lighting for education

HOW BETTER LIT ENVIRONMENTS AID ACHIEVEMENT

1 education lighting

education lighting

The importance of the role that lighting has to play in the health and welfare of our children cannot be underestimated. Nowhere is this more apparent than in the school environment, where lighting can have a direct and dramatic effect on educational achievement. Lighting can stimulate and energise the learning process by providing not just an attractive environment, but also by actively motivating the student.

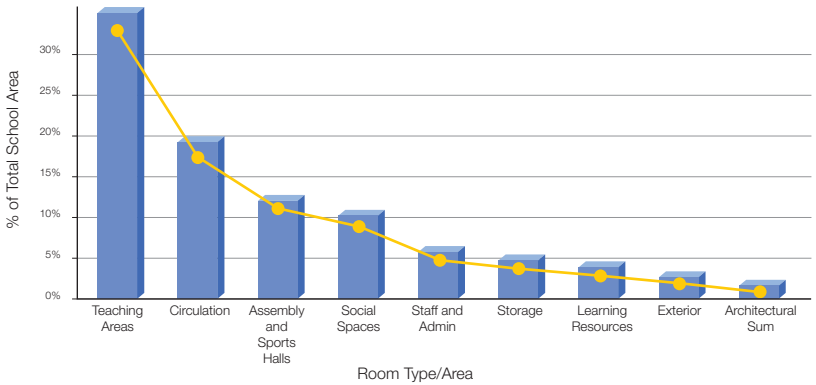
Whilst the most important lit area is the classroom, a holistic approach must be taken to the lighting of any educational establishment. Lighting has a key part to play in the architectural appearance of a building, and in schools, social spaces such as canteens and corridors play a key part in the overall development of students. In all of these areas, the balance between natural daylight and artificial illumination is critical to the success of the scheme.

Understanding the specific needs of any space is crucial to designing the best possible lighting. At Whitecroft we have taken the time to study the requirements of all areas of educational lighting, and have developed solutions specific to these needs. Over the following pages we will explore the different problems facing lighting designers and offer solutions to these for all key areas of education building design.

commercial understanding

Through experience we can now offer accurate financial models for Education projects which will allow you to set budgets and make product selection at the earliest opportunity.

This helps to focus resources and dramatically reduce the design time and associated costs.

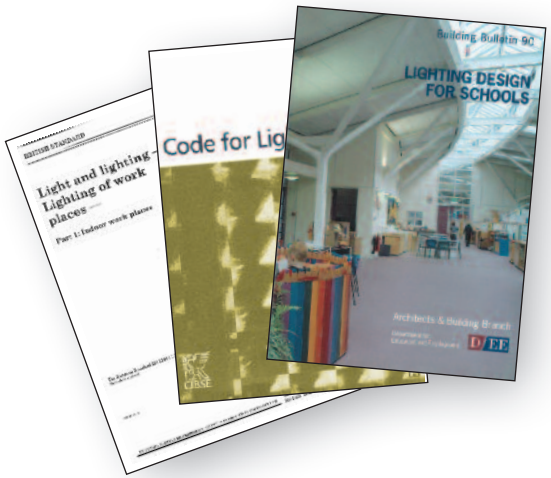


setting standards

There are a number of published documents which set the standards and framework by which we design lighting schemes for schools and colleges, but these standards only serve as a base from which we build. Light & Lighting – Lighting for work places (EN12464-1:2002) gives guidance as to illuminance levels and glare control, but this only defines the quantity of light required, not the quality. CIBSE Interior Code and Building Bulletin 90 (DfEE) goes some way to define how to achieve the quality of light required, but you must understand all of these standards and be able to interpret them correctly and cohesively to produce the best possible lighting solutions.

The Building Schools for the Future (BSF) programme has raised the standard of school design and amongst its stated objectives are to provide:

- "Attractive learning environments that teachers want to teach in and pupils want to learn in"
- "Spaces which feel like the world outside"
- "21st century schools – environments which will inspire learning for decades to come"



contents

weblinks

Throughout this brochure you will find weblink codes for each product. To access the online product information simply enter the code into the weblink box on any page of our web site - **www.whitecroftlighting.com** - and you will go directly to that product. From there you will be able to access the most up to date product specifications and downloadable datasheets.

3 classroom needs & challenges

goal blocking

One of the primary objectives in education lighting design is the avoidance of 'Goal Blocking'. Students require the right learning environment in which to flourish, and the lit appearance of a classroom can have a dramatic effect on educational outcomes. Studies have shown that good lighting aids the subconscious processes that energise learning. Without this the learning ability of even the most motivated student will be restricted.

An effective lighting scheme must reduce excessive contrast, deliver a friendly, natural environment and avoid distractions.

We deliver this by considering the illumination of ALL room surfaces, creating a motivating ambience while optimising Teaching Surface Illumination (TSI).

understanding the needs of the classroom

Whilst classroom sizes vary, a typical space will be around 55m^2. This is considerably smaller than most offices and as such needs to be treated differently. Daylight plays a much more important role in classroom illumination and lighting designs must take account of this. Luminaires designed for office applications are often unsuitable for these smaller areas and although a broadly similar illuminance level is sought in both cases, the design objectives differ greatly between the office and classroom.

For example, in an office environment users occupy the space for far greater periods of time and whilst lighting guides such as LG3 and LG7 are to be commended, cut-off angles and luminance limits are of less importance in the classroom.

inspirational teaching spaces

Create a Positive Effect

- Exceed required task illuminance
- Create vibrant interiors to stimulate and motivate
- Provide contrast balance to stimulate subconscious space perception

Provide Sustainability

- Conserve energy by selecting efficient luminaires
- Use lamps with greater efficacy
- Utilise daylight harvesting within a controls package to meet the occupancy pattern

Provide Functionality

- Provide local control to support modern teaching techniques
- Uncomplicated controls aid teaching staff with student focus and discipline
- Understand the occupancy regime and future flexibility to provide the best solutions

Provide Visual Stimulus

- Direct light on to teaching surfaces (all available wall space)
- Provide controlled brightness with luminaire selection
- Create contrast balance on vertical surfaces

Create a Comforting Ambience

- Provide superior modelling with Direct/Indirect or Bi-Directional luminaires
- Select luminaires that emit light at high angles to reduce oppressive 'cave effect'
- Try to reduce 'institutional' perception with a balance of lighting techniques and luminaire selection

the principle of lighting teaching surfaces

It is important to understand the way in which teacher and pupils interact when designing lighting schemes for classrooms. Education is not a 2-dimensional activity and even illumination must be given to all teaching surfaces, namely walls, white boards and desk surfaces alike.

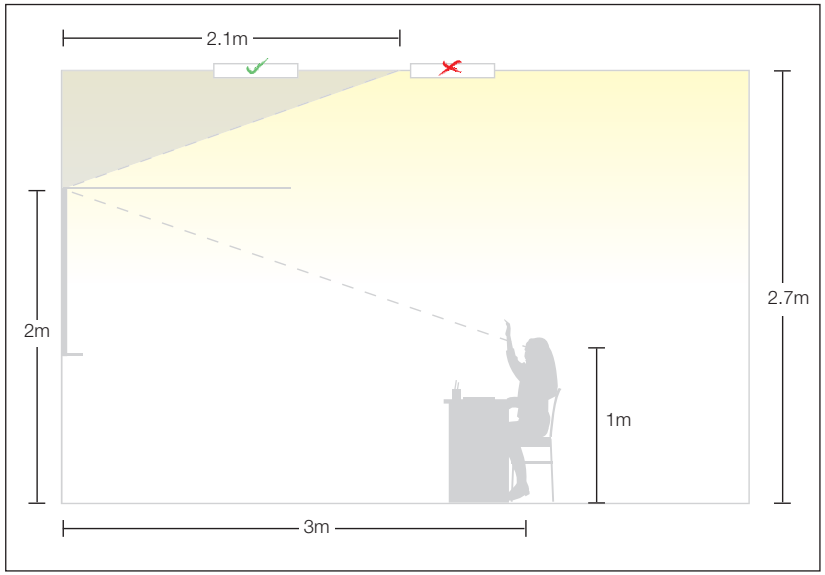
Traditional office luminaires deliver desk level illumination but are not designed to illuminate a vertical surface. As classroom walls are functional task areas, both the quantity and quality of light are important and add to both the functionality and ambience of the space.

