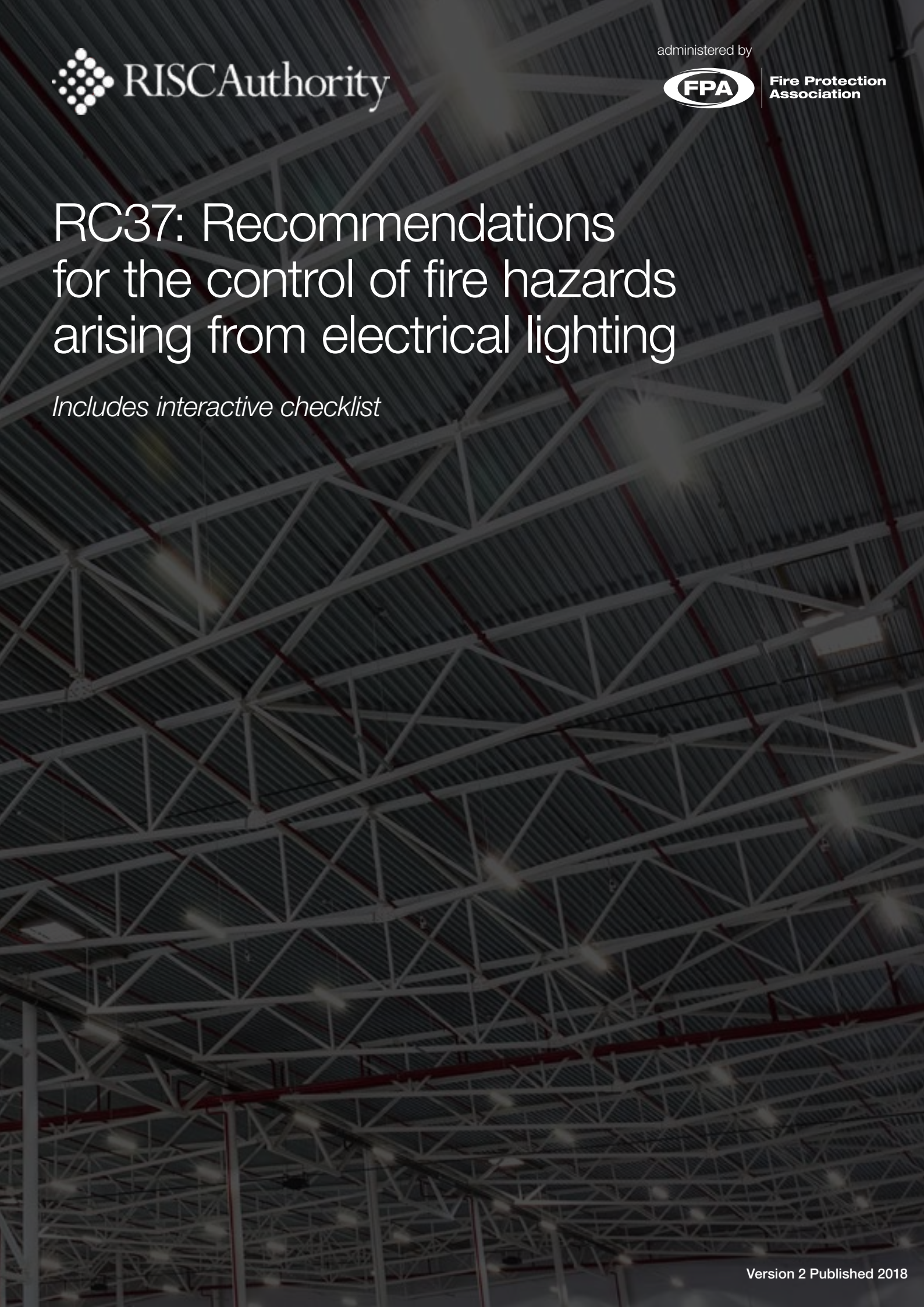
RISCAuthority

administered by FPA Fire Protection Association

RC37: Recommendations for the control of fire hazards arising from electrical lighting

Includes interactive checklist



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Contents

Summary of Key Points

The table below summarises the key points of the document.

