

THORN

Smart Sport **Lighting**



Lighting Smart Sports

Whatever the sport the competition just gets tougher. For the competitors and teams the training gets harder, there's more science involved than ever before. For the venues the competition is tough too. To keep up, sport venues need to diversify to maximise revenues, but still provide the focal point of the team branding.





As media goes through its own revolution, the pictures broadcast from a stadium, track or other venue become critical to how a team is perceived. Changes in TV broadcasting and the addition of cameras to just about every mobile device demands good lighting. Slow motion cameras and the directors need to focus in close on the top sports men and women mean the lighting itself has to perform to new levels. This is reflected in the standards for stadia from leading sports associations that mean many venues need to upgrade to attract the TV coverage and sponsorship that goes with it.

So lighting for the pitch, track or pool has to be able to keep up with media too. Thorn has responded with an array of 'smart' lighting systems featuring innovative optics, greater functionality, optimal switching and adaptive control technology. Coupled with our expertise in sports lighting design it is possible to provide the best competitive broadcast space for the latest demands from the media.

Outside of the competition it is important to know your lighting saves energy, performs reliably and safely and gives the minimum total cost of ownership so a venue can realise its maximum return on investment. At Thorn our energy and lighting specialists can help with these numbers too.

By adopting the good practice guidance and products contained within this brochure smart lighting solutions can be made for the benefit of owners, operators, competitors, spectators and the environment. Modern lighting is an essential element to building the smart, sustainable sports facility and to sporting success.

Why Thorn Lighting?

As a trusted global supplier of professional outdoor and indoor lighting with integrated controls, we have years of experience in luminaire development.

Leveraging our research and development facilities, we actively work to raise lighting standards and are uniquely placed to combine the latest light source technology with our specialist expertise in optical and luminaire design.

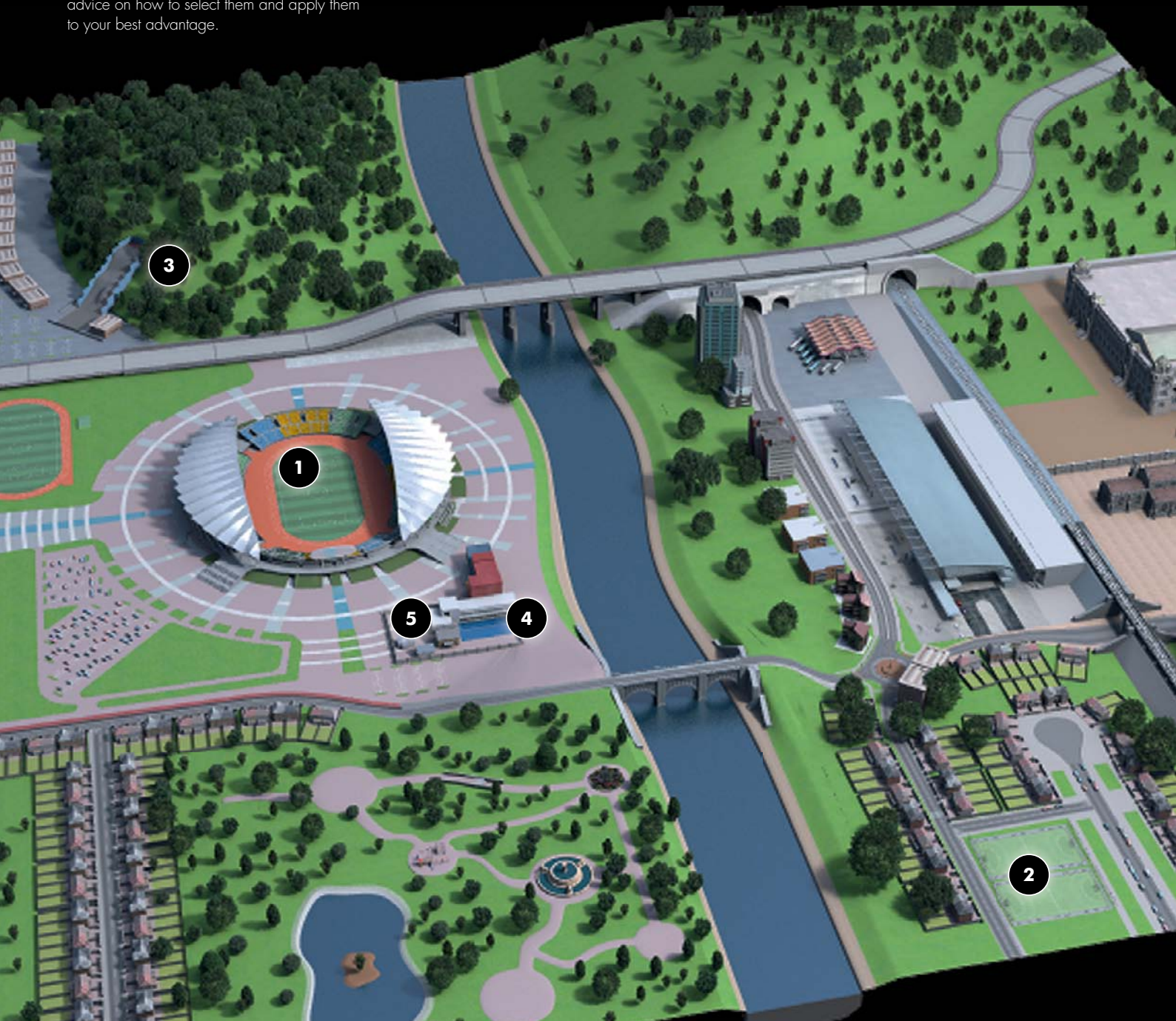
When you're lighting sports facilities with our products you can achieve a solution where aesthetics, optical performance, energy consumption and maintenance are all in perfect balance.

Product selection

The Smart sports lighting guide illustrates some of the more imaginative ways in which the wide range of Thorn sports products can be used for lighting stadiums, training grounds, ski runs, swimming pools, indoor arenas and other sporting facilities.

It examines a series of spaces commonly encountered in sporting activities giving you ideas on the most suitable lighting equipment. But, it's not just a matter of supplying you with products; well before that happens it's essential that you get the best possible design advice on how to select them and apply them to your best advantage.

That's where our 15 ways to make energy efficient lighting easy icons and good practice pointers come in. The consideration of such information forms an integral part of the design process to yield the most appropriate and up to date lighting solution.



1 Stadium



Mundial R

Options include circular reflector with intensive distributions for long throw applications



Mundial C

High power floodlight with hot restrike versions ideal for medium sized stadia



Altis

Equipped with new lamp technology and unique patented optics to meet the latest requirements of televised events

2 Training grounds



Champion

Zero-cut off floodlight with no upward light and limited spill light for urban environments



Mundial C

Ideal for side lighting with variable lamp positions and an asymmetrical distribution



Areaflood

Superior optical performance and wattage choice for small and medium sized general purpose sports applications

3 Ski runs



Mundial C

High power combined with extensive distributions for long ski runs



Champion

Wide distributions partnered with limited spill light to preserve the surrounding environment

4 Swimming pools



Areaflood

Wide choice of lamps with protective finishes protecting against corrosion



Troika

Variety of asymmetrical distributions from a fixed horizontal position, including a 45° peak angle to limit reflectance from the water and optimise swimmer visibility

5 Indoor arenas



Titus Sport

Dedicated sports hall T16 (T5) luminaire with a robust construction and unique curved housing to prevent projectiles from becoming trapped on top



Champion

1kW and hot restrike versions for indoor use, limiting glare for spectators



Mundial C

1kW metal halide lamps combined with wide optics for optimum indoor arena performance



Altis

1kW version to meet lighting requirements of indoor televised events

To help you through the process of understanding, specifying, installing and maintaining good quality, energy efficient lighting, we recommend you take advantage of our eControl programme.

eControl covers all our energy focused initiatives, products and services. If you are considering migrating to the latest high energy efficient technologies, eControl advice is available on request. Within this philosophy we have developed 15 easy ways to save energy, for the full frame work see below.

15 ways to make energy efficient lighting easy

When considering energy efficiency and lighting it is important that it is not considered in isolation. A lighting installation has a basic requirement to provide a sufficient amount of light to allow a task to be performed efficiently and safely. Requirements for this are given in standards such as EN 12464 (Lighting of workplaces),

EN 13201 (road lighting), EN 12193 (sports lighting), CIE 88 (tunnel lighting) and EN 1838 (emergency lighting), etc. In addition, as well as providing good task illumination the lighting installation should provide light of a good enough quality to provide a pleasant and fulfilling environment for the occupants of a space. The ideal is to provide these two aspects in as energy efficient way as possible.

