



# Lighting and Lighting Controls



## Buyer's Guide

Produced by **The Energy Managers Association (EMA)**

## Lighting and Lighting Controls - EMA Buyer's guide

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### Introduction

#### Summary

This EMA buyer's guide is designed to give you some basic information and guidance on how to approach Lighting and Lighting Control. The quality of artificial light is a significant influencer on productivity and wellbeing within the workplace. At the same time artificial lighting is also one of the largest consumers of power, and significantly, also one of the areas generating most waste - by being left on when not required. This guide is designed to steer you through the process of upgrading your Lighting & Lighting Control, from selecting a suitable Solutions Provider, to the questions you should ask, both your chosen Solutions Provider, but perhaps more importantly, the internal question surrounding your actual requirements.

#### For impartial sources of information

There are many good sources of impartial advice should you consider the refurbishment of your lighting and/or lighting control system. For design expertise, CIBSE have a dedicated lighting division (the Society of Light and Lighting) or alternatively designers can be found through the Institute of Lighting Professionals. The Lighting Industry Association will be able to steer you towards a number of reputable manufacturers to help select a list of lighting suppliers from which you can identify a solutions provider.

**The EMA wishes to thank Havells Sylvania for their support in producing this guide.**

### Where to start

#### Choosing a Solutions Provider

##### Solutions Provider

This is a Partner that can provide a Turnkey Lighting Solution that could (depending upon your specific needs) could include Financing, Installation and Lighting Controls

##### Audit

A reputable Solutions Provider will work with you in order to complete an Audit and establish the area for improvement.

##### Total Cost of Ownership

A Calculation of the proposed Lighting and Controls scheme factoring in Regulatory Compliance

### Available Technology

#### Choosing the right equipment

##### Fluorescent

Do not ignore fluorescent technology, many lamps, such as T5, s can offer significant energy saving benefits without the capital outlay often associated with LED

##### LED

LED lamps and luminaires have developed significantly over recent years and now offer a competitive return on investment and significant maintenance savings.

##### Controls

Controls should be a core element of your energy savings measures.

### Other Considerations

#### It's not just Lighting

##### Building Integration

It is not just Lighting that can be achieved through an upgrade. Depending upon Solutions selected additional Building functions can be incorporated (e.g. HVAC, Security, Space Utilisation etc.)

##### Productivity/Wellbeing

The correct lighting can have significant benefits on the productivity of those within a building

##### Data

Advanced control systems can leverage data from sensors to reduce further costs such as maintenance

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### Selecting a Solutions Provider – Q & A How do I know if a Company is reputable?

#### How do I know if a Company is reputable?

There are many businesses operating in the Lighting and Lighting Control space. Look for a business that has been trading for many years, is based (or has representation) within the EU and one that carries quality standards (ISO etc.). You can find a choice of supplier on the LIA website and can consult regarding the suitability to your project. Case studies and testimonials are a great way to judge how your partner performs and the strengths that they should show.

#### What is the difference between a Supplier and a Solutions Provider?

A supplier will sell you product(s) these may match your needs sufficiently but a Solutions Provider takes more time to understand your requirements and provide a Solution to meet them. This often extends beyond just supply and could be, one or all, of Audit, Finance, Product Supply, Installation, Maintenance and Review.

#### Could I procure all the Solution Provider services on an individual basis from multiple suppliers?

The short answer is yes, but you need to be aware that this is a more involved process from your side in Managing multiple suppliers and timelines. More importantly you may incur compatibility issues between hardware/software supplied by two differing entities. With a Solutions Provider you are dealing with one business, have a Warranty from one business and are guaranteed not to have compatibility issues.

#### What sort of Warranty do Solutions Providers offer?

A reputable provider will be able to cover both product and installation (labour), and, more importantly, will have a balance sheet and trading history to support the warranty. Product should be covered for a minimum of five years, the installation for twelve months; look out for maximum operational hours linked to the warranty. Failure rates and product performance information should be readily available, furthermore you can ask for references to confirm any warranty claims.

