

Retail Business

A GUIDE TO ENERGY EFFICIENT AND COST EFFECTIVE LIGHTING

This guide provides information on how to reduce energy costs and improve the effectiveness of lighting in retail premises by using energy efficient lighting technology and techniques. By following the information provided, you should be able to reduce the energy consumption of your lighting by up to 50%, reduce maintenance costs and improve the appearance of your retail outlet.



ENERGY EFFICIENT AND COST EFFECTIVE LIGHTING

Converting inefficient retail lighting installations to energy efficient types of lamps, control gear and luminaires (light fittings) saves substantially on electricity costs without reducing lighting quality. In many cases, lighting quality is improved. Good display and accent lighting can immediately increase the visibility of merchandise, focus a customer's attention, and make products appear more attractive to purchase.

Choosing energy efficient lamps and fittings to deliver the desired effect, through an appropriate balance of quality and quantity of light, will ensure that running costs are kept to a minimum.

LIGHTING REQUIREMENTS AND TECHNIQUES

While there is no single formula for all retail lighting, a number of techniques can be used to achieve the desired lighting objectives for different retail applications.

- Ambient lighting – general lighting that distributes light widely, allowing the customers to see and examine the merchandise and make their way around the shop. Customers should be easily able to read labels and information about products.
- Accent lighting – highlighting or spotlighting used to set products apart, provide contrast or add further impact to products.
- Perimeter lighting – helps to establish the overall image and impression of the shop, and defines its boundaries by lighting vertical surfaces.
- Shelf and display-case lighting – lighting that can be enclosed within display cabinets or positioned close to the products.

Retail outlets are generally of two types, that mainly require:

- General 'ambient' lighting – for supermarkets, home-improvement warehouses, etc
- Impact 'accent' lighting – for fashion outlets, jewellers, etc (with accent lighting, luminaires should be placed correctly to avoid uncomfortable glare for customers)



Fig.1 'Accent' lighting using 70W metal halide lamps

COLOUR TEMPERATURE AND COLOUR RENDERING

The colour qualities of a lamp are characterised by two different aspects — colour temperature and colour rendering.

- Colour temperature defines a lamp's 'whiteness', which is either 'blueish' (cool) or 'reddish' (warm) in appearance. This is measured in kelvin (K). A colour temperature of less than 3,500 K is 'warm'; a colour temperature of 3,500 K is mid-white; and a colour temperature of 3,500 K and above is 'cooler'. Figures 2 and 3 show how retailers can use colour temperature to enhance the look of their product ranges.

Fig. 2 Colour temperature (K) of light sources most appropriate to retail activity

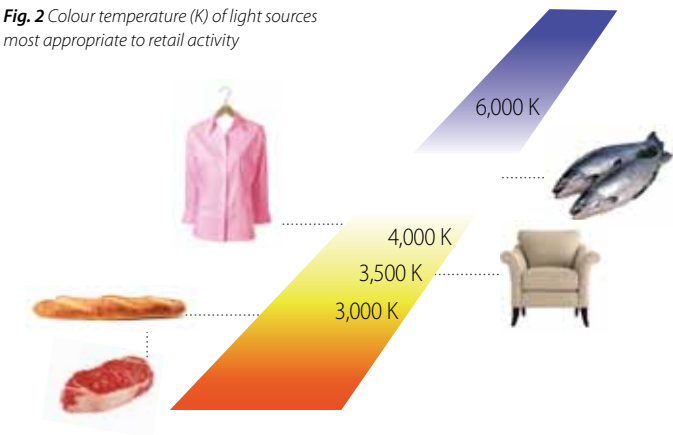


Fig. 3 'Cool White' 4,000 K and 'Warm White' 2,700 K

- Colour rendering is the ability of a light source to give good colour representation of the colour it is illuminating. It is measured on a scale of Ra 0–100, where Ra 100 represents the best, which is equivalent to that provided by daylight. For retail outlets, a colour-rendering index of Ra 80–90 gives good reproduction of colours and is particularly important in fashion retail.
- The last three digits of the reference number on fluorescent lamps represent a method of specifying a lamp's colour rendering and colour temperature. For example (Figure 4), for a 3-digit reference of 840, the first digit (8) refers to a colour rendering of 80–89 and the second two digits (40) refer to the colour temperature, where 40 = 4,000K.