Energy efficiency is a complex set of interactions and relationships linked to technology, physical environment, social behaviour and work requirements. However we can consider energy efficiency may generally be split into four main areas:

Technology



Lamp efficacy
How efficiently a lamp converts electricity into light (lm/W)



Ballast classification
Controls the electricity supply to the lamp (Energy Efficiency Index EEI)



Luminaire distribution
Light is controlled and emitted from a luminaire using optics which bend and shape the light to the correct location



System efficacy
The combination of the optical and thermal control within the luminaire (luminaire lm/W)

Application



Task lighting
Lighting the principal area and immediate surround with the correct amount of light



Zoning of lighting
Lighting is zoned according to key areas on the principal area and spectator and television camera locations



Maintenance schedule
Maintenance must be performed in response to product age, performance and environment



Waste light
Any light which does not hit the intended target area is waste light

Control



Presence/Absence
Presence: Lights automatically turn on and off with movement.
Absence: Lights automatically turn off and have to be manually switched on.



Daylight
Artificial lighting responds to the natural light conditions



Constant illuminance
A function designed to produce correct lighting levels for the duration of the maintenance period



Task/Scene setting
Allows user to set scenes and adapt the lighting to the different levels required by the sport and level of competition



Timed off
Automatic cut-off can be installed to turn all lights off during unoccupied hours

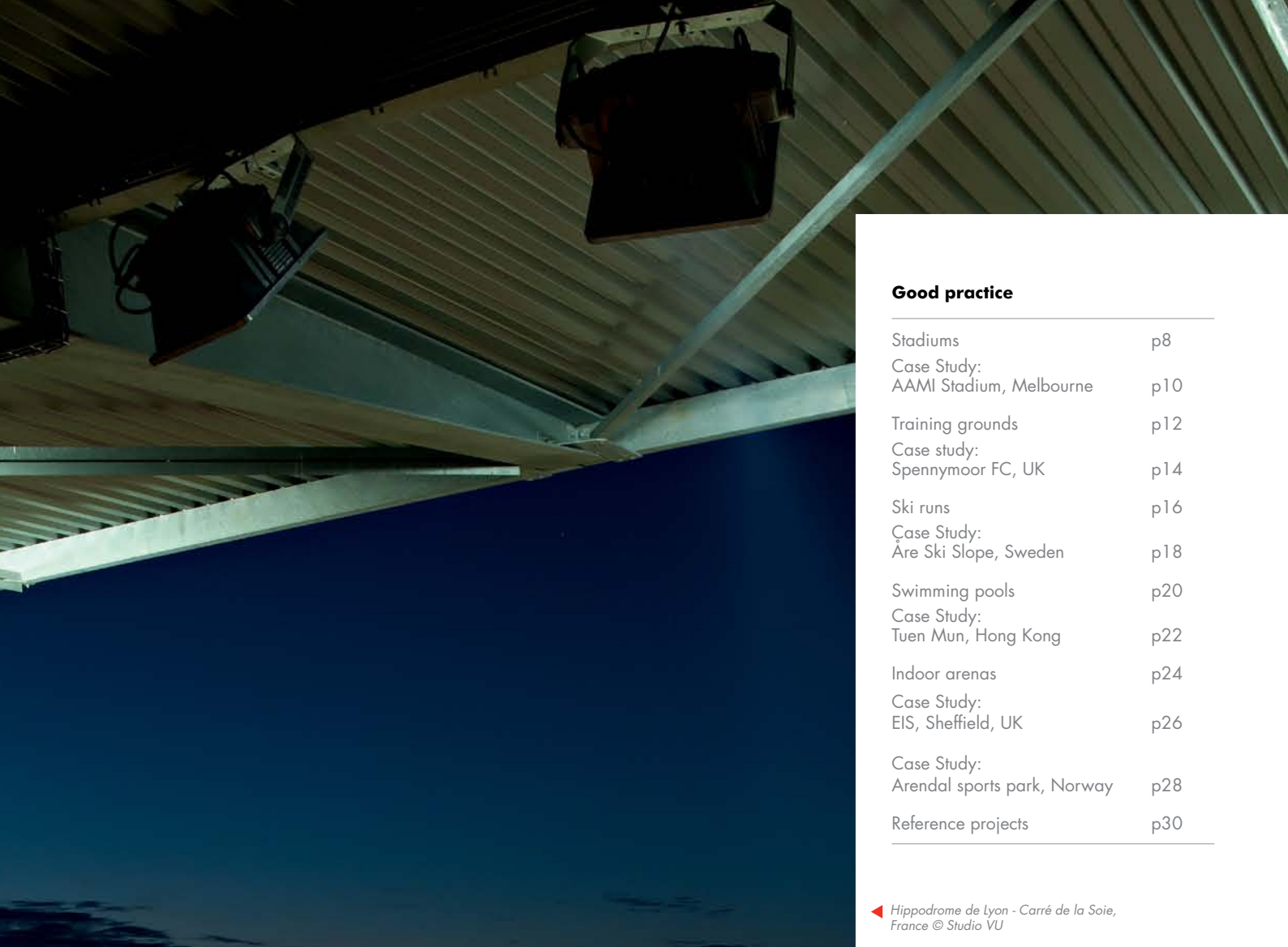
Environment



Reflectance
Light is reflected within the space from interior surfaces or spectator stands



Visible smart metering
Results of actions can be quickly seen as increase or decrease energy use



Good practice

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◀ Hippodrome de Lyon - Carré de la Soie,
France © Studio VU





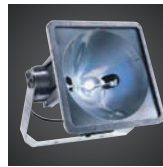
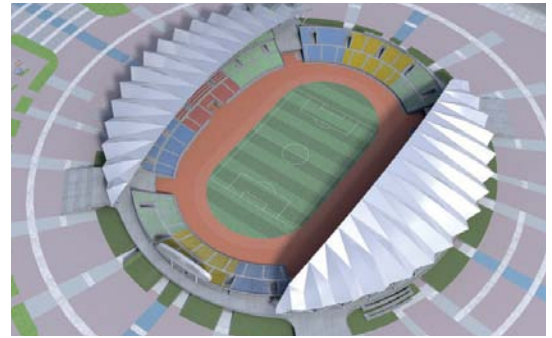
Creating the right environment

There is only one floodlighting application where the values of recommended illuminance are commonly greater than those required for interiors. This is in the lighting of large areas for spectator sports. Our Mundial range of powerful linear metal halide floodlights combines high light output – 220,000 lumens from the 2kW lamp – with a white light, the colour temperature of which is ideal for colour television broadcasts. In order to meet the exacting illuminance criteria, two different reflectors are offered - circular (R) with a symmetric beam for long projections and rectangular (C) with a double asymmetric beam for side lighting - in a number of intensity distributions. The precise light control also restricts stray light and limits glare. Both models are available in hot restrike versions for where the prolonged lack of lighting is not permitted.

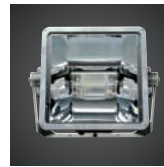
In Autumn 2013 we are introducing Altis a lighter, smaller, more efficient floodlight, offering an easy to integrate solution deal for stadiums.

Taking control

Controls in large stadia is about making sure illuminance levels are maintained throughout the game, most of them being televised. The use of hot restrike floodlight guarantees minimum light levels even in the case of short power cuts. Flexibility of switching is common to achieve stepped illuminance levels for the required events. Finally a certain number of instant lighting luminaires will ensure that security levels are achieved on the pitch and in the stands in the case of an emergency.



Mundial R



Mundial C



Altis

COMING SOON



▲ Skilled Park Stadium, Gold Coast, Australia



Good practice

In a stadium, spectators may need to see relatively small detail and fast movement at distances of 150m or more. To achieve this, the illuminance will need to be higher than that strictly dictated by the visual needs of the players. Where sports are televised, the demands of the camera system may dictate an even higher illuminance that is in excess of the minimum visual needs of the spectator. The level to be recommended depends on the size and speed of the object, the type of camera and filming techniques which obviously varies from sport to sport, and on the standard of play or competition. Lighting is usually positioned on the roof structure or on 15m–20m+lighting masts. The floodlights are normally rated 1- 2kW and have a double asymmetric or symmetrical beam shape to ensure good uniformity and glare control. Colour temperature of the lamps must be high (4000 - 6500K) to minimise apparent colour changes in the scene when daylight is progressively replaced by the floodlighting. It is important to minimise obtrusive and spill light.