#### Will I be able to afford the project that the solutions provider recommends?

There are numerous solutions available to match various requirements and budgets, however be wary of low cost products as price can often be offered at the expense of both quality and reliability. A total cost of ownership report should be able to identify the payback period for the installation, read carefully to ensure that the calculations represent your working conditions and only relevant savings are included in the finances.

Should your business not have capital available, or does not want to invest into a lighting asset, then many reputable solutions providers will offer finance options designed to be cash flow positive for the user.

#### Will the lighting refurbishment disrupt my day to day business?

Not necessarily. With advanced preparation, your solutions provider will be engaged to solve your lighting energy issues to allow you to focus on your core business. Consider when the project would be best implemented; do you have shut down periods of annual maintenance, would weekend or night work be more appropriate and suit your business needs. Discuss all of the possible options with your provider. Appropriate scheduling of work, together with clear communication to operatives, can ensure that any disruption is alleviated or minimised.

#### What service should I expect from a service provider?

From your initial brief, the chosen service provider should offer a cradle to grave solution for your business; if your provider does not engage for this brief, you should consider another provider.

Starting with a thorough audit of your existing estate, this should include luminaire types and quantities (including failures), burn hours, maintenance schedules, usage patterns, light levels, business needs/demands, and existing control strategies. From this position a detailed analysis can be conducted to establish the precise requirement for your business



## Lighting and Lighting Controls - EMA Buyer's guide

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and the appropriate lighting and controls design completed. At this stage a before and after total cost of ownership calculation can be made and the anticipated payback period determined; some work should be done to offer options and choices to suit different budgets and paybacks. If required, your provider should offer finance options.

A turnkey solution is often desirable to avoid the need to source a reliable installation partner who understands the installation brief and the energy savings strategy involved. Your service provider should have a reliable vetting system to ensure that their partner businesses meet the expectations of their clients, you. Strong project management and a robust reporting system is essential for the success of a seamless installation process.

### **Will I need a Lighting Consultant for my project?**

Most refurbishment projects would not require a Lighting Consultant as the chosen Solutions Provider should provide all the functions that a Lighting Consultant would. However, in certain sectors such as retail, an understanding how lighting may interact with products, the use of a consultant may be advisable, together with a broader view of products available.

### **How to Calculate a Total Cost of Ownership – Q & A**

#### **What are the elements that are required in a TCO Calculation?**

There are many elements that can be included in a TCO Calculation and these can broadly be allocated into 2 Categories. Tangible and Intangible. Tangible are elements that have a measurable saving that can be monetised in a TCO and the Intangible are benefits that are softer, so you may not be able to monetise them but they do still have an impact on your business.

Examples of Tangible TCO Entries: Lighting hardware, Control hardware, Installation, Commissioning, Energy Reduction, Maintenance, Carbon Credits, Tax breaks, subsidies, Lifetime, reduced cooling load

Examples of Intangible TCO Entries: Staff Wellbeing, Increased Productivity, Easy of Reconfiguration, Reduced Cleaning Costs, BMS Integration, CSR, improved EPC/BREEAM score, reduced risk of project overrun

#### **Does a Lighting & Lighting Control Upgrade qualify for Enhanced Capital Allowance (ECA)?**

Providing that the solution meets the energy saving criteria published within the Energy Technology List (ETL), then yes, the costs associated with the upgrade will qualify for Enhanced Capital Allowances. The ETL details the criteria for each type of technology, and lists the products that meet them within each technology category; currently lighting (including White Light Emitting Diode Lighting Units, Lighting Controls and High Efficiency Lighting Units) does not need to be listed, however a letter of confirmation from the manufacturer of compliance to the criteria will be required. Only costs arising as a direct result of the installation of the qualifying equipment may be claimed.

This document does not provide tax advice; therefore we recommend that independent specialist tax advice should be sourced.

