with stakeholders, NGBs, facility operators, local planning authorities, and neighbouring communities, is critical to ensure the appropriate lighting conditions are agreed and applied in the design.

Note that the Colour Rendering Index, measured in 'R_a', in BS EN 12193 is between R_a 60 and R_a 70 depending on class, however Sport England recommends a minimum of R_a 80 for all classes.

The focus of this guidance is on Community and Club sports. It is anticipated that a specialist design team will be appointed to design Class I standard facilities.



The Hive Leisure Centre
Image credit: Fotohaus

Table D6 Outdoor sports facilities

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
American Football	Table A.21	III	75	0.5			55	60	
		II	200	0.6			55	60	
		I	500	0.7			55	70	
Archery	Table A.15	III	200	0.5	See notes		55	60	Average vertical illuminance on target 750 lux with vertical plane uniformity 0.8.
		II	200	0.5	See notes		50	60	
		I	200	0.5	See notes		50	70	
Athletics	Table A.13	III	100	0.5			55	60	
		II	200	0.5			50	60	
		I	500	0.7			50	70	
Bandy	Table A.19	III	200	0.5			55	60	
		II	500	0.7			50	60	
		I	750	0.7			50	70	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D6 Outdoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Baseball (infield)	Table A.14	III	300	0.5			55	60	Horizontal outfield: Class I / II 500 / 300 lux and uniformity 0.5, Class III 200 lux and uniformity 0.3.
		II	500	0.7			50	60	
		I	750	0.7			50	70	
Basketball	Table A.21	III	75	0.5			55	60	
		II	200	0.6			55	60	
		I	500	0.7			55	70	
Beach Volleyball	Table A.21	III	75	0.5			55	60	
		II	200	0.6			55	60	
		I	500	0.7			55	70	
Bobsleigh, Luge, Toboggan	Table A.28	III	50	0.4			55	60	
		II	200	0.5			50	60	
		I	300	0.7			50	70	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D6 Outdoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Boccia / Pétanque / Boules	Table A.20	III	50	0.5			55	60	
		II	100	0.7			50	60	
		I	200	0.7			50	70	
Cricket (square)	Table A.14	III	300	0.5			55	60	Horizontal outfield: Class I / II 500 / 300 lux and uniformity 0.5, Class III 200 lux and uniformity 0.3. The ECB notes that the illuminance levels for outdoor cricket in BS EN 12193 are unacceptable for cricket. For professional cricket – see ECB recommendations.
		II	500	0.7			50	60	
		I	750	0.7			50	70	
Equestrian	Table A.13	III	100	0.5			55	60	
		II	200	0.5			50	60	
		I	500	0.7			50	70	
Fistball	Table A.21	III	75	0.5			55	60	
		II	200	0.6			55	60	
		I	500	0.7			55	70	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D6 Outdoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Floorball	Table A.21	III	75	0.5			55	60	
		II	200	0.6			55	60	
		I	500	0.7			55	70	
Football	Table A.21	III	75	0.5			55	60	FA recommend minimum 120 Lux for Class III Football.
		II	200	0.6			55	60	
		I	500	0.7			55	70	
Golf	Table A.26	III	100	0.5	See notes		-	-	Illuminance on the Tee. On the fairway 20 lux, uniformity 0.3. On the green 50 lux, uniformity 0.5. Vertical illuminance at 1 m over the fairway and green 50 lux. SLL LG04 additionally proposes 200 lux for Class I and 150 lux for Class II at 5 m above the fairway, including semi-rough.
		II	-	-	See notes		-	-	
		I	-	-	See notes		-	-	
Handball	Table A.21	III	75	0.5			55	60	
		II	200	0.6			55	60	
		I	500	0.7			55	70	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D6 Outdoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Hockey	Table A.22	III	200	0.7			55	60	England Hockey requires consultation with the design team to agree on the appropriate illumination levels, which may not align with BS EN 12193. Refer to Table D11.
		II	300	0.7			50	60	
		I	500	0.7			50	70	
Horse racing (Gallup and trotting)	Table A.24	III	50	0.2	See notes		55	60	Vertical average: Home Stretch, Class I 750 lux, Class II 300 lux, Class III 100 lux. Length uniformity: Class I / II 0.6, Class III 0.3. Cross Uniformity: Class I / II 0.4. Vertical average: Back Stretch and turn, Class I 500 lux, Class II 200 lux. Length uniformity: Class I / II 0.6. Cross Uniformity: Class I / II 0.4.
		II	100	0.4	See notes		50	60	
		I	200	0.6	See notes		50	70	
Ice Hockey	Table A.19	III	200	0.5			55	60	
		II	500	0.7			50	60	
		I	750	0.7			50	70	