5 classroom needs & challenges

whiteboards and projection equipment

The increasing use of highly reflective whiteboards and projection equipment as teaching aids pose a particular challenge for the lighting designer. Sharp changes in illuminance across the surface must be avoided, along with specular reflection.

Lower levels of illumination are required when using modern projection equipment. This is best achieved through the use of electronic lighting controls to avoid the necessity for supplementary lighting.



Chalkboard luminaires should be situated in the shaded area to avoid reflective glare to the nearest viewer.

en12464 lighting levels for classrooms

	illuminance level	unified glare rating
Classrooms, Tutorial Rooms	**300 lux**	**19**
Art / Technology Rooms	**500 lux**	**19**
Adult Education Rooms	**500 lux**	**19**

open classroom

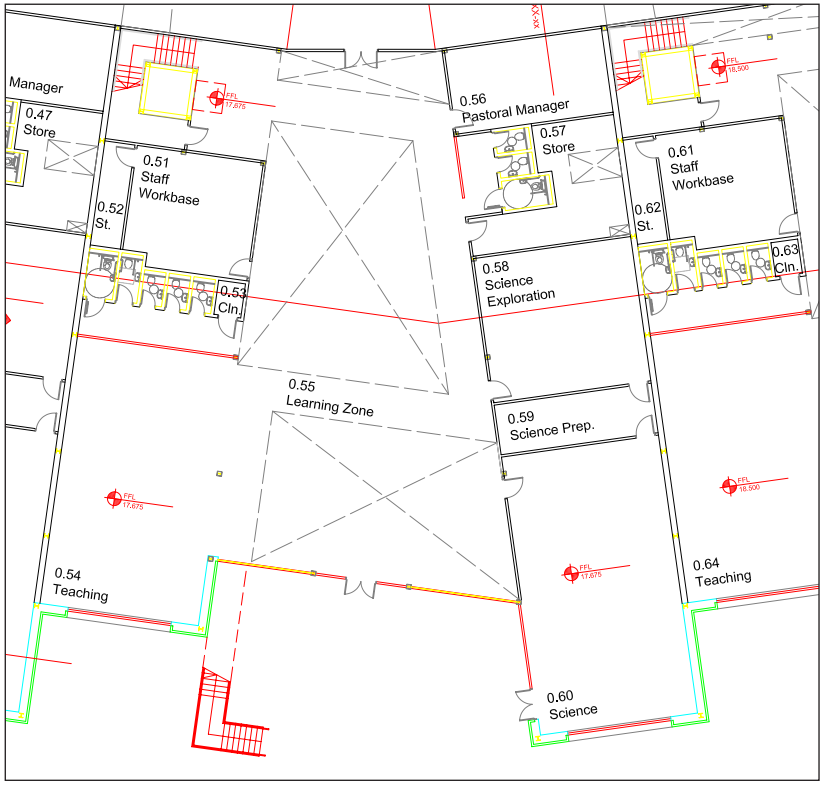
The trend towards open plan teaching spaces is aimed at providing bright, spacious and futuristic environments where students are encouraged to communicate, moving away from traditional designs.

This provides a challenge to the design team where the requirement is to provide a lighting solution which meets the demands for informal seating arrangements with the flexibility to meet the changing dynamics of future teaching needs and occupancy patterns.

Lighting controls can assist in providing the flexibility to deliver the correct lighting level for the varying teaching requirements, together with energy saving capabilities through absence/presence detection and daylight linked saving.

Surveys of both teachers and students in these spaces identify lighting and glare in particular as cause for concern, along with the noise transfer from adjacent teaching sessions.

Providing luminaires that combine controlled luminance while maintaining visual stimulus and acoustic attenuation where it is most effective will help to eliminate concerns.



Typical open classroom layout

emergency lighting

The requirement for emergency lighting (escape) is open to varying interpretations.

For teaching spaces greater than 60m², escape lighting should be provided in accordance with BS 5266, which requires provision for a minimum of 0.5 lux average.

In rooms less than 60m², there is some leeway for interpretation. Our general recommendation for best practise is to provide compliance to BS 5226 paying particular attention to the escape route for luminaire location. Where necessary, the interpretation of the local Building Control Officer can provide clarity.

7 ceiling choices

ceiling choices

The type of ceiling in a classroom is the first driver in the choice of lighting solution, ceilings can either be suspended or exposed soffit. Often the decision on how to heat and cool the space determines the ceiling detail, it is then the lighting designers challenge to create the best lighting solution for the space, maximising ceiling and wall illumination.

the advantages of exposed soffit

- An environment with a modern aesthetic can be created
- Higher ceilings enable the use of direct/indirect luminaires creating a brighter ceiling and teaching surfaces
- On site programs can be compressed as more off site pre-fabrication can be employed through the integration of services
- Efficient heating and cooling techniques can be employed to deliver better overall building energy performance

the advantages of suspended ceilings

- All services are concealed behind ceiling simplifying the design process
- The design has a neutral aesthetic
- The ‘soft’ ceiling surface means no separate acoustic treatment required
- Lowest initial cost
- Ceiling and lighting can be re-configured to adapt to changing needs

exposed soffit ceilings

When it has been decided to expose the soffit in a classroom, there are many options available to the lighting designer. The aims for the lit environment are exactly the same as with a suspended ceiling, illuminance of teaching surfaces and creating an environment that will energise learning are always the key objectives.

An exposed soffit enables the use of indirect/direct suspended luminaries, these can more effectively light the ceiling and upper walls. The increased ceiling height usually brings extra daylight into the classroom, which can further improve the quality of the environment whilst also bringing energy savings if intelligent lighting controls are used.

There are drawbacks however, the lack of a suspended ceiling means that room surfaces need to be treated to deliver the required acoustic performance and when suspended luminaires are employed, the design process can be complicated by the desire to integrate other services such as supply cabling, smoke detectors, lighting controls and presence detectors.

building performance

Modern building designers are challenged to create structures that have a style that will stand the test of time and maximise the use of natural resources to lower the burden on the environment. To deliver the optimum life cycle cost for a building the maximisation of two natural resources are necessary:

a. The obvious one is daylight. By removing the suspended ceiling, we can have larger floor to ceiling heights and taller windows. Better daylight penetration creates a better quality of illumination as well as energy savings.

b. The other natural resource is that of natural ventilation, using the building structure as a ‘cool’ radiator can assist in creating the correct temperatures through out the day, using a natural flow of air to flow through the building can help meet the air quality requirements for schools.

9 foil - combining excellent acoustics with flexible serv

balancing light, heat and sound in classroom design

With the growing demand for public sector organisations to reduce their carbon footprint, the design of school buildings and classrooms has entered a more challenging era.

The overriding aim is to create the most comfortable and effective teaching and learning conditions possible, but with the additional emphasis on achieving environmental and economic objectives.

Current best practice in building design is to utilise the natural cooling properties of the building to deliver the lowest through-life cost. The removal of a suspended ceiling challenges the designers of building services to meet both the technical and aesthetic demands of the modern building.

Foil has been developed in response to these challenges, creating a revolutionary lighting system that incorporates excellent acoustic features and allows full integration of other classroom services.

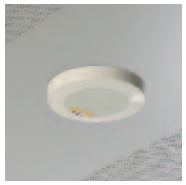
Foil's slimline rafts create a visual plane below the ceiling line, removing clutter associated with exposed soffits.

elegant, cost-effective suspended raft lighting

Foil combines all the best features of good lighting and acoustics, while allowing other classroom services to be incorporated into its aesthetic design.

Each unit incorporates a luminaire with perforated side panels containing special sound absorbing materials. Foil allows easy integration of other services, creating a more appealing ambience with an uncluttered ceiling. Three segregated cable ways incorporate luminaire control, data and power services. Luminaire infill panels can be modified to accommodate items such as speakers, smoke detectors, fire alarms, sprinkler heads and radiant heating panels.

Exposed soffits raise practical considerations other than the need to combine good acoustics with effective lighting. Classroom services previously installed behind suspended ceilings need to be concealed by other means. At the same time, simplified design and installation is essential to reducing building time and cost.