◀ PGE Arena Gdansk, Poland



Case Study: AAMI Stadium, Melbourne

Melbourne's AAMI Park kitted out with top performance lighting



Built in 2010, AAMI Park is a 30,050-seater stadium which features a cutting-edge Bioframe design with a geodesic dome roof which substantially covers the seating area. The beauty of the design is that spectators enjoy unobstructed views, free from pillars, walls or other support structures.

As well as a 65,000m² rectangular pitch, the park also features a sports campus, including an elite training centre with gymnasium, 25m lap pool, plus office and medical facilities. It is used for a range of domestic and international rugby union, rugby league, soccer and American football matches.

Lighting for architecture and performance

Working with repeat customers NDYLIGHT and Cox Architects, the aim was to develop a sports lighting system that blended with the desired architectural form of the stadium without compromising performance. In addition to the pitch, lighting was also required for the interior facilities.

The three key objectives for the main stadia lighting were to: 1) Achieve 2,000 lux on the vertical and 2,600 lux average on the horizontal 2) Achieve 0.7 uniformity 3) Minimise obtrusive light. High quality task illumination was essential to meet the exacting requirements of national and international sports and television broadcasting.

344 Mundial (2KW) metal halide sports floodlights in various beam distributions were selected for the pitch, mounted on four corner towers and along the roof structure. Importantly, Mundial's beam throw is exceptional and the variable lamp holder position enables a choice of concentrated distributions. This makes long-range floodlighting a lot easier and more precise, giving good uniformity and ensuring that glare and obtrusive light are kept to a minimum.

Products used



Mundial C

Key facts

- Uniformity: 0.7
- LENI: 5.5kWh per m² per year
- LUX: 2000 on the vertical, 2,600 average on the horizontal



eControl From Thorn's 15 ways to save energy, the following are key to minimising energy consumption at AAMI Park:



Luminaire distribution

The beam distribution and throw are exceptional while the variable lamp holder position enables a choice of concentrated distributions to suit the location within the stadium structure.



Task lighting

The specific optical designs make long-range floodlighting a lot easier and more precise, giving great results for sport and television broadcasting while minimising glare for the spectators and players.



Waste light

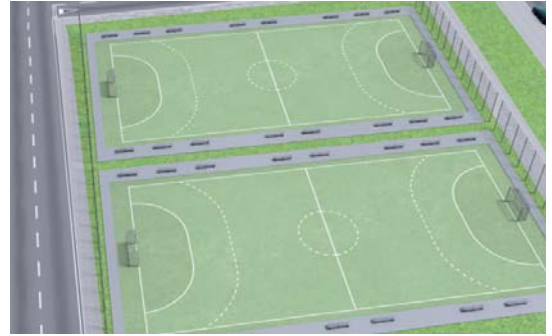
Careful selection of high performance optics and good lighting scheme design mean the light spill from the stadium is minimal, which in turn minimises waste energy consumption.

Training ground



Creating the right environment

The question of obtrusive light is of particular importance with training pitches that are frequently located close to residential housing and traffic. Champion and Troika are powerful discharge floodlights giving high performance without wasteful spillage of light onto the surrounding area. Available for 1 or 2kW metal halide lamps Champion has an integral, inclined front glass with the front of the body serving as a cowl for full-cut off of light at 80°. Illuminance and uniformity can thus be optimised without the need to tilt the projector. The 250-600W Troika is an asymmetric 'flat glass' floodlight giving a highly accurate light distribution. Both projectors feature adjustable lamp positions - to provide different photometries from just one installed position - and a selection of light shield attachments.



Champion



Mundial C



Areaflood

Taking control

Straightforward switching is advisable.

A half-pitch solution may be required.

A timeswitch will ensure that the floodlights cannot inadvertently be left running.

For the comfort of players, a proportion of hot restrike versions, even small, will enable the pitches to be lit even in case of micro power cuts.





Good practice

Smaller training venues require a different lighting approach to large stadiums. Usually located in urban areas such facilities require tight control of obtrusive light and often tall lighting columns are unacceptable. A lower level of lighting is used for training (Class III). The design illuminance should be set for the more onerous activity and take account of the type of playing surface, often synthetic. The lighting needs require the ball, the players, and the surface markings to be clearly visible at all times. So, besides directing light down on to the training surface, there must be an element of "sideways" light such that the vertical surfaces are lit whilst ensuring minimal glare and maximum uniformity. Floodlights are normally mounted at 10-12m and the choice of support will often be influenced by site conditions and access for maintenance, typically being a standard four, six or eight column layout. Columns which can be fully lowered to the ground or, better still, mid-hinged are popular.

◀ Spennymoor Town FC, UK

Case Study: Spennymoor FC, UK

Spennymoor is the first football club to unveil latest floodlight technology



Spennymoor Town Football Club, England, plays in the Northern League Division One in the English football league system. Locally known as The Moors, the club has won the Northern League Championships every year since 2009. In support of its efforts to be promoted, it has also become the first club anywhere to boast Thorn's new Champion floodlights.

Champion transforms matches

A recent review deemed the old lights at the Brewery Field grounds, which The Moors rents from the local Council, to be unfit for purpose. The new Champion floodlights however have put The Moors back in the game, providing performance lighting along with comfort for spectators and local residents.

Champion is a compact asymmetric floodlight for 1 and 2 kW metal halide lamps. It incorporates the zero-cut off concept and an integrated visor for total control over glare and obtrusive light (0 cd at 90°).

Products used



Champion

A high LOR ensures maximum optical efficiency and accurate light distribution with minimum light spill. From just one installed position, Champion can be adjusted on site to three lamp positions.

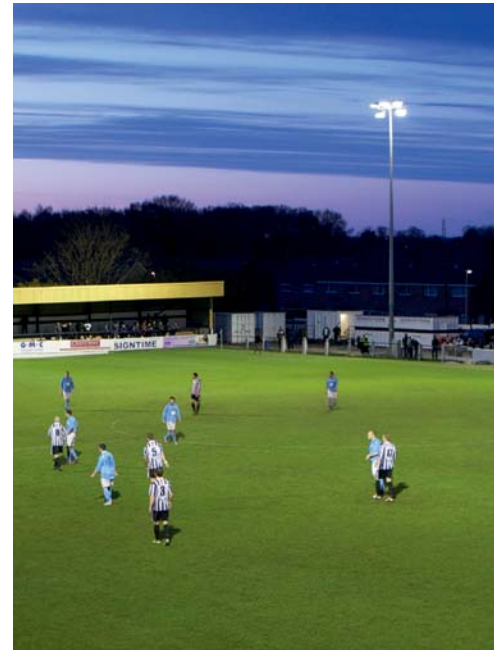
Champion is particularly easy to install and maintain with safe, tool-free rear lamp access and replacement through a hinged door and tool-free aiming in the azimuth due to integrated aiming sights. On opening the rear access door, power supply is automatically interrupted for fast and safe maintenance.

Prepared for promotion

Albert Hickman, who works for Thorn Lighting and has played over 600 games for The Moors had an instrumental role in the installation of the new floodlighting system. He said: "Thorn recognises the importance to the town of having a real successful football club, hence the support from us in providing its first floodlights back in the 60s (my era) and of course its replacements now. The floodlight fittings are of a new design and will provide high quality lighting levels to meet the stringent FA specification."

To the delight of Club Director Paul Callaghan, the new floodlights have delivered a marked improvement in visibility and gone down very well with fans. "We have known for some time that they needed replacing, but it is great to get an improvement up to conference standard," said Callaghan. "We are looking seriously at the possibility of promotion this season, so it is reassuring to know our ground is as good as, if not better than, most of the grounds in the Evostik Northern Premier League. If we do make promotion, we are not going to look out of place."

For further information on Champion visit
www.thornlighting.com/CHMP



Key Facts

- Number of floodlights: **20**
- Product: **CHAMPION 2KW HQITSL CL2 WI**
- Number of poles: **4**
- Height of poles: **18m**
- Target lux level: **250 lux**
- Maintained lux level: **260 lux**
- Uniformity: **0.67**

eControl From Thorn's 15 ways to save energy, the following are key to minimising energy consumption at Spennymoor FC:



Luminaire Distribution

Precise optical control ensures the efficient use of light by permitting an optimised design that lights the task to the required level with minimal waste



Maintenance Schedule

Ease of maintenance allows routine tasks to be performed without affecting floodlight aiming, preserving the efficiency of the installation through time



Waste Light

Tight control of obtrusive light ensures the surrounding buildings and environment are not impacted by only directing the light where it is required.