Korfball	Table A.21	III	75	0.5			55	60	
		II	200	0.6			55	60	
		I	500	0.7			55	70	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D6 Outdoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Netball	Table A.21	III	75	0.5			55	60	AENA recommend 400 lux minimum maintained average for competitive play and 200 lux minimum maintained average for training. Luminaires in line with the player's sight of the net should be avoided.
		II	200	0.6			55	60	
		I	500	0.7			55	70	
Rugby Union	Table A.21	III	75	0.5			55	60	Premier and Championship – refer to the NGB directly. National League Rugby: Match Play Level 3-4: 200 lux, uniformity 0.6. Match Play Level 5-12: 200 lux, uniformity 0.6. Training Level 3-4: 200 lux, uniformity 0.6. Training Level 5-12: min 100 lux, uniformity 0.5. Pitch run off area should be at least 25% of the illuminance of the playing / training area.
		II	200	0.6			55	60	
		I	500	0.7			55	70	
Shooting	Table A.15	III	200	0.5	See notes		55	60	Average vertical illuminance on target 750 lux with vertical plane uniformity 0.8.
		II	200	0.5	See notes		50	60	
		I	200	0.5	See notes		50	70	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D6 Outdoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Skatepark	Table A.29	III	30	0.3	See notes		55	60	Vertical average on ramps, rails and jumps: Class I 150 lux, uniformity 0.5. Horizontal average on ramps, rails and jumps: Class I 200 lux, uniformity 0.6, Class II 100 lux, uniformity 0.4, Class I 50 lux, uniformity 0.3. All illuminances are measured on the surface. Vertical illuminance at a height of 1.5 m.
		II	50	0.4	See notes		50	60	
		I	100	0.4	See notes		50	70	
Skiing (Alpine / Halfpipe / Rails / Jump)	Table A.23	III	20	0.2			55	60	Jump rundown / rails: Class I 150 lux, uniformity 0.5; Class II 50 lux; Class III 20 lux, uniformity Class II/III 0.3. Jump landing / halfpipe: Class I 300 lux, uniformity 0.7; Class II / III 200 lux, uniformity Class I / III 0.6.
		II	30	0.3			50	60	
		I	100	0.5			50	70	
Softball (infield)	Table A.25	III	200	0.5			55	60	Horizontal outfield: Class I 500 lux, Class II 300 lux, Class III 100 lux. Uniformity Class I / II 0.5, Class III 0.3.
		II	500	0.7			50	60	
		I	750	0.7			50	70	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D6 Outdoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Speed / Inline skating	Table A.13	III	100	0.5			55	60	
		II	200	0.5			50	60	
		I	500	0.7			50	70	
Street Running, Cross Country Running / Skiing, Road Cycle Racing	Table A.17	III	3	0.1			55	60	For Biathlon, refer to Shooting / Archery, Table A.15.
		II	10	0.3			50	60	
		I	20	0.3			50	70	
Swimming	Table A.27	III	200	0.5	See notes		35	60	These are general requirements only. Special requirements can be needed for individual pools. No underwater lighting should be used for racing and water polo. 600 lux on turning and staring blocks (FINA recommendation for International competitions only). For diving, the vertical grid starts 2 m above and in front of the diving board to water level and is 3 m wide. The grid is placed along the side of the board. Horizontal:Vertical average for diving is 0.5 for Class III and II, 0.8 for Class I.
		II	300	0.7	See notes		40	60	
		I	500	0.7	See notes		40	80	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D6 Outdoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Tennis / Padel	Table A.16	III	200	0.6			55	60	A safety zone around both entrances of width 2 m, height 4 m and extending 4 m from the centre to both sides is to be kept clear of any obstacles. 75% of primary play area illuminance on the total playing area. LTA recommend maintained average illuminance of 500 lux on the PPA and 400 lux on the TPA. LTA specify minimum maintained average illuminance of 400 lux on the PPA and 300 lux on the TPA. To maintain safety margins and to ensure that there are no luminaires in an unacceptable location, there must be no lighting columns within the TPA.
		II	300	0.7			50	60	
		I	500	0.7			50	70	
Track Cycling / BMX	Table A.18	III	100	0.5	See notes		55	60	The vertical illuminance at the finishing line should be 1000 lux for photo-finish equipment and officials.
		II	300	0.7	See notes		50	60	
		I	500	0.7	See notes		50	70	