Lighting controls

Public address

Smoke detection

Sprinkler heads

fully compliant with DfES BB 93

With a suspended ceiling the large area of soft fibre tiles provide the acoustic requirement for learning spaces. When an exposed soffit is employed, a specific solution is required to address the acoustic reverberation standard as more hard surfaces are exposed.

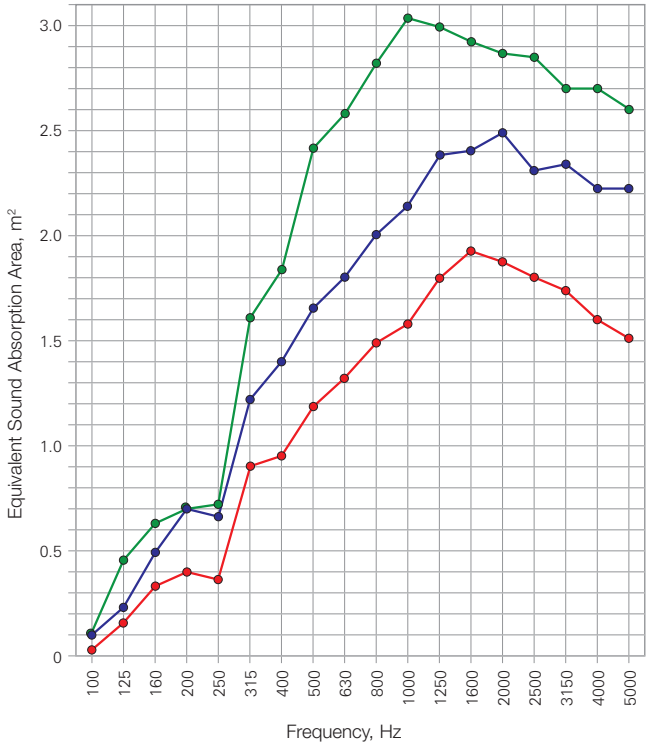
DfES Building Bulletin 93 clearly defines the acoustic performance for learning spaces. Currently most installations would include wall cladding coverings with acoustically absorptive properties to meet the requirement.

Foil has been designed with integrated panels filled with anechoic material to reduce reverberation and to actually fully meet all the requirements of BB93 in many cases.

Acoustic wall cladding panels can be time consuming and costly to install. With acoustic material integrated into Foil, significant savings can be made in both build programme and material cost.

The inclusion of acoustic material in the luminaire minimises the likelihood of acoustic cladding panels being rendered ineffective by being used as a teaching surface.

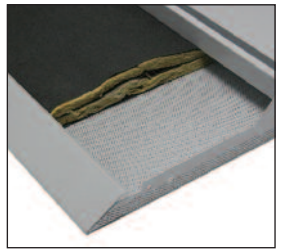
Equivalent Sound Absorption Area



800mm wide Foil with 48mm layer of Compressed Fibre acoustic material

800mm wide Foil with 30mm layer of Compressed Fibre acoustic material

600mm wide Foil with 30mm layer of Compressed Fibre acoustic material



Product Guide

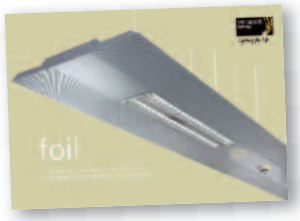
> weblink > FOIL

Foil

- Integrated solution
- Futuristic design
- Acoustic control

Lamp options:
2 x 21/28/39/54W T5

Further Information



For more information on Foil please refer to our Foil brochure or contact our technical department

11 orias - flexibility, style and value

Product Guide

> weblink > **ORIAS**

Orias

- Slim depth, aluminium body
- Continuously mounted
- Surface or suspended

Lamp options:
Single or Twin x 28/35/49 or 54W T5. 80W T5 available as single only

Further Information

For more information on Orias please refer to our Orias brochure or contact our technical department

stand alone suspended classroom lighting

Orias has been developed to meet the demanding needs of today's flexible learning spaces. It combines style with efficiency to provide a range of luminaires able to enhance both the visual and lit appearance of any environment.

The key to Orias's visual attraction is its distinctive profile. This elegant shape not only adds visual interest from any viewing angle, but creates an extremely narrow plane for the luminaire. Orias combines this striking design with class leading efficiency across a range of lamp and optic options to allow the designer to meet tomorrow's energy requirements without compromising appearance.

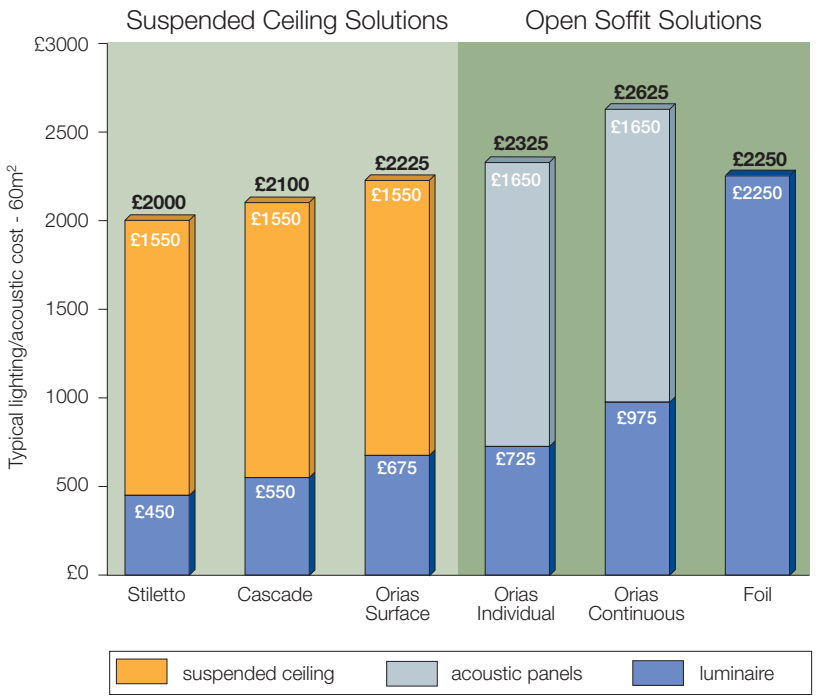
To add to the range of optical systems, Orias can be mounted in a variety of positions to create different visual effects with a continuous design theme. Suspended, surface and close mounting options are available, with Orias used in a single or continuous configuration.

For complete architectural integration Orias is available in a choice of Silver or White surface finishes.

the benefit of integrated lighting, acoustics and services for the classroom

With the growing demand for public sector organisations to reduce their carbon footprint and provide more inspirational learning environments, the design of school buildings has entered a more challenging era.

Classroom services previously installed behind suspended ceilings need to be concealed by other means. At the same time, simplified design and installation is essential to reducing building time and cost.



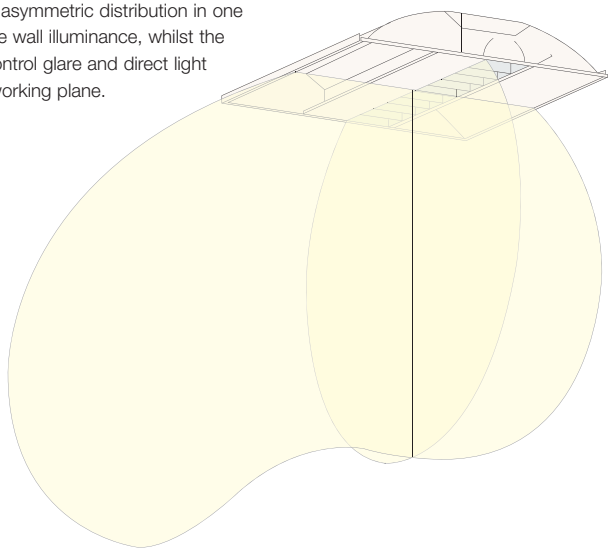
13 classroom lighting for suspended ceilings

teaching surface illuminance

Having established the issues surrounding the lighting of classroom spaces, studies showed that standard office luminaires did not perform well in this environment. A luminaire that could effectively light not only the horizontal working plane but also the vertical teaching surfaces and inject a feeling of space into the classroom was required. In a standard classroom lighting layout, 9 luminaires would be used, 8 of which would be adjacent to the wall surfaces or windows.