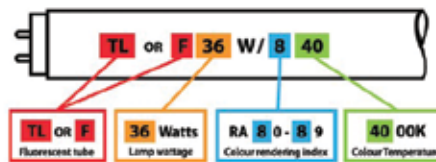


Fig. 4 Fluorescent tube lamp codes

EXAMPLE:

- 825 = High Colour Rendering – Very warm appearance
- 827 = High Colour Rendering – Warm appearance
- 830 = High Colour Rendering – Warm/Intermediary
- 835 = High Colour Rendering – Intermediary
- 840 = High Colour Rendering – Cool
- 860 = High Colour Rendering – Very cool

APPLICATIONS IN RETAIL AREAS

Refer to pages 6 and 7 for recommended lamp technical information.

FASHION

Appropriate light sources to enhance colours and appearance: for general ambient lighting use lamp type 1, 2 or 3. For accent lighting use lamp 2, 3, 4, 5 or 6 (see page 5).



FURNITURE/CARPET STORES

Use metal halide or low voltage dichroic tungsten halogen for impact 'accent' lighting.



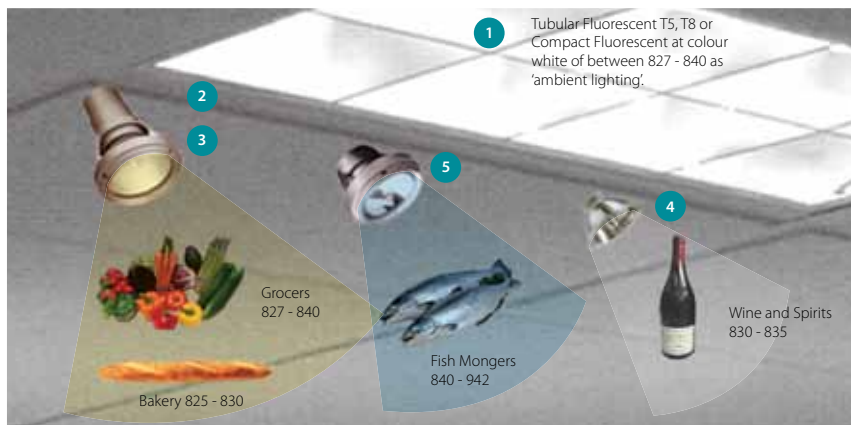
When selling home furnishings use warm white and high colour rendering light sources as in the home.



Use compact or tubular fluorescent for general areas and wall washing.



MINI-SUPERMARKETS



LEDs are appropriate for localised lighting.



Metal halide light sources with the correct luminaire can provide over 60% in energy savings and give higher illumination than tungsten halogen equivalents

The table below shows the type of lamps, and their characteristics, that are most suitable for different kinds of retail outlets

Shop type	Colour Rendering Scale 1 - 100 (100 = daylight)	Colour Temperature (K)	Recommended light source* (lamp ref. no.)	
			Ambient and Perimeter lighting	Accent Lighting
Butchers/Bakers	80	2,500 - 3,000	1	2, 3, 4 or 5
Fish mongers	80	4,000 - 6,000	1	2, 3, 4, 5 or 6
Grocers	80	2,700 - 4,000	1	2, 3, 4, 5 or 6
Fashion/Clothing	80	3,500 - 4,000	1	2, 4 or 5
Sports goods	80	4,000	1	2, 3, 4, 5 or 6
Footwear and leather goods	80	3,000 - 4,000	1	2, 3, 4 or 5
Jewellery, watches and eyewear	80	2,700 - 4,000	1	2, 4 or 5
Perfumes, hair salons, chemists	80	4,000	1	2, 4 or 5
Furniture, carpets	80	2,700 - 4,000	1	1, 2, 3, 4 or 5
Glass, gift items, household goods	80	2,700 - 4,000	1	2, 3, 4, 5 or 6
Home entertainment and electronics	80	2,700 - 4,000	1	1, 2, 4 or 5
Bookshops	80	3,500 - 4,000	1	1, 2 or 6

CONTROLS

The benefits of using energy efficient lighting can be greatly enhanced by using lighting controls to provide the right quantity of light as and when required.