Sport England recommends a minimum of R_a 80 for all classes.

Cont/d...

Table D6 Outdoor sports facilities cont/d...

Sport	BS EN 12193	Class	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	Vertical E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Reference / Sport England updates
Tug of War	Table A.21	III	75	0.5			55	60	
		II	200	0.6			55	60	
		I	500	0.7			55	70	
Volleyball	Table A.21	III	75	0.5			55	60	
		II	200	0.6			55	60	
		I	500	0.7			55	70	

Sport England recommends a minimum of R_a 80 for all classes.

4 Comparison tables

This section presents a series of tables comparing and approximating guidance across different sports, and provides a summary of the illumination requirements specified in BS EN 12193 and CIBSE / SLL LG4.

4.1 Introduction

The following Tables D7 to D14 provide comparisons and indicative alignments between various sporting guidance documents.

Designers should not simply default to the most stringent or highest lighting specification.

Instead, it is recommended that they consult with all relevant stakeholders to determine the most suitable lighting performance (see Part A 1 Introduction).

The tables also include cross-references to additional Sport England guidance, which should take precedence over other sources for community-level facilities.

Further Sport-specific guidance for many indoor and outdoor sports, including design guides and technical data sheets, is available from Sport England and the relevant NGBs.



Harris Academy
Image credit: Arcaid Images



Table D7 Comparison table: Badminton

Class	Institution	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Sport England recommendations	National Governing Body (NGB)
III	BS EN 12193	300	0.7	40	60	Developing the Right Sports Hall. Horizontal illuminance 500 lux. Emin/EAve 0.70. Affordable Sports Halls. Horizontal illuminance 500 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 300 lux. Emin/EAve 0.70. Refers to BS EN 12193 and NGB.	Badminton England design guidance refers to SE ASL guidance. (For luminaires 5m above floor) Average 500 lux – Minimum 300 lux and maximum 600 lux. Badminton World Federation (BWF) 1000 lux for International events. Walls to provide a reflectance value of 30 – 50% and ceilings 70 – 90%.
	CIBSE / SLL LG4	200	0.5	-	80		
II	BS EN 12193	500	0.7	40	60	Developing the Right Sports Hall. Horizontal illuminance 500 lux. Emin/EAve 0.70. Affordable Sports Halls. Horizontal illuminance 500 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 500 lux. Emin/EAve 0.70. Refers to BS EN 12193 and NGB.	
	CIBSE / SLL LG4	300	0.6	-	80		
I	BS EN 12193	750	0.7	35	80	Developing the Right Sports Hall. Horizontal illuminance 1000 lux. Emin/EAve 0.70. Affordable Sports Halls. Horizontal illuminance 1000 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 750 lux. Emin/EAve 0.70. Refers to BS EN 12193 and NGB.	
	CIBSE / SLL LG4	500	0.7	-	80		