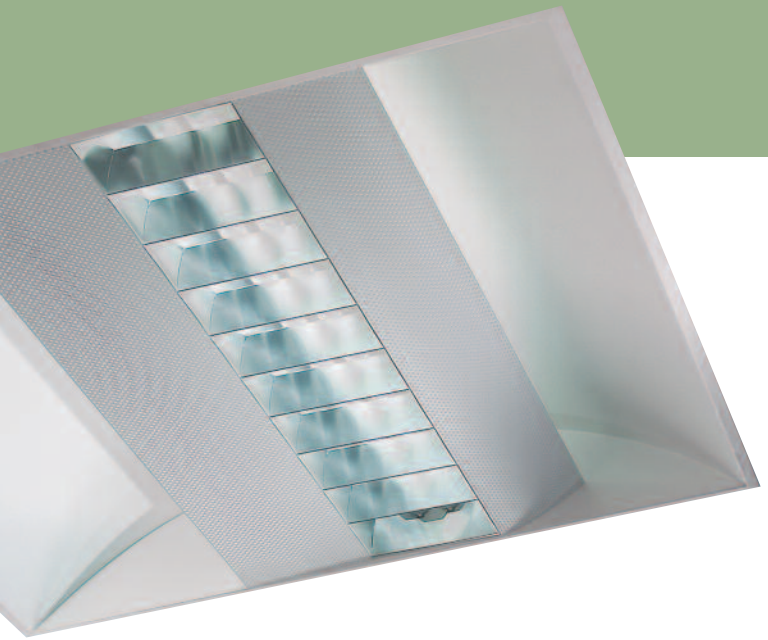
Whitecroft developed Cascade TSI (Teaching Surface Illuminance) specifically to address the problem of lighting the teaching surfaces of a classroom without the need for supplementary wall washers. Cascade TSI combines high optical performance with innovative design and not only delivers the best lit environment but also reduces energy consumption and installation costs. Cascade TSI used in conjunction with a standard Cascade luminaire provides the best possible recessed lighting solution for the classroom.

Cascade TSI has an asymmetric distribution in one quadrant to maximise wall illuminance, whilst the other 3 quadrants control glare and direct light onto the horizontal working plane.



Further Information

For more information on Cascade TSI please refer to our Cascade TSI brochure or contact our technical department



the cascade tsi solution

In a standard classroom configuration 9 luminaires can be used to effectively light the space. By using Cascade TSI illumination of the teaching surfaces can be achieved without compromising the quality of light on the horizontal plane. This tried and tested solution is fast and easy to install giving both a low installed and life cycle cost as supplementary lighting is not required.

The addition of plug and play controls can further reduce both installation time and life cycle costs, whilst bringing greater flexibility to the space.

Cascade TSI used in conjunction with standard Cascade in a 9 luminaire typical classroom arrangement.

classroom comparative lighting levels

Typical 300 lux Classroom	3x14W T5	Cascade TSI
Average Side Wall Illuminance	**27%**	**59%**
Average End Wall Illuminance	**30%**	**48%**

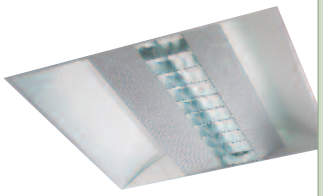
Cascade TSI puts almost twice as much light onto the walls of a classroom with a superior degree of uniformity than that of a typical symmetrical distribution luminaire.

Typical 3x14W T5

Cascade TSI 4x14W T5

Product Guide

› weblink › **CTSI**



Cascade TSI

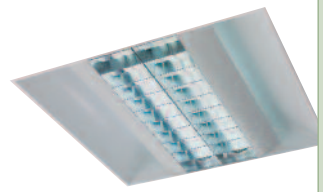
- Louvered and coffered optic
- Asymmetric distribution
- High frequency gear

Lamp options:

4 x 14W T5 - 300 lux solution
2 x 40W TCL - 500 lux solution

Product Guide

› weblink › **CSD**



Cascade

- Matching louvered optic
- Symmetrical distribution
- High frequency gear

Lamp options:

4 x 14W T5 - 300 lux solution
2 x 40W TCL - 500 lux solution

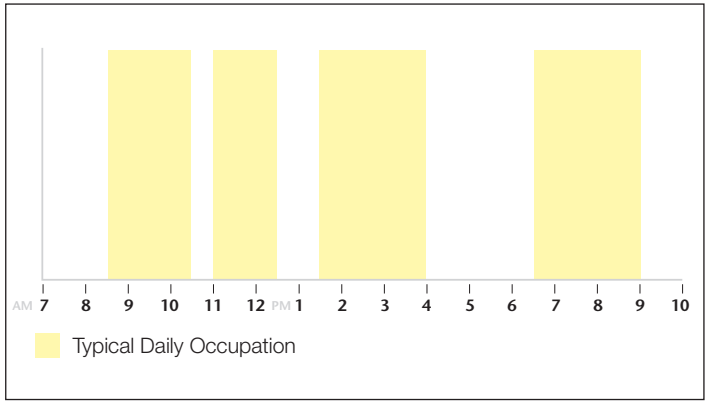
15 reducing carbon footprint

meeting the demands of the classroom

Energy conservation is a key issue within the education establishment. New schools need to be 'greener' in their design and use. With classrooms only being actively used for around 6 hours per day, there is great scope for reducing energy consumption. Command Fast Link can deliver much more than financial benefits. Different lighting levels and configurations can be programmed for different uses such as group working, presentation or adult education. With Command FastLink wiring systems, ceilings can be quickly and easily re-configured to cope with the changing demands placed on the space.

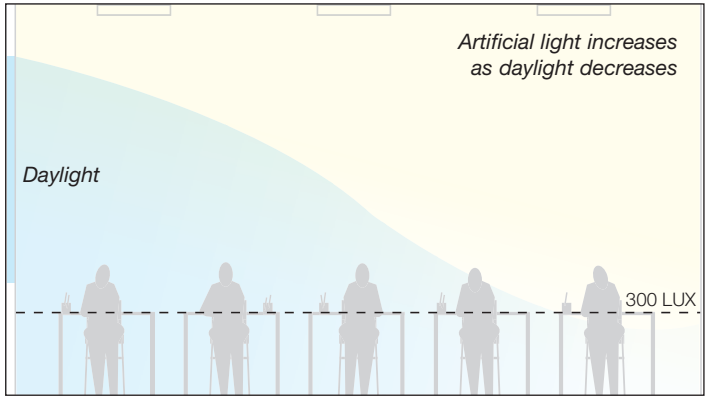
occupation patterns

A school differs from most other applications in that it has unusually large periods without occupation. A school is unoccupied for 13 weeks per year and in general each classroom will only be used for around 6 hours each day. This means that typically annual classroom usage is only 1,200 hours, less than half of that of the average office. If lighting is left on all day this means that approaching 50% of annual energy usage is wasted.



daylight penetration

A typical modern classroom will have a great deal of natural daylight, and this must be taken into account when designing the lighting scheme. Command Fast Link can sense the amount of daylight in a classroom and dim the artificial lighting accordingly, so that only the amount of lighting and energy actually needed is used. From February to October lighting is not required at all for significant parts of the normal school day.

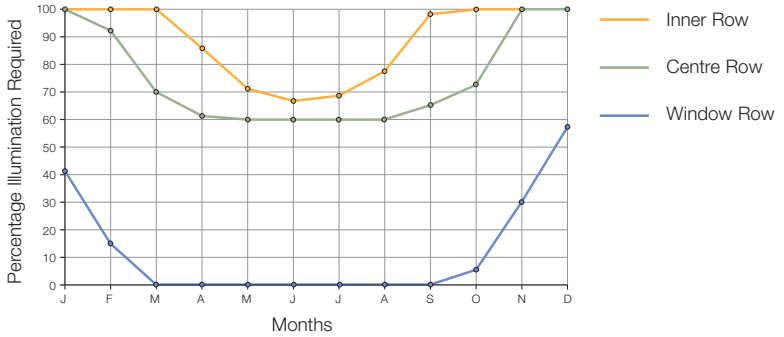


energy saving controls

To illustrate the potential for energy saving using daylight linked dimming, we can model a typical 60m² classroom and consider the penetration of natural light as a percentage of the required illuminance across the space.

If we assume 3 rows of lighting, each row comprising of 3 zones typically window row, centre row and inner row, we can assess the benefit from investing in dimming capability in each zone.