(A lady in an adjoining property commented that since the new lighting was installed she now has to turn the light on in her kitchen on a match night)

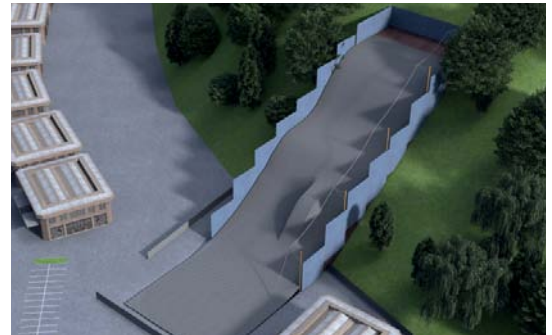


Creating the right environment

The aim of the lighting is to ensure that skiing can be undertaken both safely and skilfully, spectators can see the action clearly and comfortably, and if present TV cameras can operate. Lighting requirements are defined by EN 12193 and by sports bodies such as the Fédération Internationale de Ski (FIS). In addition to key factors such as illumination levels, uniformity, glare, colour rendering and the elimination of stroboscopic effects it is important to reduce obtrusive light in order to contribute to a ski run's environmental "footprint". The use of precision optics in high performance floodlights can provide the answer. The powerful metal halide Mundial C floodlight is especially suitable for side lighting installations, the rectangular reflector providing a double asymmetric beam of brilliant pure white light. Where a smaller lumen package is required, typically near urban areas, the Champion comes into its own because of its innovative optical control.

Taking control

Use one or more of the following control mechanisms:
 Photocells and time switches.
 Flexibility of switching may be needed to achieve stepped illuminance levels for the different levels of competition.



Champion



Mundial C





Good practice

As high speed can be achieved the position of floodlights is important to provide the correct visual conditions, therefore floodlights are positioned and aimed to prevent glare to skiers, whilst revealing the texture of the surface of the slope to ensure safety. This requires aiming away from the direction of view of skiers, and the use of glancing angles to show surface texture while preventing reflected glare from the snow. The 'run' needs to have a high level of uniformity, from beginning to end. Wide horizontal and narrow vertical angle floodlights mounted on masts up to 12m high and using metal halide lamps are most suitable for this application. Any luminaire chosen should have good optical control to allow for the minimisation of spill light or light trespass when aimed correctly, and needs to be mechanically robust to ensure safe and correct functioning in often harsh mountainous conditions.

◀ Wildkogel Ski Arena, Austria

Case Study: Åre Ski Slope, Sweden

Ski resort improves world championship prospects with Mundial floodlights



Åre is an alpine ski area and the largest mountain sports resort in Sweden. Located at the foot of Areskutan, a mountain 1,420 meters above sea level, it was host to the World Cup Championship in 2007 and named the "World's Top Ski Resort" in 2009 by the British travel magazine *Condé Nast Traveller*.

Åre is now striving to be selected to hold yet another World Cup Championship. In a bid to improve its prospects and provide a world-class facility for visitors, alpine operator SkiStar took to upgrading and improving Åre's Swedish Alpine National Arena. Of the investments made, the installation of new lighting on the Störtloppet ski slope was a top priority.

illuminating Sweden's most fierce ski slope

The Störtloppet ski slope is Sweden's most fierce and dangerous. It has a total length of 2,912 feet with a vertical drop of 841 metres. To bring it up to world class standards and meet television broadcast requirements, 350 Mundial HQI-TS 2000W floodlights were specified to illuminate 1,308 feet with a vertical drop of 416 meters.

Producing a light level of 1,000 lux, Mundial is mounted at a height of 15m and can be set in three different lamp positions. It also features a spun circular reflector with baffle for asymmetrical lighting distribution. By minimising glare, light spill and upward light, Mundial effectively prevents obtrusive light and light pollution. This is especially important for preserving the local environment.

Nalle Hanson, Arena Manager at SkiStar Åre says: "With the new lighting, we can now run evening competitions throughout the winter. The last winter women's World Cup competitions were in fact run with the new lighting and both the competitors and the television broadcasting company were very happy with it. The lighting level of 1,000 lux is particularly crucial for managing the broadcasting requirements. Aside from the lighting, SkiStar is also very satisfied with the cooperation with Thorn."

For further information on Mundial C visit www.thornlighting.com/MUNC

Products used



Mundial C

Key Facts

- Maximum light level: 1,000 lux
- Lux level can be adjusted according to use of the slope, including public skiing, training and competition
- The Mundial floodlights are mounted at a height of 15m and can be set in three different lamp positions



eControl From Thorn's 15 ways to save energy, the following are key to minimising energy consumption at Åre's Swedish Alpine National Arena:



Task lighting

Ensuring light is concentrated on the task provides the required high levels of illuminance while using minimal energy through less light loss in ancillary areas.



Zoning of lighting

Careful selection and arrangement of lighting on key sections of the slope maximises lighting impact whilst minimising energy use on lighting in areas of lesser importance.



Waste Light

Precise optical control and luminaire aiming minimises spill light, so no energy is wasted lighting the wrong area.

Swimming pool



Creating the right environment

The primary objective of swimming pool lighting is safety; the pool attendant must be able to see a swimmer in difficulty clearly, and secondly, the lighting must provide a pleasant and visually comfortable environment for the swimmers, both in the water and when standing on the pool side. The most common lighting approach is the use of lighting masts with metal halide floodlights that have an asymmetric beam to ensure good uniformity and glare control. Areaflood and Troika are floodlights with superior performance and control. They are fully adjustable and the optical system gives a variety of controlled beams optimised for the application. Available in 70-600W. External accessories also available. The Areaflood accepts outdoor lighting controls.

Taking control

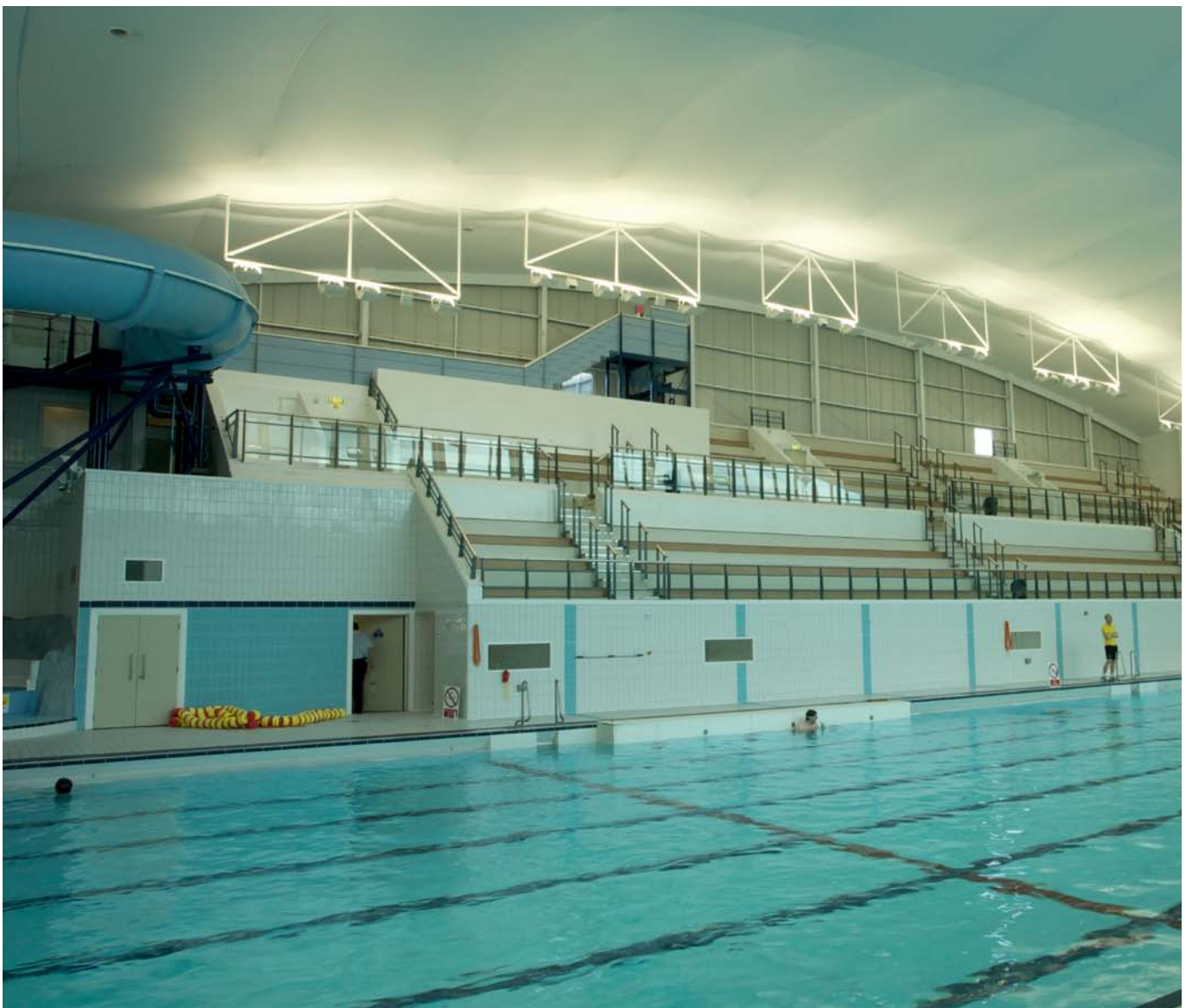
Use one or more of the following control mechanisms:
Photocells and time switches.