Table D8 Comparison table: Basketball

Class	Institution	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Sport England recommendations	National Governing Body (NGB)
III	BS EN 12193	200	0.5	40	60	Developing the Right Sports Hall. Horizontal illuminance 500 lux. Emin/E Ave 0.70. Affordable Sports Halls. Horizontal illuminance 500 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 300 lux. Emin/E Ave 0.70. Refers to BS EN 12193.	EBL Youth leagues / Recreational 500 lux.
	CIBSE / SLL LG4	200	0.7	-	80		
II	BS EN 12193	500	0.7	40	60	Developing the Right Sports Hall. Horizontal illuminance 500 lux. Emin/EAve 0.70. Affordable Sports Halls. Horizontal illuminance 500 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 500 lux. Emin/EAve 0.70.	Senior EBL / National Competitions 500 lux.
	CIBSE / SLL LG4	500	0.7	-	80		
I	BS EN 12193	750	0.7	35	80	Developing the Right Sports Hall. Horizontal illuminance 750 lux. Emin/EAve 0.70. Affordable Sports Halls. Horizontal illuminance 750 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 750 lux. Emin/EAve 0.70.	For national team training and international games horizontal illuminance is 1500-3000 lux with uniformity of 0.7, and broadcasting 2000 lux with uniformity of 0.7 (FIBA official rules).
	CIBSE / SLL LG4	750	0.7	-	80		



Table D9 Comparison table: Indoor cricket

Class	Institution	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Sport England recommendations	National Governing Body (NGB)
III	BS EN 12193	300	0.7	40	60	Developing the Right Sports Hall. Horizontal illuminance 750 lux. Emin/EAve 0.80. ASL updated guidance. Horizontal illuminance 300 lux. Emin/EAve 0.70. For Cricket Nets: Horizontal illuminance 750 lux. Emin/EAve 0.80. Affordable Sports Halls. Horizontal illuminance 750 lux. Emin/EAve 0.80.	The England & Wales Cricket Board (ECB) Indoor cricket for schools Low-Level Club / Local Club 750 lux. Emin/EAve 0.80. The ECB notes that the illuminance levels for outdoor cricket are generally unacceptable except for professional, purpose-built training / competition facilities.
	CIBSE / SLL LG4	1500	0.8	-	80		
II	BS EN 12193	500	0.7	40	60	Developing the Right Sports Hall. Horizontal illuminance 750 lux. Emin/EAve 0.80. (Club only) ASL updated guidance. Horizontal illuminance 500 lux. Emin/EAve 0.70. Refers to BS EN 12193 and notes unacceptable by ECB. For Cricket Nets: Horizontal illuminance 1000 lux. Emin/EAve 0.80.	The England & Wales Cricket Board (ECB) Indoor cricket for schools Mid-Level Competitions 1000 lux. Emin/EAve 0.80. The ECB notes that the illuminance levels for outdoor cricket are generally unacceptable except for professional, purpose-built training / competition facilities.
	CIBSE / SLL LG4	1000	0.8	-	80		
I	BS EN 12193	750	0.7	35	80	ASL updated guidance. Horizontal illuminance 750 lux. Emin/EAve 0.70. Refers to BS EN 12193 and ECB. For Cricket Nets: Horizontal illuminance 1500 lux. Emin/EAve 0.80.	The England and Wales Cricket Board (ECB) Indoor cricket for schools Top-Level Competitions 1500 lux. Emin/EAve 0.80. The ECB notes that the illuminance levels for outdoor cricket are generally unacceptable except for professional, purpose-built training / competition facilities.
	CIBSE / SLL LG4	1500	0.8	-	80		