The graph opposite illustrates the amount of illumination required at each row of luminaires on a monthly basis. The table below details the energy use and savings that can be made by investing in this technology.



	Installed load (KW)	running hours	annual energy use (KWh)	Annual energy saving (KWh)
No Controls	**0.558**	**1800**	**1004**	**0**
Detection	**0.558**	**1200**	**670**	**334**
Detection/Window Dimming	**0.558**	**1200**	**486**	**518**
Detection/All Dimming	**0.558**	**1200**	**323**	**681**

based on a classroom with 9, 4 X 14W (62 circuit watts recessed luminaires)

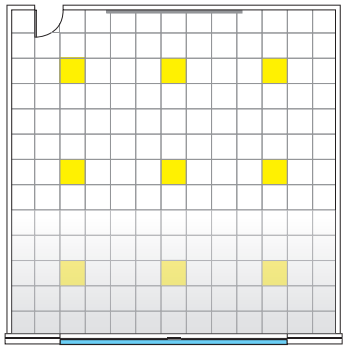
17 keeping installation simple

typical classroom configurations

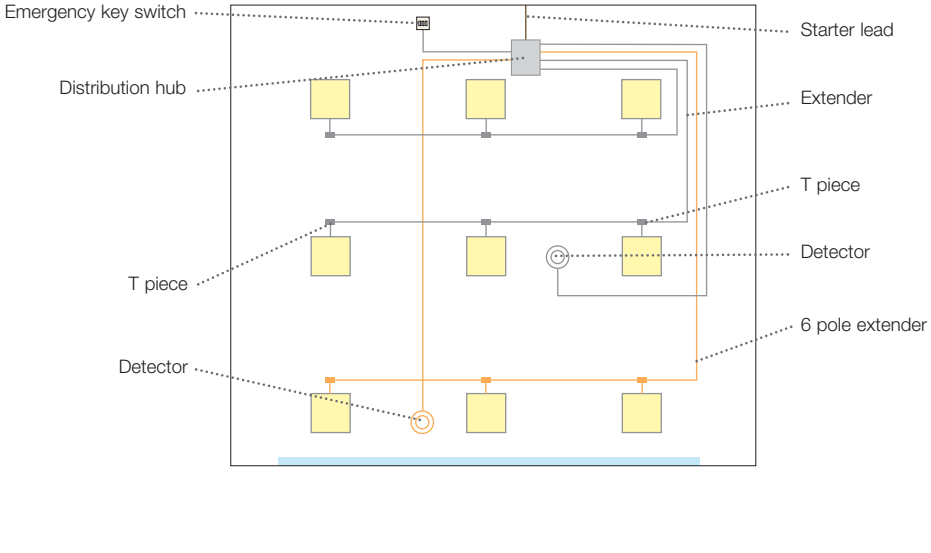
With Command Fast Link from Whitecroft Lighting, installation of any lighting scheme is significantly simplified. As a lighting scheme is designed, connectivity can be pre-planned and a complete package of luminaires, controls and wiring ready to install is delivered to site. Not only does this reduce installation time, but eliminates both costly down time and the risk associated with traditional multi-party specifications. These systems are factory tested and guaranteed to be fault free.

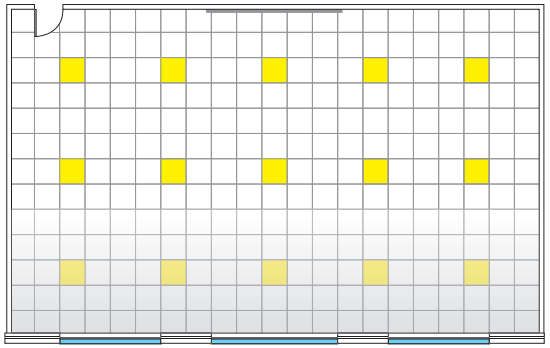
Command Fast Link brings savings to any installation. Whilst material costs increase, on-site labour cost is significantly reduced which can result in an overall saving of around 20%.

These examples demonstrate how a typical classroom can be simply wired and configured using Command Fast Link, with both 4 pole switching and 6 pole dimming applications. These can be used with or without a distribution module and offer maximum energy efficiency with minimum installation costs.

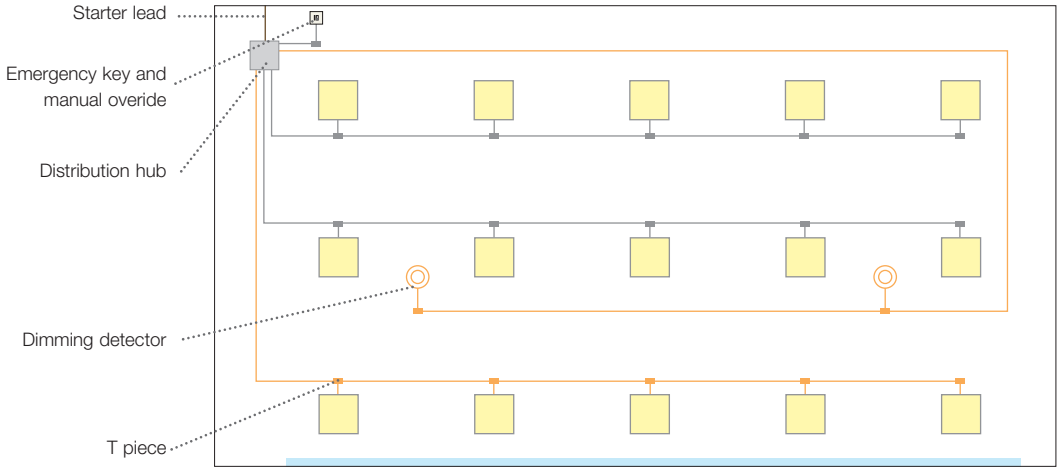


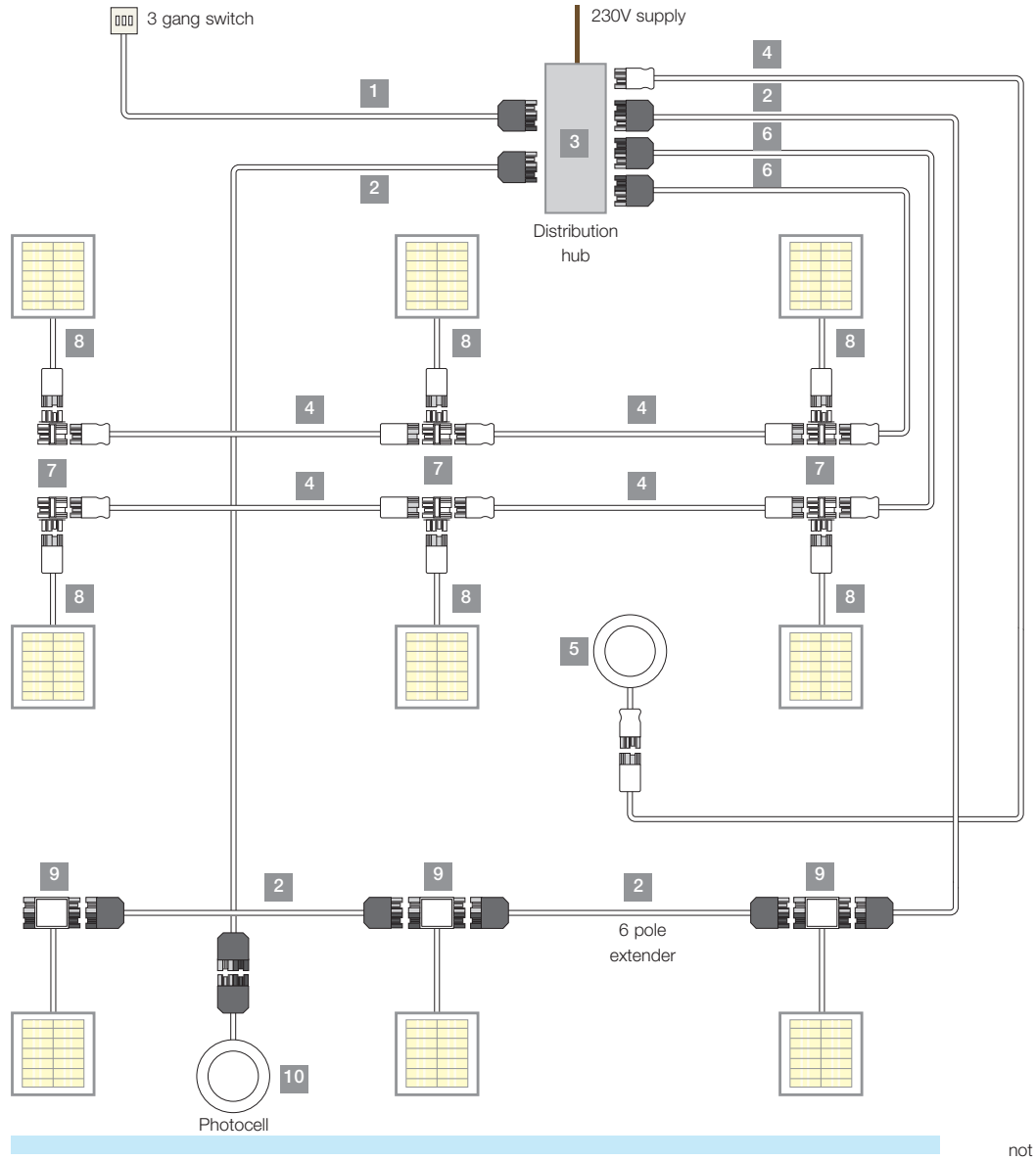
standard classroom window row dimming + detection + manual 3 gang latching