Areaflood



Troika





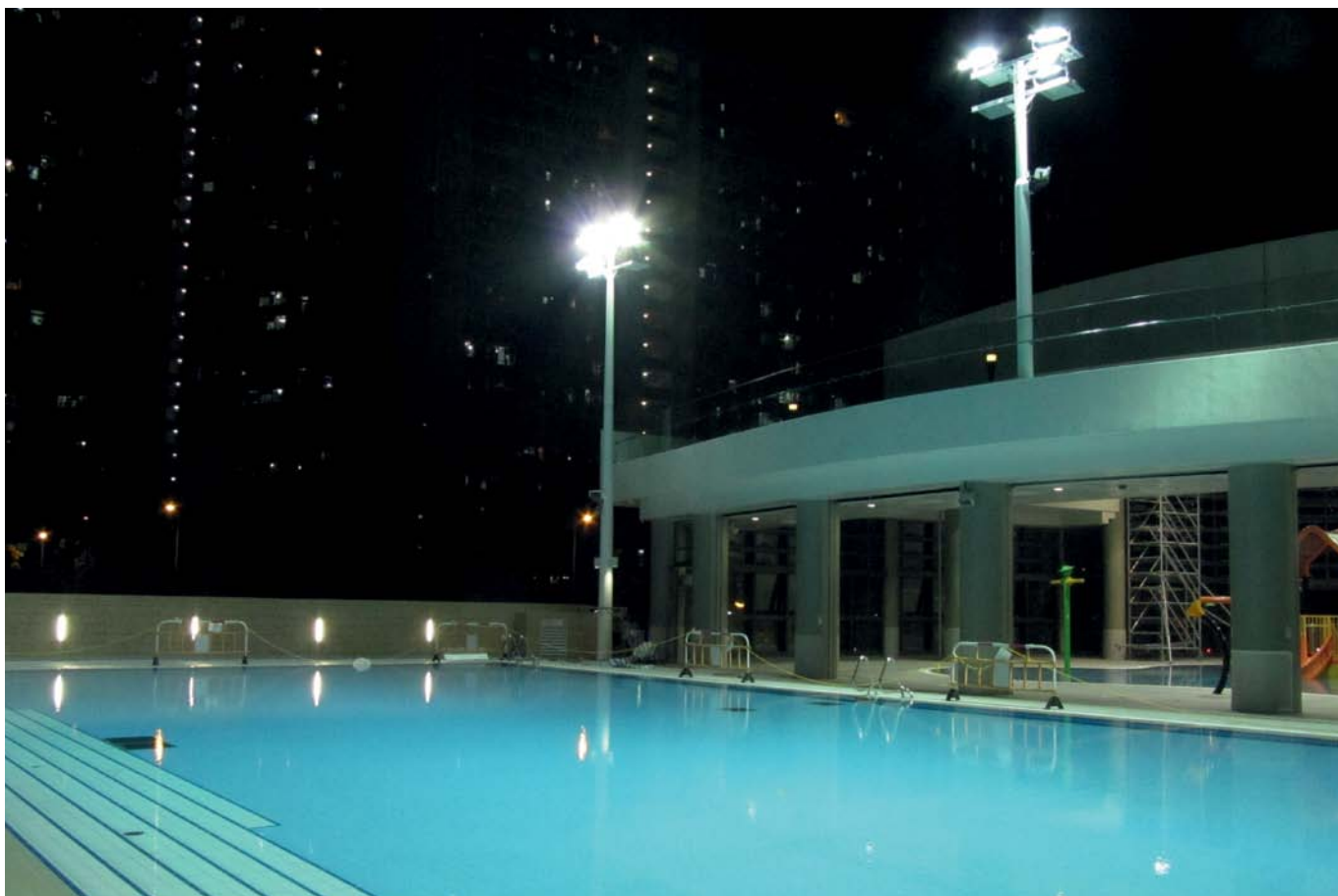
Good practice

The aim of the lighting is to ensure that swimming can be undertaken both safely and skilfully and that spectators can see the action clearly and comfortably. Surface reflectance and penetration of light into the water varies with the angle of incidence, which impacts upon the choice and aiming position of the luminaire. Typically asymmetrical floodlights are employed, positioned around the pool to help to reduce unwanted reflections. For diving the lighting in the diving zone requires a good ratio of horizontal to vertical illuminance. Good colour rendering lamps (metal halide) are required to provide the correct ambience and visual comfort for competitors and bathers. Floodlights should have a high degree of protection and resistance to the elements built in, plus an accurate optical system to control obtrusive light. Underwater lighting can help to reduce reflected glare from the pool surface as well as improving viewing conditions on the pool bottom. For recreational swimming pools themed or decorative lighting effects may be required.

◀ DGI-Huset, Herning, Denmark

Case Study: Tuen Mun, Hong Kong

Thorn floodlights create a safe, comfortable environment for Tuen Mun swimmers



The Leisure and Cultural Services Department in Hong Kong attaches great importance to providing high quality facilities to the public.

The new swimming pool complex in Area 1 (San Wai Court), Tuen Mun, is a state-of-the-art HK\$790m development. Outdoor facilities include a 50x25m main pool with a 1,200 seated capacity spectator stand, a 25x15m outdoor training pool and a 25x15m outdoor teaching pool.

Thorn Lighting Hong Kong was commissioned to provide the floodlighting for this fantastic outdoor space with the aim of providing high quality task illumination.

Glare control essential for comfort and safety

Thorn's Champion and Mundial C metal halide floodlights were chosen to illuminate the three pools. Champion is a high performance floodlight with best in class optic control of obtrusive light. The 1kW projector incorporates a flat glass concept and an integrated visor for total control of glare and obtrusive light. Champion offers maximum optical efficiency and accurate light distribution with minimum light spill.

The Champion floodlights were applied to achieve 0.5 uniformity. This ensures there is enough variation to prevent bland uniform light but with no excessive contrasts, as visual dark spots in the pool could be dangerous in the event of a swimmer having problems.

Products used



Champion



Mundial C

Key facts

- Switched lighting levels (200, 300 and 600 lux)
- Maintenance factor - 0.68
- Glare - <math><56</math>
- Luminaires designed for sustainability and end of life recycling
- Year of completion: 2012



Similarly, Mundial C is a high power and high performance floodlight specifically designed for all sport applications and large area illumination. With the lighting applied to highlight the pools' turning ends, the 1kW hot restrike lamp version was selected to ensure there is no loss of lighting, which would be dangerous for both swimmers and those surrounding the pools.

Computer optimised optical systems combined with unique optical construction ensure glare is kept to <math><56</math> on the water surface whilst lighting to the bottom of the pool for maximum swimmer safety. Excellent glare control is important to ensure pool attendants' have a good view of swimmers, as well as the comfort of spectators, the surrounding residents and local wildlife.

The quality IP65 rated luminaires and asymmetric distribution allow the fittings to be positioned on the edge of the pool for ease of maintenance and safety. Mundial C is particularly easy to install and maintain with rear access and automatic power interruption.

Peter Thorns, Head of Strategic Lighting Applications at Thorn says: "Professional design has ensured verified compliance to all applicable standards and best practice. On-site measurement of installed performance also ensures safety and energy efficiency by providing the correct lighting levels at all times."

For more information about Champion, go to www.thornlighting.com/CHMP

For more information about Mundial C, go to www.thornlighting.com/MUNC

eControl From Thorn's 15 ways to save energy, the following are key to minimising energy consumption at the Tuen Mun swimming pool complex:



Luminaire distribution

Maximum efficiencies are achieved with a unique polar curve to ensure precise beam angle asymmetric distribution to light only the task area.



Task lighting

Providing the correct amount of light for a specific set of conditions and moment in time is vital for saving energy. Switched lighting levels (200, 300 and 600 lux) enable the lighting to be adjusted according to pool use, such as closed or public or competition swimming. This ensures both efficiency and comfort for the task in hand.