Responsibility for turning lights on/off outside business hours needs to be allocated (e.g. to cleaners or security guards). One Irish retail chain uses different levels of lighting that are matched to store activities or the time of day. Lighting levels are increased at staff entrance areas during staff shift changeovers, and levels are adjusted for store opening times, cleaning, restocking shelves and overnight security.

Lighting mainly in 'back of house' areas can be controlled automatically by time, occupancy and daylight availability.

- Use presence detectors for retail areas that are infrequently used, such as store rooms and toilets.
- Use a separate daylight sensor or a daylight sensor that is integrated within the presence detector for areas with good levels of natural light.
- An infra-red sensor reacts to changes in heat patterns and works best if wall-mounted in cellular spaces rather than in areas with aisles of shelves, partitions or cabinets, which can block the detection beams.
- Ultrasonic and microwave sensors do not need a direct line of sight of the motion source to detect presence.

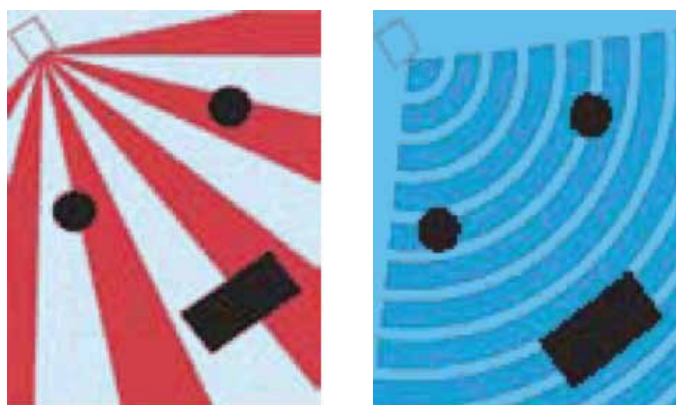


Fig. 5 (a) Infra-red and (b) sonic occupancy detection coverage

MAINTENANCE AND LAMP REPLACEMENT

















Do not mount luminaires in positions where they will be difficult to maintain. Also consider the luminaire's effectiveness. For example, the globe lights (Figure 6) are ineffective in the retail space of this shopping centre. A much more effective solution would be an uplighter with integrated reflector providing more downward light, enabling merchandise also to be lit.

There are great cost advantages to upgrading existing lamps and fittings. Recommendations for the most common lamp replacements are given below, with typical expected savings. Additional lamp comparisons are shown on page 7.

When replacing lamps, make sure that the new lamp has comparable colour temperature and light levels to the lamp it replaces. Lamp replacement and luminaires should be trialled in an area before widescale lamp replacement.