large classroom window row dimming + detection + manual overide





component layout for standard classroom configuration

number	description
1	Switch Lead
2	6 Pole Extender
3	Hub
4	4 Pole Extender
5	Detector Module
6	Converter
7	T piece
8	Flying Lead
9	T Piece complete with lead
10	Photocell

Further Information

For more information on Command Fast Link Wiring and Controls please refer to our Command Fast Link Wiring and Controls brochure or contact our technical department

19 circulation areas

circulation areas

The circulation routes through a school are the main arteries taking pupils, staff and visitors to particular areas. Functionality is key and their primary purpose is to create safe and easy navigation around the school.

These spaces have a wider role to play in the social aspect of school life however, as they form the spine of any school and are social spaces in their own right.
These are areas where children develop their interpersonal skills and they also perform important display and communication tasks. Illumination of wall surfaces is as important here as it is in the classroom.

However, these areas are usually unsupervised and care must be taken to specify products that can withstand the inquisitive nature of children.

corridors

Where possible, daylight should be allowed into corridor spaces and artificial lighting should compliment this. The avoidance of glare, shadows and silhouettes is very important and the best way to avoid this is to mount luminaries to one side of the corridor rather than directly overhead. This also best simulates daylight conditions.

In an emergency, corridors form the main escape route from a school, so emergency lighting must be included in accordance with EN1838.

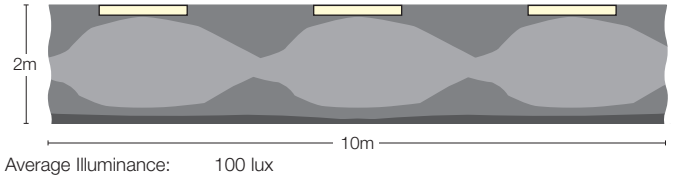
luminaire types

For the optimum corridor lighting solution, Whitecroft recommend Radial, a highly efficient 1x28W T5 luminaire suitable for offset mounting which achieves the 100 lux illuminance level. Radial has been designed to fit unobtrusively into the cornice of a corridor, and can be mounted continuously if required. A robust and versatile luminaire, Radial combines good optical performance with an aesthetic appearance.

Radial is available as an emergency version, to achieve the requirements of EN1838 every 2nd luminaire should be specified with an emergency pack.

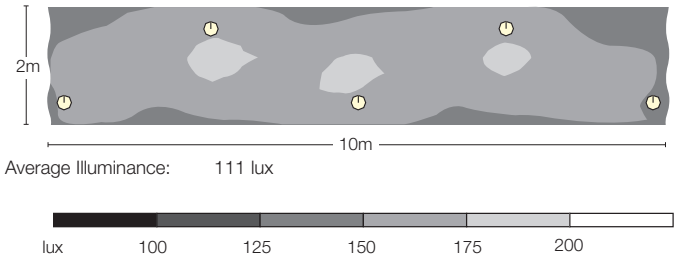
Downlighters can also be used in suspended ceilings to accent break out areas but in corridors more installed points are required to meet illuminance levels.

Radial light distribution - 1 x 28W T5



Average Illuminance: 100 lux

Mirage light distribution - 2 x 18W TC-L



Average Illuminance: 111 lux

stairwells

The main consideration when lighting stairwells is to provide contrast between treads and risers. Stairwells can be the most potentially hazardous area in a school and safety should be paramount. As these are high traffic areas, robust luminaries should be used to minimise damage and maintenance.

luminaire types

Stairwells are best lit with ceiling mounted luminaires. Whitecroft's Convor range offer flexibility and robust construction with excellent optical performance and use energy saving TC-D lamps.

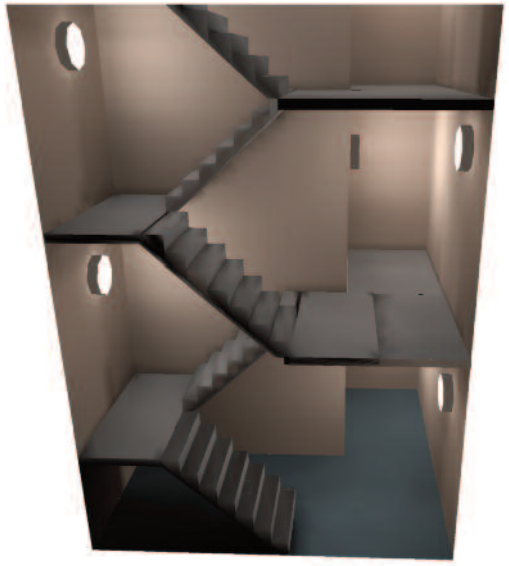
Radial can also be used in stairwells as well as corridors, and its high mounting position means that it is ideal for unsupervised areas.

emergency lighting

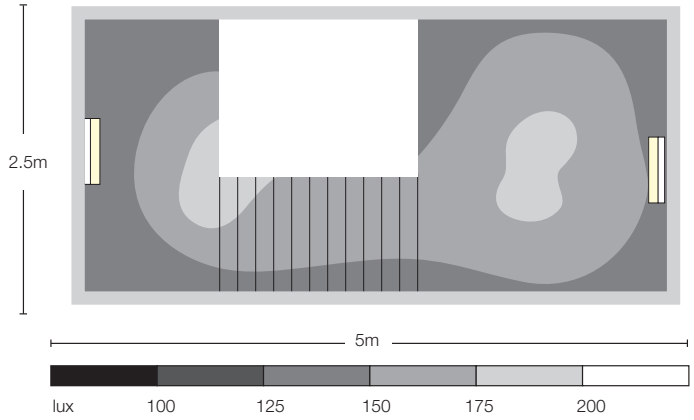
A minimum illumination level of 1 lux must be provided on the centre line of escape in all corridors. This cannot fall below 0.5 lux at the extremities of the corridor. On stairwells, a minimum of 1 lux must fall on the stair tread.

en12464 lighting levels for circulation areas

	illuminance level	unified glare rating
Corridors	**100 lux**	**25**
stairs	**150 lux**	**25**



Convor light distribution - 4x26W TC-D



Average Illuminance: 162 lux

Product Guide

> weblink > **RAD**

Radial

- MIRO 4 reflector
- Extruded aluminium body
- emergency version available

Lamp options:
Single 28/35/49 or 54W T5.

Product Guide

> weblink > **CONV**

Convor

- Satin Diffuser
- Steel Body
- Emergency version available

Lamp options:
4 x 26W TC-D
1 x 60W T5-C

21 sports hall lighting

sports hall lighting

Sport and exercise play a major part in our children's development, and sporting success instills pride in both students and the school. It is also one of the prime ways a school interacts with the wider community. These spaces are used both in inter-school competition and by both students and the public in extra-curricular activities. These multi-functional spaces need to be flexible enough to cope with a wide variety of sporting uses and the lighting must be adaptable, consistent and robust.

serve 6

Serve 6 has independent gear pods to reduce thermal transfer and allow a luminaire of only half the depth of many alternatives, reducing the risk of impact from projectiles. The 6 x 55W TC-L lamps are retained firmly at both ends with lockable lamp holders, and separate switching between 2, 4 and 6 lamps is available for variable illuminance levels and energy consumption.