Maintenance schedule

Careful consideration has been given to the maintenance schedule to give a 0.68 maintenance factor. With a clear and realistic maintenance schedule in place, lighting performance can be optimised while ensuring maximum efficiency too.



Creating the right environment

Lighting for an indoor sports arena has many aspects in common with lighting for an outdoor sports stadium. However restrictions caused by the indoor environment can necessitate different techniques and considerations.

Generally indoor arenas are more compact which means that the spectators are closer to the action. If the sports event requires high levels of illuminance, such as for a televised event, this necessitates careful control of the lighting to prevent glare and discomfort to the spectators. This compactness also creates issues with positioning of luminaires as frequently there is limited height above the level of spectators and luminaires should be placed without obstructing spectator view. In addition many playing surfaces do not diffuse light in the same way grass will, meaning that care should be taken to prevent reflected glare causing problems for both players and spectators.

Control of heat gain within the space is important as the build up of heat within an enclosed arena can quickly make it uncomfortable. Lighting can be a major source of heat so careful selection of luminaires is necessary to minimise installed power.

Each sport has differing requirements dictated by the speed of play, size of target, size and type of playing area, viewing distance, etc. and individual sports governing bodies will set criteria to account for this. The European Standard EN 12193:2007 Light and Lighting – Sports Lighting gives a good overview of these requirements and the document CIE 169:2005 Practical design guidelines for the lighting of sports events for colour television and filming provides valuable information for televised events in large sporting arenas.

Taking control

Lighting controls should allow switching of lighting levels via preset scenes for differing levels of competition, for example training, amateur sports, regional leagues and national or international competition, and also between non-televised and televised events.

For multi-purpose halls the lighting should allow scene-setting based upon the sport in play as positioning of luminaires can be critical for many sports, for example those where the competitor has to look directly upwards.

Careful consideration of ease of luminaire maintenance can influence installed power. Lighting that is hard to access will require the installation of excess luminaires to overcome the possibly significant loss of light between maintenance sessions. Ensuring ease of access can allow more frequent maintenance, reducing the need to over-light.



Champion



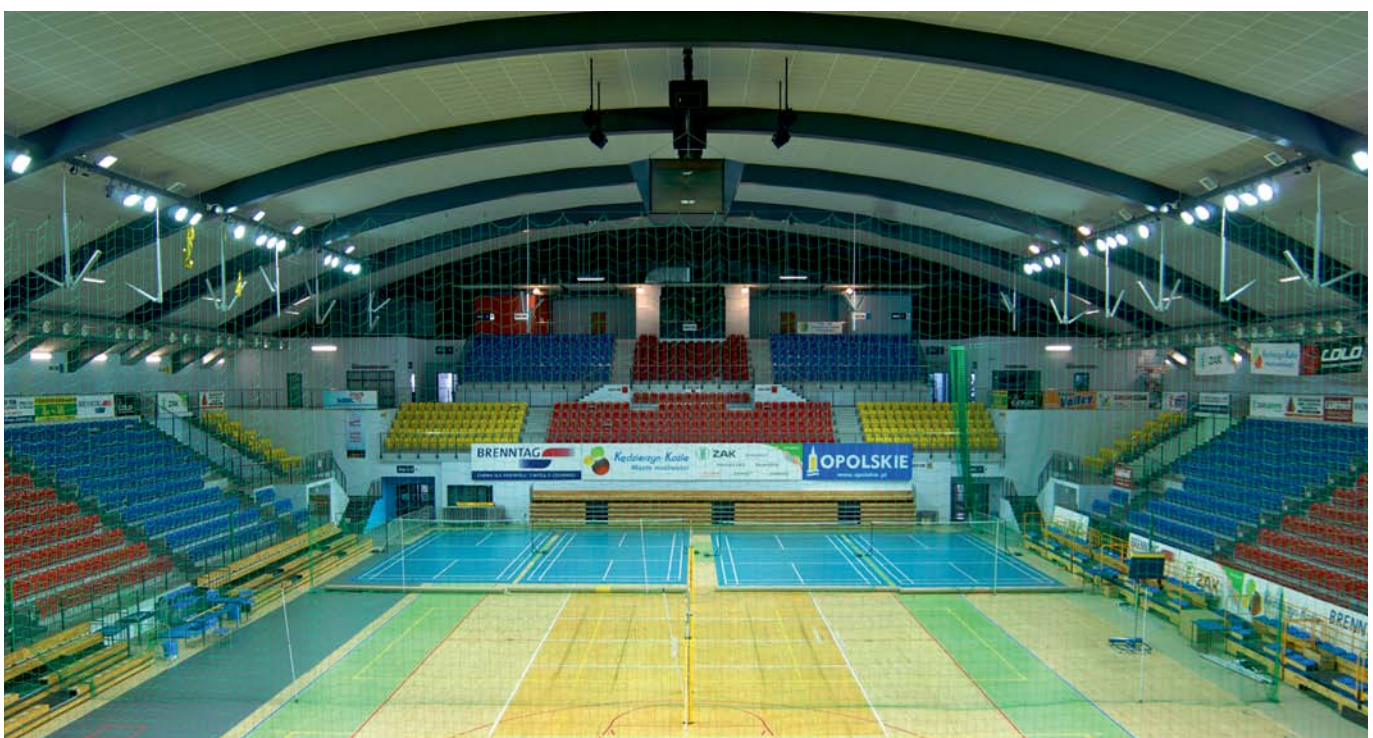
Mundial C



Altis



Titus Sport





Good practice

For sports involving a fast moving target, especially if the target is also small, care should be taken to ensure there are no stroboscopic effects caused by flicker from the light sources. This can make the target appear to move in a non-continuous manner making play difficult and creating a potential risk to health due to difficulty in visually tracking the target. This is especially important for televised events where high-definition slow motion pictures may be required, necessitating strict control of light flicker.

Lighting equipment should be chosen after consideration of the environmental conditions, especially the possibility of impact from sports equipment. It is necessary to ensure that the fitting is proof against the most onerous condition considering both force of impact and size of object likely to strike the luminaire. Ideally luminaires should be shaped and mounted to minimise the risk of sports equipment such as balls becoming trapped behind or within the fitting.

The structural design of a sports building may place restrictions both in positioning of luminaires and in luminaire weight as some structures have limited weight bearing capabilities. As many sports also place restrictions upon the positioning of luminaires with respect to the playing area to minimise glare and distraction this requires careful design.

◀ *Palace of Sports, Druzhba, Ukraine*

Case Study: EIS, Sheffield, UK

Light boost for England's top athletes



Known as the 'team behind the team', the English Institute of Sport (EIS) delivers a range of performance improving sport science and sport medicine services to Olympic and Paralympic sports, as well as a select number of non-Olympic sports. Impressively, it supported 86% of all Olympic and Paralympic medallists during London 2012.

Having successfully worked with Thorn on a previous sports lighting project, the EIS commissioned Thorn to design a high performance lighting scheme for its 2,030m² multi-sport facility in Sheffield, England.

The new-build facilities included recreational areas, multiple sports courts, a 200m indoor sports track, staircases, the building exterior and car park. EIS also requested for the lighting on the existing basketball and netball courts to be upgraded. Aims for the project included meeting European sports standards and television broadcasting requirements.

Lighting fit for Olympians

Two key luminaires specified for the EIS Sheffield facility included the Mundial (1KW) metal halide sports floodlight and the Titus Sport dedicated sports hall luminaire. Specifically designed for high performance, Mundial minimises glare and can be set in three different lamp positions to meet the various sporting requirements.

With T16 (T5) fluorescent lamps, Titus Sport can be surface mounted with adjustable stepless tilt up to 50° for sports applications. Its unique curved housing prevents projectiles from becoming trapped on top of the luminaire.

Overall, the design and flexibility of the lighting installation increased the facility capability from 750 lux on six layouts across three sports to up to 750 lux on nine layouts across five sports. As a direct result of the new lighting, the EIS Sheffield facility can now be used for more sports and is certified to All England Netball Association Standards.

Head of Global Applications Management, Iain Macrae, says: "The nature of the building never made it easy to light for such a wide range of sports but working closely with the client we managed to upgrade the lighting, remove some problems with glare and add two new sports to this vitally important facility."

Products used



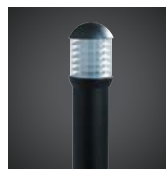
Mundial C



Titus Sport



Mica



Basalt



Key facts

- All key lighting standards met, including European sports standards, television broadcasting requirements and All England Netball Association Standards
- Lighting provided for five sports, including netball, basketball, badminton, football and volleyball
- Adjustable stepless tilt up to 50° allows lighting to be adjusted to suit the various sport applications

eControl From Thorn's 15 ways to save energy, the following are key to minimising energy consumption at the EIS Sheffield facility:



Luminaire distribution

Tight optical control allowed lighting of courts and sports areas with minimal spill light into adjacent areas, preventing energy usage in lighting unused space.