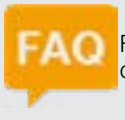
Comply with fire safety legislation	• There is a requirement in fire safety legislation that the responsible person must ensure that the premises and any facilities, equipment and devices provided for the use by or protection of firefighters are subject to a suitable system of maintenance and are maintained in efficient working order and good repair. This applies to electrical cut-off switches and similar provisions for lighting circuits. (5.1.3)
Ensure the continued well being of your business	• As well as the provision of emergency lighting, the emergency plan should address the provision of backup power supplies to ensure adequate safety lighting for high hazard, totally enclosed and business critical areas. (5.2.3)
Fire safety management	• All fixed lighting should be wired and fused independently from circuits providing power for any other equipment. (5.3.2) • Fixed wiring for all installations, including lighting circuits, should be subject to periodic inspection and testing according to BS 7671. (5.3.1) • Lights should introduce the minimum of fire hazards to the workplace and be economic to operate. (5.3.7) • Care must be taken in all instances where lights are controlled by timers. (5.4.10)
General precautions	• A lighting installation should be controlled by means of a switch or switches, or other suitable control system which, where necessary, should be designed for use with discharge lighting circuits. (5.4.9) • Switches and other control systems should be installed in readily accessible positions where they will not put the operator in danger. (5.4.9)
Firefighters' switches	• A firefighters' switch should be provided in the low voltage circuit supplying exterior electrical installations and interior discharge lighting installations operating at a voltage exceeding low voltage. (5.5.1)
Installation in ceilings	• Where a quartz halogen downlighter or other form of recessed luminaire is used in a fire rated ceiling, a suitable back plate or cover should be fitted so as to maintain the fire resistance of the ceiling. (5.6.1)
LED lighting	• Although in many cases replacing traditional lights with LED alternatives is not a complex process, all work on the electrical installation should be undertaken by a qualified electrician. (5.12.2)
Temporary installations	• Temporary lighting installations should be inspected regularly and tested at intervals not greater than every three months. The results of the tests should be recorded. (5.15.3)

Symbols used in this guide


Good practice


Bad practice


Discussion topic



Frequently asked question

1 Introduction

Lighting is a feature of buildings that is often designed to be unobtrusive and unnoticed. As it is ever present, it tends to be forgotten and sometimes treated without thought. But there have been several major fires in industrial and commercial premises resulting from failure of lights (mainly High Intensity Discharge (HID) units) and numerous near misses where lighting fixtures have overheated or caused overheating of nearby materials. The latter are particularly significant in residential accommodation, such as care homes, where people may not be able to recognise the hazard or react promptly to an incipient fire. Fires originating from the use and sometimes misuse of electric lighting are thus a threat to life as well as to property and business continuity.

Light

Light may be considered to be a narrow section of the electromagnetic spectrum. Low frequency waves are used for radio communications whereas those of high frequency are encountered as X-rays and gamma rays. In between there is a narrow band of frequencies that are visible to the eye (visible light) and, at a slightly lower frequency, infrared radiation that is sensed as heat (see figure 1). Light and heat are therefore inextricably linked.

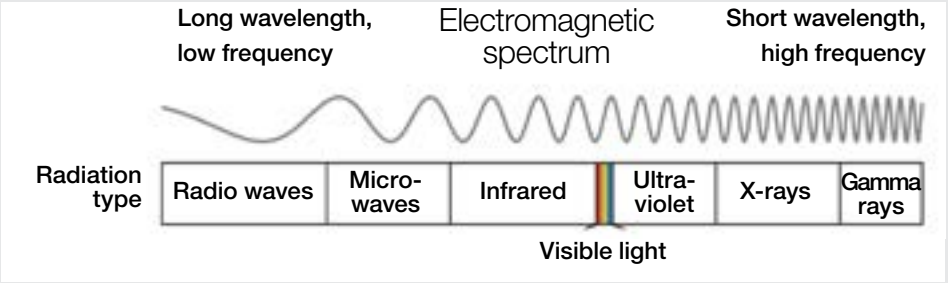


Figure 1: The electromagnetic spectrum

Although lights are normally described as 'white' different light sources produce light of a slightly different colour; this is known as the colour temperature. The higher the colour temperature the higher the frequency of the light and thus the more blue and ultraviolet it becomes. Although this is known as the colour temperature the term does not relate to the actual temperature of the light source or fittings.

Quartz halogen lights are some of the most intense that are used in commerce and industry and these have a colour temperature of some 3,500°K (compared with the 6,000°K of sunlight). Although they produce a light that has a significant ultraviolet component, there is a considerable production of infrared light which is evident as heat. Modern LED lights have a colour temperature of 2700-3000°K and produce less heat.

Lamps with a colour temperature of 3,000°K are often thought of as producing 'warm and inviting' light and are used in coffee shops, restaurants and hotel lobbies whereas hospitals, conference rooms and classrooms use more energetic lights with a colour temperature of 4,100°K.

Only about 5% of the energy consumed by a typical incandescent light bulb is used to produce light; 83% produces infrared radiation and 12% heat. In contrast, a typical LED may produce 15% visible light and 85% heat. While being a lot more efficient, LEDs do produce heat – although because of the much lower power usage this is far less than an incandescent bulb of equivalent light output.

In all forms of lighting the production of heat therefore has to be managed.

2 Scope

These recommendations aim to outline practical measures that can be taken to reduce the number of fires caused by artificial lighting and mitigate the losses associated with these incidents. The guidance relates to portable as well as fixed lighting but does not extend to emergency escape lighting, way-finding installations or lighting for use in hazardous environments; these should be addressed at the time of the fire risk assessment undertaken in compliance with the Regulatory Reform (Fire Safety) Order 2005 and equivalent legislation in Scotland and Northern Ireland (refs. 1-5).