Utilising fluorescent lamp solutions can provide energy saving benefits when combining absence detection and daylight linked saving due to the instant response characteristics in comparison to discharge lighting options.

design standards

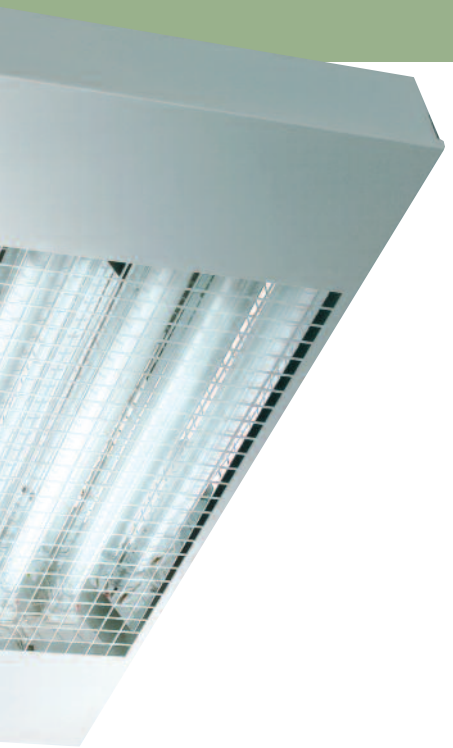
CIBSE LG4 sets the standards to which sports halls should be designed, both in terms of illuminance levels and glare factors. There are other factors that need to be considered in the design of sports hall lighting however, such as colour rendition and lamp flicker. Whilst most sports halls within schools do not have dedicated spectator areas, care must be given to viewing areas when considering lighting schemes.

competitive level	illuminance level
International and National	**500-750 lux**
Regional	**400-500 lux**
Local	**400-500 lux**
Training	**300 lux**
Leisure - Time and School Sports	**300 lux**

maintenance

With luminaires positioned high in the ceiling of sports halls to avoid trapping balls and shuttlecocks, maintenance is a key factor in choosing the right luminaire. Robust construction and wire guards will minimise projectile damage.

Good thermal management employed in this luminaire design will prolong the life of the electronic components improving the reliability and will ultimately deliver lowest life cycle costs.



light absorption and surface reflection

When designing a lighting scheme for any area, assumptions are made as to the relative reflectance of different surfaces. Typically these are 70% for ceilings, 50% for walls and 20% for floors. It is against these assumptions that illuminance levels are calculated. In sports halls, our experience has shown us that this is dramatically different. Ceilings tend to be cluttered with services and hanging points for equipment, reducing the reflectance value to 30%.

Walls tend to be darker and covered in apparatus, reducing the reflectance to 30%, whilst floors are highly varnished and reflect more than a carpeted area, again bringing a value of 30%. This knowledge means that between 10-15% extra lighting is required to illuminate a sports hall when compared to a similar area used for other purposes.

colour rendition

HID colour rendition

Fluorescent colour rendition

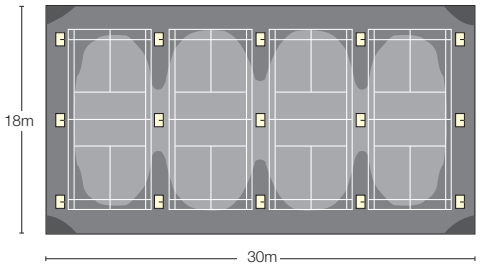
The primary purpose of any lighting scheme is to ensure clear recognition of fast moving objects, whatever the sport. The first priority is to ensure sufficient levels of illuminance. Whilst CIBSE recommend a minimum of 300 lux for most applications, we would recommend 500 lux as appropriate for most sporting activities.

Colour rendition is also an important factor and fluorescent lighting offers advantage above HID solutions.

visual distractions

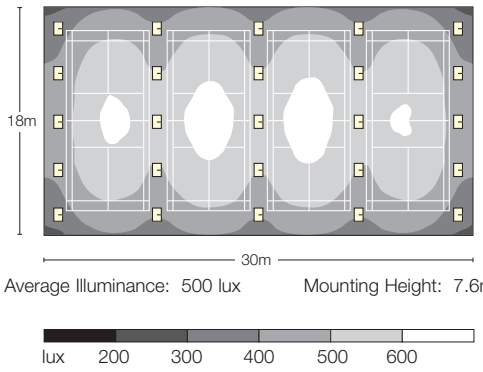
The avoidance of visual distraction is important in any sporting activity, and especially so in activities such as Badminton, where competitors have to pick out a fast moving object above head height. Disability glare must be avoided, fluorescent luminaires give little direct glare and have a much lower surface brightness than HID, so offer less contrast to dazzle a competitor. They should be positioned out of normal line of sight at the edges of courts to minimise any discomfort.

15 Luminaire configuration - Serve 6



Average Illuminance: 300 lux Mounting Height: 7.6m

25 Luminaire configuration - Serve 6



Average Illuminance: 500 lux Mounting Height: 7.6m

Product Guide

› weblink › **SRV6**

Serve 6

- Robust Construction
- Easy access to lamps & gear
- Separately switched 4/6 lamps

Lamp options:
6 x 55W TC-L

23 welcoming spaces

social spaces

Outside of the classroom, social spaces play an important part in the education process. These encompass a variety of uses, from common rooms and canteens to libraries and even toilets. In these spaces children develop their inter-personal skills and learn social interaction. The lighting of these spaces should be conducive to this and provide a warm, welcoming environment. These areas are also those which give pupils and visitors their first impression of the school, so must create an attractive, stimulating and vibrant appearance.

Entrance halls and Atria are areas where the architect and lighting designer have more freedom to create exciting, vibrant spaces. A wide variety of area and accent lighting can be used to compliment the building aesthetics.

design criteria

No standard design templates are possible as these spaces are many and varied, but of primary importance is to distinguish these informal areas from formal classrooms. Lighting these areas with standard fluorescent luminaires should be avoided. The aim is to create a contrast to the classroom whilst still maintaining the overall lighting objectives of an appealing, natural appearance. Glare reduction is less important so a wider choice of luminaire types is available to the designer for use in these areas. Each area must be considered individually however, Libraries and areas used for display must have good vertical illuminance and uniformity whilst unsupervised areas such as toilets must be lit with robust, easy to clean luminaires.

en12464 lighting levels for social spaces

	illuminance level	unified glare rating
Entrance Halls	**200 lux**	**22**

entrance halls, atria and high ceiling areas

In areas with greater ceiling height, pendant luminaires combine good visual interest and illumination levels on all surfaces. Themed lighting can be used in these areas and can be arranged to create areas of visual interest and a stimulating ambiance.

Utilising compact fluorescent lamp solutions can provide energy saving benefits when combining absence detection and daylight linked saving due to the instant response characteristics in comparison to discharge lighting options.