Table D10 Comparison table: Handball

Class	Institution	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Sport England recommendations	National Governing Body (NGB)
III	BS EN 12193	200	0.5	40	60	Developing the Right Sports Hall. Horizontal illuminance 300 lux. Emin/EAve 0.70. Refers to BS EN 12193. ASL updated guidance. Horizontal illuminance 300 lux. Emin/EAve 0.70. Refers to BS EN 12193.	
	CIBSE / SLL LG4	200	0.5	-	80		
II	BS EN 12193	500	0.7	40	60	Developing the Right Sports Hall. Horizontal illuminance 500 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 500 lux. Emin/EAve 0.70. Refers to BS EN 12193. Developing the Right Sports Hall. Horizontal illuminance 300 lux. Emin/EAve 0.70.	
	CIBSE / SLL LG4	500	0.7	-	80		
I	BS EN 12193	750	0.7	35	80	Developing the Right Sports Hall. Horizontal illuminance 1000-1500 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 750 lux. Emin/EAve 0.70. Refers to BS EN 12193.	European Handball Federation (EHF). Horizontal illuminance 1200 lux with 2000 lux for televised top quality.
	CIBSE / SLL LG4	750	0.7	-	80		



Table D11 Comparison table: Hockey

Class	Institution	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Sport England recommendations	National Governing Body (NGB)
III	BS EN 12193	300	0.7	40	60	Developing the Right Sports Hall. Horizontal illuminance 500 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 300 lux. Emin/EAve 0.70.	England Hockey (EH) Horizontal illuminance 350 lux considered suitable for training. International Hockey Federation (FIH) Horizontal illuminance 500 lux.
	CIBSE / SLL LG4	300	0.7	-	80		
II	BS EN 12193	500	0.7	40	60	Developing the Right Sports Hall. Horizontal illuminance 500 lux. Emin/EAve 0.70.	England Hockey (EH) Horizontal illuminance 350 lux considered suitable for club competitions. International Hockey Federation (FIH) Horizontal illuminance 500 lux.
	CIBSE / SLL LG4	500	0.7	-	80		
I	BS EN 12193	750	0.7	35	80	Developing the Right Sports Hall. Horizontal illuminance 750 lux. (1000 lux televised) Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 500 lux. Emin/EAve 0.70. Refers to BS EN 12193.	England Hockey (EH) Horizontal illuminance 500 lux for high level National & International non televised competitions. International Hockey Federation (FIH) Horizontal illuminance 750 lux.
	CIBSE / SLL LG4	750	0.7	-	80		

Note:
The illuminance values quoted in British Standards and CIBSE guidance are intended to provide a general framework for sports lighting design. However, England Hockey has specific recommendations that differ from those documents. The final design criteria should be established through consultation with Hockey England and the facility operator at an early stage of the project.



Table D12 Comparison table: Netball

Class	Institution	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Sport England recommendations	National Governing Body (NGB)
III	BS EN 12193	200	0.5	40	60	Developing the Right Sports Hall. Horizontal illuminance 750 lux. Emin/EAve 0.70. Affordable Sports Halls. Horizontal illuminance 500 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 300 lux. Emin/E Ave 0.70. Refers to BS EN 12193.	England Netball Horizontal illuminance 500 lux. Emin/EAve 0.70. Outdoor: Horizontal illuminance 400 lux competitive play & 200 lux training. Emin/EAve 0.70.
	CIBSE / SLL LG4	200	0.5	-	80		
II	BS EN 12193	500	0.7	40	60	Developing the Right Sports Hall. Horizontal illuminance 750 lux. Emin/EAve 0.70. Affordable Sports Halls. Horizontal illuminance 750 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 500 lux. Emin/EAve 0.70.	England Netball Horizontal illuminance 750 lux. Emin/EAve 0.70.
	CIBSE / SLL LG4	500	0.7	-	80		
I	BS EN 12193	750	0.7	35	80	Developing the Right Sports Hall. Horizontal illuminance 1500 lux. Emin/EAve 0.70. Affordable Sports Halls. Horizontal illuminance 1500 lux. Emin/EAve 0.70. ASL updated guidance. Horizontal illuminance 750 lux. Emin/EAve 0.70.	England Netball Horizontal illuminance 1500 lux. Emin/EAve 0.70.
	CIBSE / SLL LG4	750	0.7	-	80		