#### **How does Regulations affect the TCO?**

With all buildings requiring to meet Part L of the Building Regulations and, depending upon project type, perhaps BREEAM and BCO recommendations you need to find a solution that allows full compliance but at the lowest TCO. This is achieved through removing major elements of the Tangible inputs to the TCO – for example commissioning.

#### **Should I look for low hanging fruit?**

Many areas will offer different total cost of ownership based on existing equipment, burn hours, cost of solution and control; this can result in widely varying payback periods. Consider which areas should be completed first, which would have the greatest impact on your energy consumption, and which should not be considered. Often the opportunity to take savings from one area to pay for another can be made.

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Example:



### Lighting Types – Q & A

#### LED is expensive and will not offer an attractive return on investment?

LED (Light Emitting Diode) lighting has been around for many years. Developments in LED, LED driver, and associated thermal technologies have significantly impacted the cost to make these products more competitive in today's market. Whilst LED luminaires are often more expensive than their conventional lamp counterparts, this cost is often offset by energy and maintenance savings enjoyed by their installation. Make sure that you compare LED products and ensure that you are making a like for like comparison

#### Everyone is talking about LED, should I only consider this option or are other technologies as efficient?

No, the light source should be matched with the application, budget and aesthetic. Many other light sources can offer great energy savings, such as T5 lamps.

#### How do I choose which light source is right for me?

Choosing the correct lighting solutions provider should help with this decision. They are experts in their field and will give best advice regarding compatibility of all products. Do not hesitate to ask for a comparison between technologies within the same space and explore the savings relevant to your business.

#### What happens to my old lighting that is currently installed?

Under the WEEE directive, your solutions provider should remove and safely dispose of all redundant materials with certification of the disposal issued upon project completion. Ask your provider for details.

#### Are there issues of compatibility between Lighting and Lighting Control?

There can be compatibility issues if two separate systems from two separate suppliers are being used. A Solutions Provider supplying a fully integrated Lighting and Lighting Control solution will eliminate any compatibility issues. The Solutions Provider will also issue a Warranty covering the integrated Lighting and Lighting Control solution

#### I've heard that LED's last forever, is this true?

No. This myth has been caused by many manufacturers over stating reliability or not offering clarity on how lifetime is measured. First and foremost, LED, and the drivers used to operate them, will not last forever. Unlike most lamps, LED's degrade gradually over time and do not typically experience the sudden failure that can be seen in other lamps such as

## Lighting and Lighting Controls - EMA Buyer's guide

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fluorescent. Any source lifetime should be stated to a given percentage of output (given as an L value); for example 50,000 hours to L70 (70% of initial lamp output). Furthermore, the lumen depreciation rate during this time should also be given (given as a B value); for example 50,000 hours to L70, B50 (only 50% failure). Check to ensure that products are being compared equally before making a choice.

### **Can I use my existing light fittings and simply fit a more efficient lamp?**

Sometimes, but you should look carefully at the condition of the luminaires and optical performance of the lamp and luminaire combination before making this decision. Low energy lamp replacements are available on the market and can convert T8 to T5, T8 to LED, T5 to LED, discharge to LED, etc., however a great deal of caution should be taken with regard the compatibility of the lamps. Most warranties will be invalidated should such a conversion be made; furthermore often luminaires will need to be rewired to enable the retrofit lamp to operate. Any reworking of a luminaire should be clearly labelled to avoid a potentially hazardous insertion of an incorrect lamp during future maintenance.

### **How can I be sure that my new lighting will not result in lower light levels?**

A thorough audit should include light level readings of the existing solution. Request that lighting design calculations are conducted by your solutions provider to ensure that the new now energy products will provide sufficient light to meet both your business and your employees' expectations.

### **How do I know how much light I need?**

CIBSE produce a comprehensive lighting guide, also EN12464-1, detailing the recommended lighting for most sectors and applications. Considerations should be made by your provider to ensure that the correct lighting levels, and quality, are met to suit the work function.