Task/scene setting

In combination with switching arrangements, the correct lighting level can be selected for a wide range of court uses, including netball, basketball, badminton, football and volleyball.



Zoning of lighting

In combination with switching arrangements, the lighting can be zoned according to use to minimise energy consumption in areas where it is not needed.

Case Study:

Arendal sports park, Norway

Arendal sports park in Norway was completed in August 2012. The facilities, which are a joint project shared by the municipality of Arendal, Aust-Agder and the sports community, consists of a tennis hall, a sports hall and a gymnasium indoors, plus an administration building, VIP rooms, club facilities and fitness facilities. Outdoors, tennis courts and volleyball courts are being built, as well as more parking areas and green features.

In cooperation with electrical contractors Agder El.installasjon, Thorn has supplied some of the lighting for the building project, primarily for the common areas where people move around or mingle. The contractor and the architect's design consultant played a leading role in the choice of luminaires.

LED lighting in all its forms

Thorn's first suggestion for lighting at Arendal sports park was based on luminaires with T5 light sources and compact tubes, but the contractor wanted a LED-based solution with more modern technology, while the architect wanted to preserve the same design language as the original lighting. This challenge led Thorn to produce customised EqualLine LED for Arendal sports park in order to combine technology and design harmoniously.

The use of different types of Glacier II LED unifies the building. The predominant choice is a version with glass refractors to create a soft, comfortable light and a welcoming ambience. However, in areas next to the playing courts an aluminium reflector has been chosen instead, to avoid disturbing light and dazzle on the courts.

Simple and efficient lighting control

The lighting is controlled by a combination of simple "stand-alone" solutions from Thorn and DALI lighting control. In the changing rooms and toilets motion sensors have been chosen, with daylight switches in the offices. This means that the installation is easy to maintain and adjust, and does not require special skills. In the passages and common areas DALI lighting controls have been used, which can vary the ambience with the help of pre-defined lighting scenes, according to the time of day or the current activity in the sports park. With the combination of lighting control and LED the maximum energy savings are achieved, and then the lighting control system ensures improved functionality in each room.

Key facts

- Thorn has supplied the lighting for common areas and traffic areas in Arendal sports park: BaseLED, Cruz LED, Glacier LED, EqualLine LED.
- For indoor lighting control, simple stand-alone solutions from Thorn are among the systems used, which means that the individual areas can be controlled independently of each other: SwitchLite, SensaDigital, SensaDAY.
- LED lighting from Thorn also has priority outdoors: D-CO LED below ground, Clan LED in the entrance area, and Band LED on tennis courts and volleyball courts.
- The lighting has been delivered in cooperation with Agder El.installasjon.



▲ Glacier II LED lighting links the various parts of Arendal sports park together: Glacier II LED with glass refractors create a soft light and a welcoming ambience



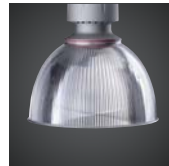
Products



BaseLED



Cruz LED



Glacier LED



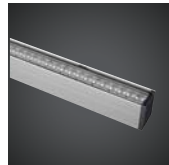
EquaLine LED



Clan C LED



D-CO LED



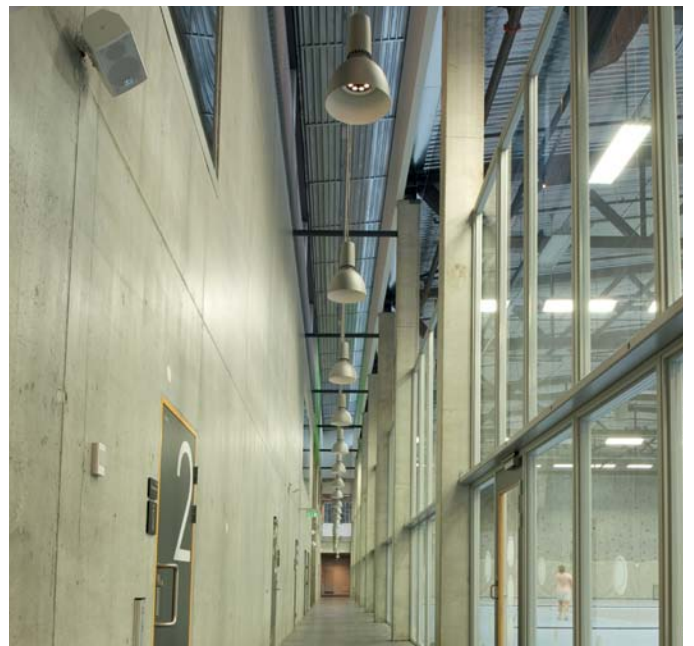
Band2



▲ The outdoor surroundings are also lit by LED luminaires from Thorn, and in the entrance section they are Clan LED.

▲ The special EquaLine LED luminaire is linear and built into the ceiling, making it possible to combine the requirements for modern technology with the original lighting plan.

▼ Glacier II LED Alu are used along the sports pitches. The aluminium shades prevent disturbing light and dazzling on the sports pitches.



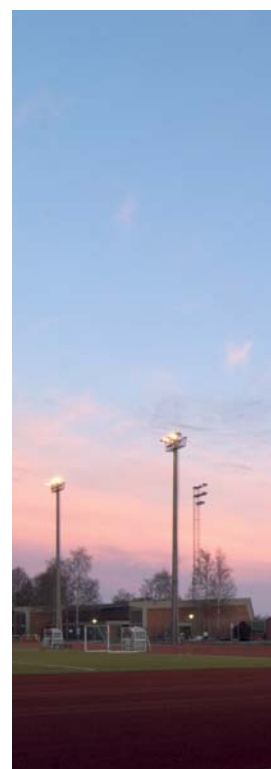
Project references



Kaja Idrettspark
Norway
Products used:
Champion



Croke Park
Ireland
Products used: Mundial





▲
Ostersund Ski Area
Sweden
Products used: Mundial



Norges Idrettshoyskole
Norway
Products used: Champion



Project references



▲ **Zagłębie Sosnowiec Training Ground**
Poland
Products used: Mundial



▶ **Parc-Y-Scarlets**
Carmarthenshire, UK
Products used: Mundial



▲ **FC Mlada Boleslav**
Czech Republic
Products used:
Mundial C and Mundial R

▲ **Malmö Arena**
Malmö, Sweden
Products used: Champion and Indus

Project references



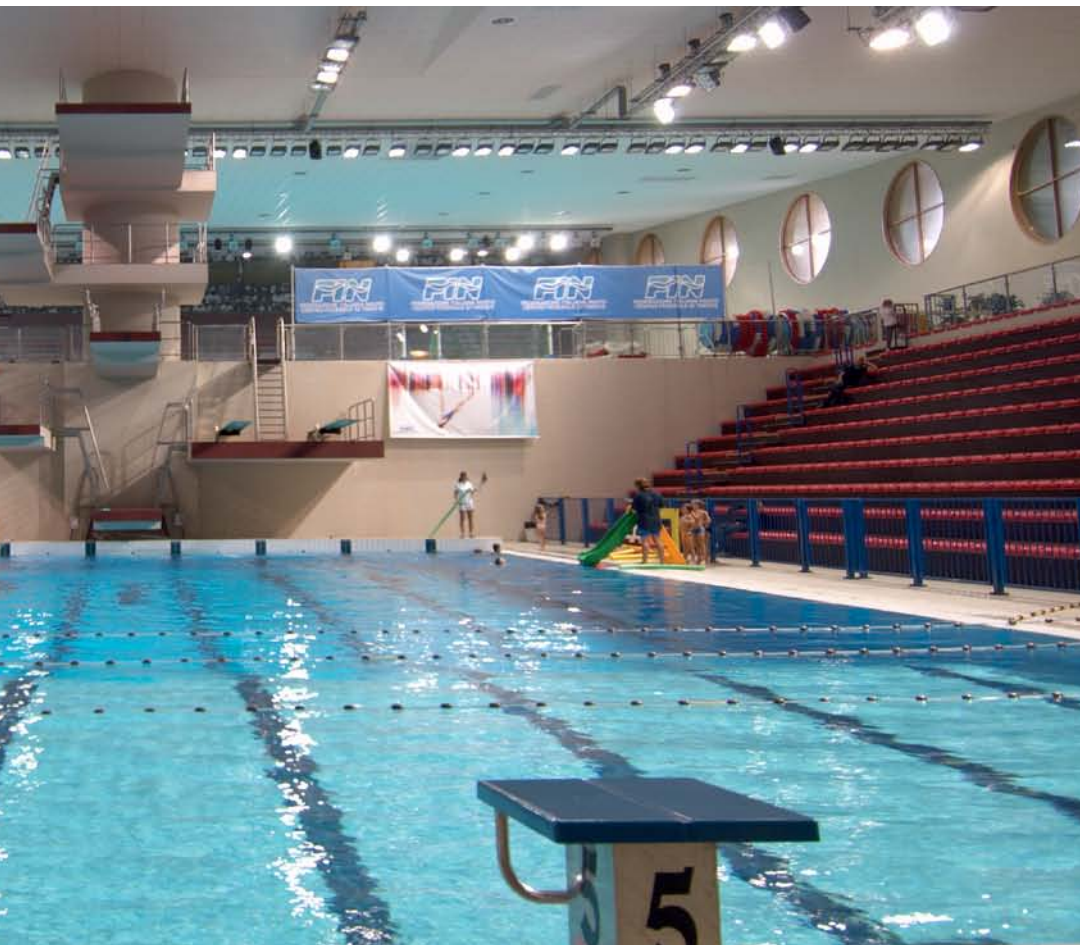
▲ **Boras Arena**
Sweden
Products used: Mundial