Table D13 Comparison table: Swimming



Class	Institution	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Sport England recommendations	National Governing Body (NGB)
III	BS EN 12193	200	0.5	35	60	Swimming Pools updated guidance. Most activities 300 lux (refers to CIBSE Lighting Guide 4). ASL updated guidance. Horizontal illuminance 200 lux. Emin/EAve 0.5. (Notes additional requirements for diving, racing and polo in pools).	
	CIBSE / SLL LG4	200	0.5	35	80		
II	BS EN 12193	300	0.7	40	60	Swimming Pools updated guidance. Competition swimming 500 lux. ASL updated guidance. Horizontal illuminance 300 lux. Emin/EAve 0.70. (Notes additional requirements for diving, racing and polo in pools).	FINA Competitions 500 lux.
	CIBSE / SLL LG4	300	0.7	40	80		
I	BS EN 12193	500	0.7	40	80	Swimming Pools updated guidance. Diving only 600 lux 1 m above water level. Competition swimming 500 lux. Notes FINA 600 lux at turn & start ends. ASL updated guidance. Horizontal illuminance 500 lux. Emin/EAve 0.70. (Notes additional requirements for diving, racing and polo in pools).	FINA International events: 600 lux at turn and start ends. FINA Olympics / World Championships 1500 lux.
	CIBSE / SLL LG4	500	0.7	40	80		



Table D14 Comparison table: Volleyball

Class	Institution	Horizontal E_{ave} (lux)	E_{min} / E_{ave}	R_{GL}	R_a	Sport England recommendations	National Governing Body (NGB)
III	BS EN 12193	200	0.5	40	60	Developing the Right Sports Hall. Horizontal illuminance 300 lux. Emin/EAve 0.70.	Volleyball England Horizontal illuminance 300 lux. Emin/EAve 0.70 for recreational play.
	CIBSE / SLL LG4	200	0.5	40	80		
II	BS EN 12193	500	0.7	40	60	Developing the Right Sports Hall. Horizontal illuminance 500 lux. Emin/EAve 0.70. Affordable Sports Halls. Horizontal illuminance 500 lux. Emin/EAve 0.70.	Volleyball England Horizontal illuminance 500 lux. Emin/EAve 0.70.
	CIBSE / SLL LG4	500	0.7	40	80		
I	BS EN 12193	750	0.7	35	80	Developing the Right Sports Hall. Horizontal illuminance 500 lux. Emin/EAve 0.70. Affordable Sports Halls. Horizontal illuminance 500 lux. Emin/EAve 0.70.	Volleyball England Horizontal illuminance 500 lux. Emin/EAve 0.70. 1000-1500 lux for play at international level. FIVB event regulations: light intensity must be no less than 2000 lux measured at 1 m from the floor. For FIVB, World and Official Competitions, played at night, the lighting on the playing area should be 1000-1500 lux measured at 1 m above the surface of the playing area. Lighting should be no less than 300 lux. World ParaVolley, World and Official Competitions (including Zonal Championships), the lighting on the playing area should be 1000-1500 lux measured at 1 m above the surface of the playing area.
	CIBSE / SLL LG4	750	0.7	35	80		

Document accessibility

This document has been designed for comfortable reading at A4 and on a laptop screen, but can also be printed at A3 for large print versions. The pdf is accessible and has been tested to work with text readers.

Contributors

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User guide

Before using this design guidance note for any specific projects all users should refer to the User Guide to understand when and how to use the guidance as well as understanding the limitations of use.

Click here for User guide and other Design and cost guidance

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