### **Are there any other considerations that I should be aware of?**

BS5266-1:2011 dictates the minimum emergency lighting requirement that you should legally have under emergency conditions within the workspace. This standard is introduced for the safety and wellbeing of those occupying a building at any time; therefore, naturally, adherence to this is mandatory.

## Lighting Controls (Myth Busters) – Q & A

### **Lighting Control is not worth it?**

This Myth is defiantly worth busting. You can save between 34% and 70% on your Lighting Energy consumption by using Lighting Control – the exact amount will depend upon the existing controls in place.

### **Switching Lighting shortens the lifetime of the fixture?**

With quality Lighting Control on LED fixtures you are actual dimming the fixture, not necessarily switching it off. This not only saves money (see question above) but allows the fixture to last longer therefore saving money on the maintenance/replacement of fixtures. Switching and/or dimming has no detrimental effect on LED.

### **We have light switches in our building – are these not sufficient?**

Standard switched control require human intervention and whilst this may happen sometimes it can't be relied upon. This can be demonstrated by numerous office estates burning lighting throughout the night.

### **Will my workforce experience areas of darkness?**

A typical PIR based system uses a sensor per eight fixtures – so, if that space has typically ten people in it, this equates to one sensor per ten people. It is this sparsity that can cause 'false offs' when a user is sitting at a desk and the lights go out. Obviously this is not good for occupancy comfort. A granular system typically has a sensor per fixture so this equates to nearly one sensor per person giving a much high resolution and therefore detecting much smaller movement. This approach can also make reconfiguration of spaces much easier as there is no need to worry about where the PIR sensors

## Lighting and Lighting Controls - EMA Buyer's guide

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are located and what they can see; if there is one in each fixture, regardless of configuration, most human movement will be detected.

### **Daylight Dimming does not work in the UK?**

Whilst there is not as much sunshine in the UK as other countries, there is usually sufficient ambient light to allow daylight dimming to operate. A controls solution that has 'fine grain' control with distributed intelligence (as opposed to a Central Control function) and sensors in each fixture will allow for accurate and effective daylight dimming. As with all forms of dimming the User should not be aware of this, ensuring maximum user comfort but still achieving energy savings. Within the UK you can expect to achieve up to xx% energy saving from daylight.

### **Is a control system responsive enough?**

It can be. A localised, distributed intelligence solution will allow the individual luminaires to react quickly and efficiently to any changes in the surroundings, from movement to dimming, by controlling the luminaires within the immediate vicinity of the environmental condition.

### **Will my new lighting be compatible with our controls system?**

Most light sources can be switched and dimmed, with the exception of the majority of discharge light sources. Care should be taken to understand which dimming system is in place to ensure that the correct driver is installed within the product. Most products should be available enabled with DALI (Digital Addressable Lighting Interface) drivers. As the leading industry standard, luminaires equipped with such products should be compatible with many controls systems and building management systems (BMS). Again, this should be discussed with your provider, and guarantees given to avoid any on costs. However, other dimming protocols are available, such as 1-10V, Phase dimming and DSI. It is important to ensure that an audit is undertaken to ensure that this information is gathered, especially when undertaking a refurbishment project, to ensure that control compatibility is considered and implemented

### **Installation and Set-up of Lighting Control is expensive?**

Whilst the above statement can be true of some Controls Systems there are systems that do not need to add anything to the installation costs and can be set-up by inexperienced end users. These controls solutions are ones that are built in to the fixtures at point of manufacture and so also address the daylight dimming and areas of darkness questions (above)

### **Do I switch, or should I dim?**

If a lighting control system is able to dim as well as switch then increased energy savings can be realised. Dimming gives occupants more choice over the levels of lighting they experience. It can also be less intrusive to adjust lighting levels than to suddenly turn luminaires on and off. If the lighting controls can be implemented alongside fully dimmable lighting then occupants will be happier, the savings will be greater and the lighting design will be maintained. Daylight linked dimming, often known as daylight harvesting, offers tremendous savings by recuing the light output of the lighting as greater levels of daylight are detected.