▶ **Trieste Swimming Pool**
Trieste, Italy
Products used: Mundial



▶ **Boson Leisure Centre**
Boson, Sweden
Products used: Titus Sport





▲ **Wildkogel Ski Arena**
Vienna, Austria
Products used: Contrast R and Sonpak

▼ **Stavanger Sports Centre**
Stavanger, Norway
Products used: Titus Sport



◀ **Tower Links Golf Course**
Ras Al Khaimah, UAE
Products used: Mundial

Thorn Lighting Main Offices

Thorn Academy of Light

Durhamgate, Spennymoor
County Durham DL16 6HL, UK
Tel: (44) 1388 420 042
E-mail: academy@thornlighting.com
Website: www.thornacademyoflight.com

Australia

Thorn Lighting Pty Limited
43 Newton Road, Wetherill Park
NSW 2164
Tel: (02) 8786 6000
Fax: (02) 9612 2700
E-mail: infoaustralia@thornlighting.com
Website: www.thornlighting.com.au

Austria

Thorn Licht GmbH
Donau-City-Straße 1,
1220 Wien, Austria
Tel: (43) 1 202 66 11
Fax: (43) 1 202 66 11 82712
E-mail: office.at@thornlighting.com
Website: www.thornlighting.at

Benelux

Rijksweg 47 A
Industriezone Puurs Nr. 442
BE- 2870 Puurs, Belgium
Phone: +32 (0)3 860 16 60
Fax: +32 (0)3 860 16 69
e-mail: infobe@thornlighting.com
infonl@thornlighting.com
infolu@thornlighting.com

China

Thorn Lighting (Guangzhou) Limited
No. 12 Lianyun Road, Eastern Section, GETDO
Guangzhou 510530 P.R.China
Tel: (86) 20 3228 2706
Fax: (86) 20 3228 1777
E-mail: sales.cn@thornlighting.com

Thorn Lighting (Tianjin) Co. Ltd
332 Hongqi Road, Tianjin 300190, China
Tel: (86) 22 8369 2303
Fax: (86) 22 8369 2302
E-mail: info.tj@thornlighting.com

Croatia

Dravska 17
HR- 42000 Varazdin
Tel: +385 42 290 471
+385 42 290 474
Fax: +385 42 290 470
E-mail: officehr@thornlighting.com
Website: www.thornlighting.com.hr

Czech Republic

Thorn Lighting CS spol. s r.o.,
Pekařská 621/7, 155 00 Praha 5
Czech Republic
Tel: (420) 224 315 252
Fax: (420) 233 326 313
E-mail: thorn.cz@thornlighting.com
Website: www.thornlighting.cz

Denmark

Thorn Lighting A/S
Stamholmen 155, 5. sal,
2650 Hvidovre, Denmark
Tel: (45) 76 96 36 00
Fax: (45) 76 96 36 01
E-mail: info.dk@thornlighting.com
Website: www.thornlighting.dk

France

Thorn Europhane SA
156 Boulevard Haussmann,
Cedex 08, Paris 75379, France
Tel: (33) 1 49 53 6262
Fax: (33) 1 49 53 6240
Website: www.thornlighting.fr

Hong Kong

Thorn Lighting (Hong Kong) Limited
Unit 4301, Level 43, Tower 1,
Metroplaza, 223 Hing Fong Road,
Kwai Chung, N.T., Hong Kong
Tel: (852) 2578 4303
Fax: (852) 2887 0247
E-mail: info.hk@thornlighting.com

India

Thorn Lighting India Pvt. Ltd.
Unit No. 404, Western Edge-1
4th Floor, Located at CTS 163A/165
W.E Highway, Borivali (E)
Mumbai - 400 066, India
Board line: +91-22-40481900
Fax: +91-22-40481900
E-mail: international_sales@thornlighting.com
Website: www.thornlighting.in

International Sales

Thorn Europhane SA
156 Boulevard Haussmann
Cedex 08, Paris 75379, France
Tel: (33) 1 49 53 6262
Fax: (33) 1 49 53 6270
Email: international_sales@thornlighting.com
Website: www.thornlighting.com

Ireland

Thorn Lighting (Ireland) Limited
Century House
Harolds Cross Road
Dublin 6W
Tel: (353) 1 4922 877
Fax: (353) 1 4922 724
E-mail: dublinsales@thornlighting.com
Website: www.thornlighting.co.uk

Italy

Thorn Europhane Spa
Via G Di Vittorio, 2, Cadrano di Granarolo,
Bologna 40057, Italy
Tel: (39) 051 763391
Fax: (39) 051 763088
E-mail: info@thornlighting.it
Website: www.thornlighting.it

New Zealand

Thorn Lighting (NZ) Ltd
399 Rosebank Road, Avondale,
Auckland 1026
PO Box 71134, Rosebank,
Auckland 1348
Tel: (64) 9 828 7155
Fax: (64) 9 828 7591
E-mail: info.NZ@thornlighting.com
Website: www.thornlighting.co.nz

Norway

Thorn Lighting AS
Strømsveien 344, 1081 Oslo,
Norway
Tel: (47) 22 82 07 00
Fax: (47) 22 82 07 01
E-mail: info.no@thornlighting.com
Website: www.thornlighting.no

Poland

Thorn Lighting Polska Sp.z.o.o.,
Ul. Gazowa 26A, Wrocław 50-513,
Poland
Tel: (48) 71 7833 740
Fax: (48) 71 3366 029
E-mail: thorn.pl@thornlighting.com
Website: www.thornlighting.pl

Russia

Thorn Lighting
Novoslobodskaya Str., 21, office 406
Business Center "Novoslobodskaya 21",
Moscow 127030, Russia
Tel: (7) 495 981 35 41
Fax: (7) 495 981 35 42
E-mail: office.moscow@thornlighting.com
Website: www.thornlighting.ru

Singapore

Thorn Lighting (Singapore) Pte Ltd
5 Kaki Bukit Crescent, 04-02 Koyotech
Building, 416238 Singapore
Tel: (65) 6844 5800
Fax: (65) 6745 7707
E-mail: info.sg@thornlighting.com

Slovenia

Thorn Lighting
Dunajska cesta 159
Ljubljana, SI- 1000
Tel: +386 31 388 965
Fax: +386 1 56 09 865
E-mail: office.si@thornlighting.com
Website: www.thornlighting.si

Sweden

Thorn Lighting AB
Industrigratan, Box 305, SE-261 23
Landskrona, Sweden
Tel: (46) 418 520 00
Fax: (46) 418 265 74
E-mail: info.se@thornlighting.com
Website: www.thornlighting.se

United Arab Emirates

Thorn Lighting Ltd Dubai
Al Shoala Building, Office 301,
Block E, Airport road, P.O. Box 22672,
Deira, Dubai, UAE
Tel: +971 (0) 4 294 8938
Fax: +971 (0) 4 294 8838
E-mail: marketing.mena@thornlighting.com
Website: www.thornlighting.com

United Kingdom

Thorn Lighting Ltd
Durhamgate, Spennymoor,
County Durham, DL16 6HL
Tel: +44 (0) 1388 42 00 42
Fax: +44 (0) 1388 42 01 56
Email: brochures.uk@thornlighting.com
Website: www.thornlighting.co.uk

www.thornlighting.com

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