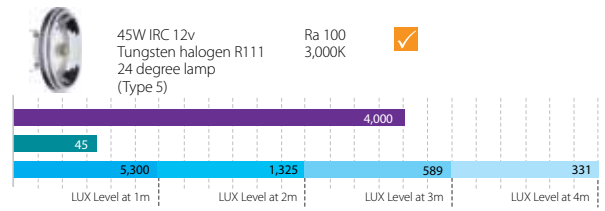
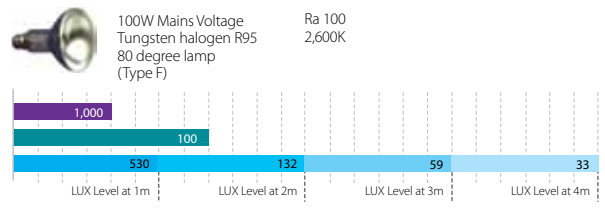
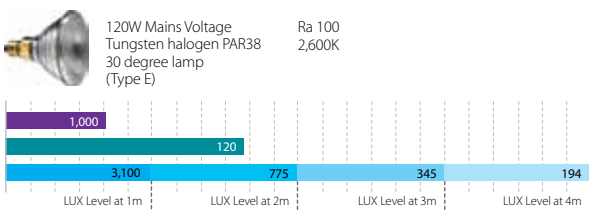
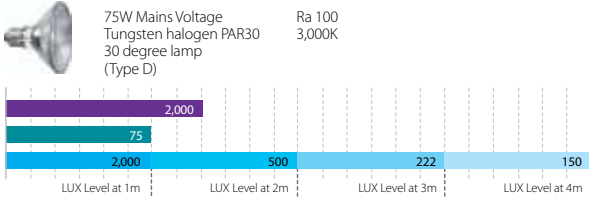
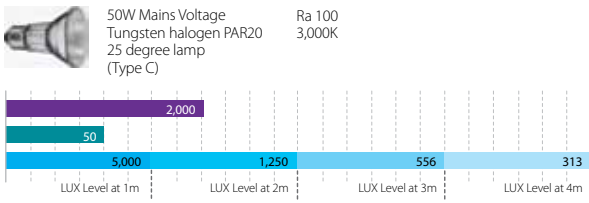
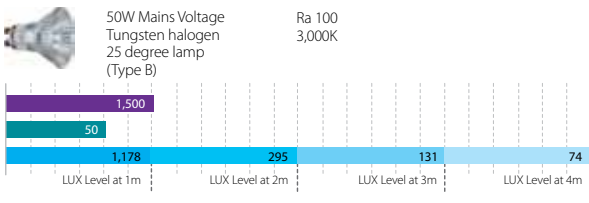
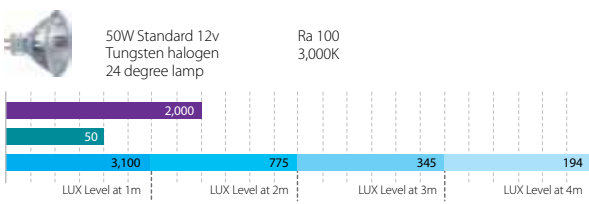
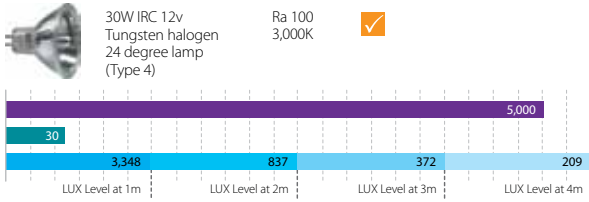
Fig. 6 Convert ineffective globe light to uplighter with integrated reflector