### **Questions to ask yourself/your business**

**Are my staff happy with the existing lighting?**

**Is my existing lighting efficient?**

**Does my existing lighting provide enough light for my business function and/or tasks?**

**Am I making the most of all available daylight within my building?**

**Do I have sufficient control of my lighting?**

**Have my controls been commissioned correctly?**

**Are the hazards within my building been identified and lit?**

**Have I answered "no" to any of the above? - This guide is for you.**

## Lighting and Lighting Controls - EMA Buyer's guide

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### Glossary - Commonly used lighting terms

#### Average Rated Life

The average rating, in hours, indicating when 50% of a large group of lamps have failed.

#### Ballast

A device which provides the necessary starting voltage and current to a fluorescent or high intensity discharge luminaire.

#### CRI

Colour Rendering Index. The ability of a light source to accurately render an object's colour in comparison with a natural light source. Measured on a scale of 1 -100 with 100 being the ideal.

#### Colour Temperature

A scale used to describe the colour of light. Light with a lower Kelvin rating will have a more yellow tint, while light with a higher Kelvin rating will have a more blue tint.

#### Daylight Sensor

A device which senses the amount of daylight in a room and controls the luminaire accordingly.

#### Direct (light output)

A direct source of light which is cast downwards from a fixture to provide lighting with uniform levels of illumination.

#### Direct/Indirect (light output)

A source of light in which light is cast both upwards and downwards from a fixture to provide a combination of direct and indirect illumination.

#### Efficacy

A measure expressed in either lumens per watt (LPW) representing the efficiency of a lamp/ballast system or luminaire lumens per watt (LLPW) representing the efficiency luminaire.

#### Heat Sink

A component or integral part of luminaire that conduct or convects heat away from LED components.

#### HID

High Intensity Discharge lamps.

#### Illuminance

Light arriving at a surface, expressed in lumens per unit area; 1 lumen per square meter equals 1 lux.

#### Indirect

An indirect source of light which is cast upwards from a fixture and bounced down to provide lighting with minimal glare and more uniform levels of illumination.

#### Initial Lumens

The lumens produced by a lamp after an initial burn in period (usually 100 hours).

#### Lamp

The source of light in a fixture, often mistakenly "bulb".

#### Lamp Disposal

Refers to the proper recycling of lamps containing mercury or other hazardous materials.]



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## **LED**

Light Emitting Diode –commonly known as LED is a semiconductor device that emits visible light of a certain colour.

## **LED Driver**

An electronic device which feeds input power to LED to produce light.

## **Lens**

A glass or plastic element used in luminaires to seal a fixture or control the exiting light.

## **Lumen Depreciation**

The decrease in lumen output of a light source over time; every lamp type has a unique lumen depreciation curve (sometimes called a lumen maintenance curve) depicting the pattern of decreasing light output.

## **Lumens**

A unit of luminous flux; overall light output; quantity of light, expressed in lumens.

## **Luminaire**

A complete lighting unit which contains a lamp, housing, ballast, sockets and any other necessary components.

## **Lux**

A unit of illuminance equal to 1 lumen per square meter.

## **Occupancy Detector**

A device which activates a fixture upon sensing the presence, or absence, of a person.

## **Phosphors**

Substances which emit light after being bombarded by electrons. Phosphors are used to coat the inside of fluorescent lamps.

## **T5**

5/8" (c16mm) diameter fluorescent lamps. "T" stands for tubular, while the number "5" stands for the 5 in 5/8".

## **T8**

1" (c26mm) diameter fluorescent lamps.