Product Guide

> weblink > ATLA

Atlanta

- Architectural appearance
- Choice of reflectors

Lamp options:

1 x 57W TC-T
1 x 85W PL-H
1 x 70/150W CDM-T

Product Guide

> weblink > REAK

Reaktor

- Extruded aluminium frame
- Satin Diffuser
- Fluorescent or LED back light

Lamp options:

1 x 60W PL-H
1 x 120W PL-H

Product Guide

> weblink > MD24

Mirage

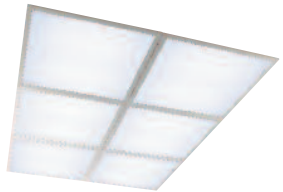
- Diamond facet reflector
- Clip attachments
- Colour and IP40 options

Lamp options:

18/26/32/42 or 54W TC-D

Product Guide

> weblink > LIFEQ



Life Q

- Daylight effect
- Multiple configurations

Lamp options:

3 x 24W T5

25 social spaces

common rooms, social rooms and canteens

The challenge in these areas is to differentiate them from the classroom. Whilst the rooms themselves may be similar to the formal teaching environment, lighting can dramatically change the appearance of the space. The use of wall lights & downlights combined with direct/indirect luminaires can create areas of visual interest.

toilets

In these unsupervised areas a robust solution is required. Low maintenance, easy to clean luminaires should be chosen and a higher IP rating may be a requirement.

emergency lighting

Emergency illuminance levels in social areas must not be less than 0.5 lux at floor level in the empty core of the space in accordance with EN1838. Uniformity must be better than 40:1.

en12464 lighting levels for social spaces

	illuminance level	unified glare rating
Common Room & Cafeterias	**200 lux**	**22**
Library Bookshelves	**(vert) 200 lux**	**19**
Library Reading Area	**500 lux**	**19**
Toilets	**200 lux**	**25**

Product Guide

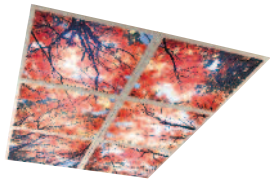
> weblink > **MD24**

Mirage
- Diamond facet reflector
- Clip attachments
- Colour and IP40 options

Lamp options:
18/26/32/42 or 54W TC-D

Product Guide

> weblink > **LIFEP**



Life P
- Printed Diffuser
- Multiple configurations

Lamp options:
3 x 24W T5

27 exterior lighting

exterior lighting

The exterior of a school is the public face of the establishment and every effort should be made to present it in the best way possible. The lit exterior must perform a variety of functions; it must impress, provide guidance, safety and security. With such varied demands the lighting designer must be careful to provide a cohesive scheme. The exterior of a school can provide the opportunity for creative lighting, and the use of colour and new technology such as LED's can be employed to great effect.

entrances

All educational establishments, from schools to universities, operate in an increasingly competitive environment. The lit façade offers the opportunity to create a positive first impression to pupils, staff and the wider community which can have a vital influence on the choices made by parents and pupils alike.

Evidence also shows that if students have pride in their school, behaviour is improved and vandalism reduced. A holistic approach should be taken to the lighting of the exterior and interior of the entrance to deliver the best possible impression. This requires luminaires that enhance both the night and day time appearance.

design standards

The recommended maintained illuminance levels as set out in CIBSE LG6 are listed opposite. However, these figures should only be seen as guidance and consideration must be given to the relative illumination levels of surrounding areas and the risk of vandalism. These may call for a higher level of illumination.

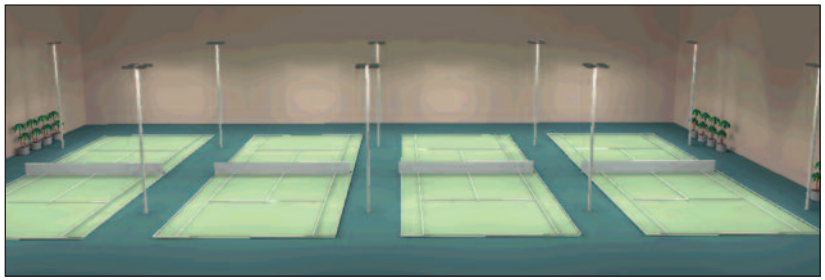
	illuminance level
Roadways and General Movement	**5 lux**
Car Parks and Bicycle Racks	**10 lux**
Walkways, Perimeters, Security	**20 lux**
Facades and Signs	**(vert) 100 lux**
Recreation and Club Sports	**200 lux**
Notice Boards	**150 lux**

security

Regrettably in today's school environment security is of increased concern. Security considerations apply to all areas of a building but particularly in car parks, walkways and strategic areas around a building where an intruder may gain access. Low level illumination around all areas will deter casual intruders but extra illumination may be required around entrances. The primary purpose however, should be to engender a feeling of safety for all users and ensure no dark areas exist which may cause concern to visitors.

sports pitches

Exterior pitches can have a benefit to the whole community and can be enjoyed as a leisure facility by a wide range of users. Lighting must be specified that will effectively illuminate the playing surface without causing glare and light spillage into the surrounding area. As with indoor sports facilities, full spectrum colour rendition is vital and the use of HQI lamps is recommended.



4 tennis courts illuminated to 200 lux in-line with CIBSE guidelines, using 32 off Euroflood Midi fitted with wide beam reflector and 400W HQI lamps mounted on 10m columns.

building approaches and car parks

The primary consideration in lighting these areas is the safe movement of both pedestrians and traffic. Luminaires that provide good vertical as well as horizontal illuminance are most effective in these areas. Area illumination should be used in conjunction with way guidance lighting such as bollards to ensure the safe movement of all users. High visibility and good colour rendition have equal parts to play in these areas, and can act as a significant deterrent to crime.
If CCTV is used, care must be taken to use luminaires with effective optical control to prevent glare and the positioning of lighting in relation to cameras is critical. As the relationship between the school and surrounding neighbours is important, designers must ensure minimal light pollution and avoid glare to the surrounding area.

Product Guide

> weblink > **SPOK**

Sirocco Spoke
- Architectural appearance
- Vandal resistant
- Excellent glare control

Lamp options:
70W HQI-E
100W HQI-E

Product Guide

> weblink > **ROAD**

Mistral Road
- Aluminium construction
- High performance optic
- Dual IP66 protection

Lamp options:
150-400W SON-T
250-400W HQI-T

Product Guide

> weblink > **EURO**

Euroflood
- Asymmetric distribution
- No light pollution
- Aluminium construction

Lamp options:
70-400W SON
150-400W HQI

Product Guide

> weblink > **BRK**

Broadwalk Bollard
- Vandal resistant
- Aluminium construction
- UV Stable coating

Lamp options:
70W SON/HQI-E
42W TC-T

29 case studies

Brunel Academy/Bristol BSF Schools

Brunel Academy is the first operational Wave 1 Building Schools for the Future (BSF) school. The project team led by Skanska, including architect Wilkinson Eyre and M&E consultant Buro Happold was determined to deliver classrooms that would transform the learning environment.

The decision was made to adopt an exposed concrete soffit to help maximise building efficiency. Dispensing with the usual suspended ceiling allowed the ceiling height to be increased to 3.3m providing a more pleasant learning environment, but this did however present two major problems.

Firstly, mineral fibre tiles make a major contribution to the acoustic performance of spaces. DfES document Building Bulletin 93, 'Acoustic Design of Schools' requires a mid frequency reverberation time of <0.8 seconds in secondary school classrooms to ensure good speech intelligibility. The traditional approach to solving this problem was the use of acoustic wall linings. These have drawbacks as they (a) occupy valuable wall area required for teaching materials, (b) are exposed to the inquisitive nature of children (penknives, compass points etc) and (c) when installed, involve a budget of about £1000/classroom, d) require an additional trade during installation with the potential for a prolonged programme.

Secondly, architectural considerations required services normally concealed by recessed ceilings not to be visible on the soffit leaving a clean ceiling. It was further required the solution had a light 'visual weight'.

Foil (600mm) delivers a direct: indirect 80:20 light distribution providing a high quality lit environment. Perforated side panels lined with 30mm thick Class A acoustic materials with the aid of other materials in the space fully met the acoustic reverberation requirement without the need for additional wall linings. (800mm Foil is now available to cope with more demanding acoustic requirements)

There are two segregated wiring channels for through wiring of electrical services. Integrated controls included absence detection, daylight linking and teacher override and sprinkler heads were mounted in luminaire infill panels. Multi wattage control gear can run either 21W or 39W T5 lamps which provide future proofing. This allows lighting levels to be increased or reduced to suit adult or child education or to facilitate changed uses of the space (>300 lux standard classrooms, 500 lux laboratories/practical etc)

The Foil aesthetic was designed to be in harmony with classroom geometry while the knife edged design ensures a light visual weight while still allowing sprinkler pipe-work to be concealed at most viewing angles.

Financing costs associated with major projects such as Bristol BSF are considerable. Build programme must be compressed to minimise the period of financial exposure. Adopting a single lighting, acoustic, and services solution eliminated need for liaison to coordinate these services by reducing the point of contact for these items to one; cutting the number of visits to site needed.

Isambard Kingdom Brunel was an innovative engineer of whom Bristol is rightly proud. Whitecroft is delighted to have played its part in the Skanska team in delivering a state of the art academy worthy of bearing his name.

Whitecroft lighting

Lighting for Life

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