Existing Lamp Type	Replacement Lamp Type	Benefits and Features
Incandescent GLS 100 W 150 W 	CFLi 20W-25W 26W-29W 	<ul style="list-style-type: none"> – Up to 75% energy saving – Up to 12 times the lamp life of an incandescent lamp – Use 'warm white' (2,700 k) cfl lamps
Mains Voltage Tungsten Halogen Dichroic Reflector 35W 50W 	CFLi (GU10 Fitting) 7W 11W 	<ul style="list-style-type: none"> – Over 80% energy saving – Up to 7 times the lamp life of tungsten halogen – Use for 'accent' or 'feature' lighting rather than general illumination – As the light distribution differs between these two lamp types lower light levels may be expected
Mains Voltage Tungsten Halogen Dichroic Reflector 35W 50W 	Low Voltage (12v) IRC Tungsten Halogen Dichroic 20W 35W 	<ul style="list-style-type: none"> – Up to 40% energy saving – 3 Times the lamp life of mains-voltage tungsten halogen
Mains Voltage Tungsten Halogen Dichroic Reflector 35W 50W 	LED (GU10) (Also available in low voltage) 4W 8W 	<ul style="list-style-type: none"> – Up to 90% energy saving – 40 Times the lamp life – As the light distribution differs between these two lamp types lower light levels may be expected
T12 (38mm) Fluorescent Tube (with conventional ballast) 	T5 (16mm) High Output Fluorescent Tube with electronic adaptor conversion kit 	<ul style="list-style-type: none"> – 30% to 50% energy saving if the existing luminaires are using switch-start or quick-start electromagnetic ballasts – A conversion kit is required which includes the new electronic control gear (kits can also be used for t12 to t8 conversions) – Further savings can be made by using fewer fluorescent tubes when the luminaires have opal or prismatic diffusers, which have no internal reflectors. The electronic adaptors are also available with 'clip-on' reflectors that can increase the luminaire light output by up to 50% and reduce the number of lamps required
T8 (26mm) Halophosphor Fluorescent Tube, i.e. colour 29,33,35 	T8 (26mm) Triphosphor Fluorescent Tube, i.e. colour 830, 835, 840 	<ul style="list-style-type: none"> – Up to 10% energy saving – Twice the lamp life when used with electronic ballasts – Use electronic control gear
Mains or Low Voltage Tungsten Halogen Reflector Lamps 	Metal Halide 'CDM' type 	<ul style="list-style-type: none"> – 80% Energy saving – Increased light output of 400% – Ensure that ballasts/wattages are compatible – Check the colour temperature to make sure it is appropriate
Mains or Low Voltage Tungsten Halogen Reflector Lamps 	White Sodium – SDW-T 35W equivalent to 2 x 50 Tungsten Halogen 	<ul style="list-style-type: none"> – 65% Energy saving – Increased light output of 300% – Ensure that ballasts/wattages are compatible. – Check the colour temperature to make sure it is appropriate

Note: Always use reputable suppliers and products that comply with all national and EU lighting regulations. Trial newer products for their suitability before widescale upgrades. Refer to www.seai.ie/aca for energy-efficient products.

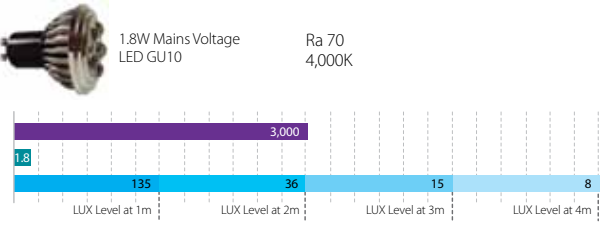
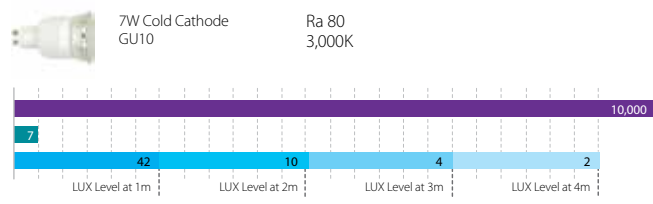
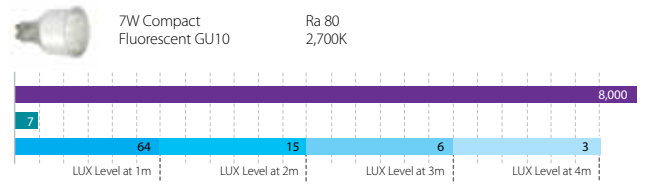
REFLECTOR SPOT LAMP COMPARISON CHART

The following lamps listed are most commonly used for 'Accent' lighting in the retail sector. The chart indicates the efficiency of each lamp type listed under 3 indicators – energy consumption (wattage) – lux levels (light level at a given distance) – lamp life (hours).



✓ The IRC version of the Dichroic lamp (number 4) or the IRC version of the R111 reflector lamp (number 5) mentioned here and on page 3 are the most efficient and effective for 'Accent' lighting.

Manufacturers have made efforts to enhance the performance of spotlights. Generally improvements can be seen in the indicators of consumption and life hours. Below are the three most popular types of lamps currently available. The light levels at 1 or 2 metres is considerably less and would generally be inadequate for 'Accent' lighting. Therefore the lamp types shown are only appropriate where the light sources are required to be mounted very close to the merchandise to give localised highlighting or in inaccessible positions where they are used as 'features' and not used for illumination.