## **T12**

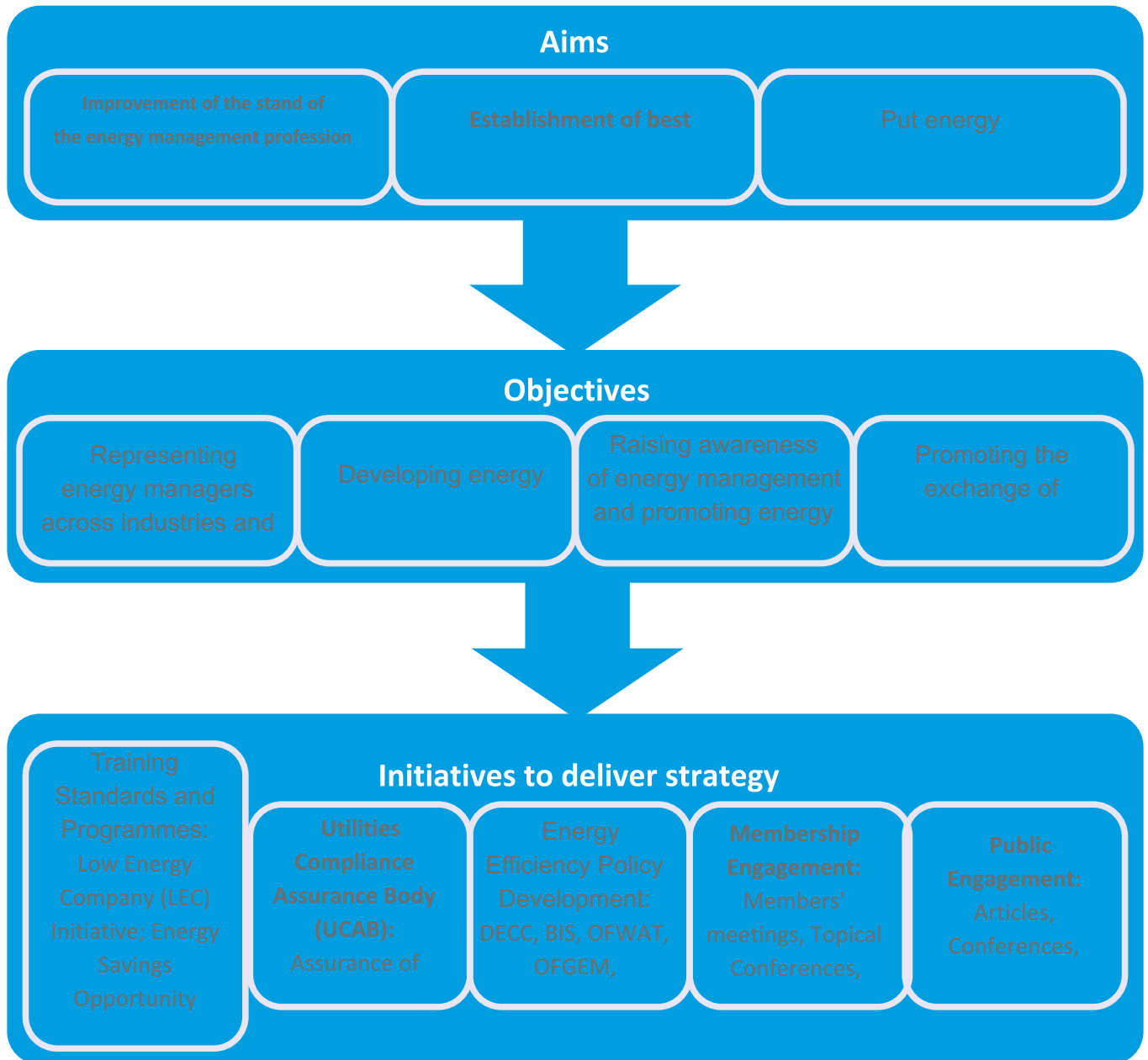
1 1/2" (c38mm) diameter fluorescent lamps.

## **Thermal Characteristics**

The manner in which a luminaire manages heat, either dissipating heat or retaining it.

A decorative background graphic consisting of a grid of light blue squares, arranged in a pattern that recedes into the distance, creating a sense of depth and perspective.

# The Energy Managers Association



## Contact information

For more information visit [www.theema.org.uk](http://www.theema.org.uk) or for expert advice on energy reduction and business energy plans and strategy contact:

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