Lamp Life (Hours)
 Wattage/Energy Consumption
 Lux Levels

LIGHTING TECHNICAL DETAILS

1



Fluorescent tubes and compact fluorescent fittings

Fluorescent tubes T8 (26mm diameter) or T5 (16mm diameter) or compact fluorescent lamps of the correct colour white (2,700 - 6,500K) decided in accordance with the application, i.e. whether the requirement is for a warm or cool light appearance. Always use triphosphor tubes which are high in colour reproduction. Compact fluorescent lamps are only available in triphosphor.

2



Metal halide discharge lamps

Metal halide CDM-T (HID) lamps of the correct colour white (3,000 -4,200K). These lamps have good efficiency and should be used to provide 'highlight' but can also be used for localised illumination.

3



White sodium lamps

White Sodium (SDWT) lamps are available in warm white (2,500K) which is very close in colour appearance to domestic tungsten lamps. These are suitable for displaying antiques, meats and anywhere the colour red needs enhancing.

4



Low voltage dichroic lamps

Low voltage (12v) dichroic lamps are available in many wattages and beam angles. The IRC (infra-red coating) type is the most efficient with a 30W type providing equal if not more light than a standard 50W dichroic lamp. IRC lamps are more economical than standard halogen lamps because of a special coating on the lamp. Always choose the correct beam angle according to the distance to the objects to be 'highlighted' to ensure appropriate light levels.

5



Low voltage glare free reflector lamps

Low voltage (12v) R111 glare free reflector lamps are available in high efficiency types with a 60W IRC version providing equal illumination to a standard 100W R111 version.

6



Light-emitting diodes (LEDs)

LEDs are appropriate for localised lighting, i.e. shelving or closely mounted to merchandise. There are many LED replacements for Mains Voltage GU10 or Low Voltage MR16 Dichroic reflector lamps. They vary in wattage and distribution and can therefore be disappointing if the incorrect LED type is chosen. Always trial the prospective model to obtain the appropriate LED type for your application. Not only do the LED lamps vary in lumens and distribution of light; they also vary in expected life-hours.

ACCELERATED CAPITAL ALLOWANCE

An Accelerated Capital Allowance is offered for lamp types that reach a minimum efficiency requirement. Further information, including a list of manufacturers and suppliers with eligible products, can be found on the SEAI website, at www.seai.ie/aca

LAMP COMPARISON CHART

The best light sources for retail are highlighted in yellow, in the table below.

Lamp Type	Efficacy (Lumens per watt)	Colour Temperature (K)	Colour Rendering (Ra)	Lamp Life (Hours)
Daylight		5,500 - 8,500	100	
Tungsten Mains Voltage	12	2,600	100	1,000 - 2,000
Tungsten Halogen Mains Voltage	18	3,000	100	2,000 - 8,000
IRC Tungsten Halogen Low Voltage (12v)	22	3,000	100	5,000
Compact Fluorescent	45 - 90	2,700 - 4,000	85	12,000
T8 (26mm dia.) Halophosphor Fluorescent Tubes	37 - 68	2,700 - 4,000	58	8,000
T8 (26mm dia.) Triphosphor Fluorescent Tubes	71 - 92	2,700 - 6,000	80	12,000 - 60,000
T5 (16mm dia.) High Efficiency Fluorescent Tubes	66 - 82	2,700 - 6,500	80	20,000
T5 (16mm dia.) High Output Fluorescent Tubes	62 - 76	2,700 - 6,500	80	20,000
Metal Halide (Standard)	71 - 83	3,000 - 6,000	65 - 85	8,000 - 10,000
Metal Halide (CDM)	87 - 95	3,000 - 6,000	65 - 85	12,000
White Sodium	31 - 46	2,500	80	10,000
LED	50 - 100	3,000 - 6,000	70 - 80	50,000 - 100,000

Efficacy is the ratio of light emitted by a lamp to the power consumed by it, i.e. lumens per Watt. A lumen is a measure of the quantity of light emitted by a lamp.

Always try to use long-life versions of lamps to maximise savings in energy and maintenance costs.