Further information regarding provisions for firefighter safety from electricity are set out in RISCAuthority Recommendations RC67 (ref. 6).

This document is supplemented by a checklist, based on the guidance and recommendations made and designed for use by premises operators, and in particular members of the maintenance and facilities teams as an audit tool for use on site.

The checklist can be printed, and a hard copy used or completed electronically and printed off (if needed); checklists created electronically will be saved with the document on closing as a digital record.

Additional blank copies of the checklist may be created as required for printing or electronic completion.

3 Synopsis

These recommendations outline the fire hazards associated with the various forms of lighting that are to be found in a modern workplace. Practical advice is provided, not only regarding the protection of life but also the protection of property and disruption to business continuity.

4 Definitions

Ballast

Electronic component used to control the frequency of fluorescent lamp operation.

Colour temperature

A description of the colour quality of a light source, in terms of warmth or coolness, using as a reference source a perfect black body at the stated temperature, measured at absolute temperature (degrees Kelvin).

Competent electrician

An electrician with suitable knowledge and experience such as those recognised by the NICEIC, the Electrical Contractors' Association (ECA), the National Association of Professional Inspectors and Testers (NAPIT) or Select in Scotland.

Extra low voltage

A voltage not exceeding 50V a.c. or 120V d.c. whether between conductors or to earth.

Low voltage

Greater than extra low voltage but less than 1000V a.c. or 1500V d.c. between conductors, or 600V a.c. or 900V d.c. between conductors and earth.

Luminaire support coupler

A socket outlet, normally ceiling mounted, with a plug providing mechanical support for a luminaire and the electrical connection to and from a fixed wiring installation.

Residual current device (RCD)

A mechanical switching device intended to isolate a circuit under specified conditions. When introduced into a lighting circuit to reduce the risk of electric shock, such a device should have a residual operating current not exceeding 30mA and an operating time of less than 40ms.

Separated extra low voltage

An extra low voltage system which is electrically separated from earth and from other systems in such a way that a single fault cannot give rise to the risk of electric shock.

Thermography

An infrared imaging technique whereby areas or components that are hotter than the ambient temperature appear brighter in a camera image, the brightness or colour of the image being proportional to the temperature of the area viewed.

The objective is not only to comply with relevant legislation and satisfy the requirements of insurers, but also to serve as a maintenance monitoring control that identifies early warning of 'hot-spots' that may then require suitable corrective action to take place. Such corrective action will then assist with reducing the level of risk in terms of safety for employees and other persons and property protection.

5 Recommendations

5.1 Compliance with fire safety legislation

5.1.1 A suitable and sufficient fire risk assessment should be undertaken by a competent person for all premises to which the Regulatory Reform (Fire Safety) Order 2005 (or equivalent legislation in Scotland and Northern Ireland) applies (refs 1-5). This assessment should include consideration of the fire hazards associated with lighting installations.

5.1.2 The risk assessment undertaken in compliance with the Regulatory Reform (Fire Safety) Order should be reviewed periodically. The fire risk assessment should be reviewed when any changes to the processes, the hours of operation, the layout of the building or equipment are being carried out, and when changes to the fire hazards, including changes to the lighting installation are being considered.

5.1.3 Article 38 of the Regulatory Reform (Fire Safety) Order for England and Wales (Article 23 in the case of the equivalent legislation in both Scotland and Northern Ireland) places a requirement on the responsible person to ensure that the premises and any facilities, equipment and devices provided for the use by, or protection of firefighters in the event of a fire, are subject to a suitable system of maintenance and are maintained in efficient working order and good repair. This applies to electrical cut-off switches and similar provisions.

5.1.4 The design and location of an electrical cut-off switch should be compatible with the hazard zones identified as part of any assessment undertaken in compliance with the Dangerous Substances and Explosive Atmospheres Regulations (as amended) (DSEAR) (ref. 7). DSEAR assessments should be undertaken by a competent person.

5.2 Business continuity

5.2.1 Even a small fire can have a disproportionate effect on a business if it occurs in a critical area. Lighting is a permanent hazard throughout most business premises, especially where spotlights and other intense sources are in use and thus requires careful management and maintenance to avoid unnecessary disruption to the efficient functioning of the business.

5.2.2 All businesses should take steps to maintain the continuity of their operations by making a suitable emergency plan. Guidance for this is set out in Business resilience: A guide to protecting your business and its people (ref 8). The emergency plan should address the implications of a fire, flood or other perceived disaster on all facets of the business model. It should indicate the lines of communication that should be followed and the contact details for specialist assistance, providers of alternative accommodation and suppliers of replacement equipment.

5.2.3 As well as the provision of emergency lighting, the emergency plan should address the provision of backup power supplies to ensure adequate safety lighting for high hazard, totally enclosed and business critical areas.

5.2.4 Tabletop exercises should be held periodically to test the effectiveness and suitability of the emergency plans.

5.2.5 Consideration may be given to applying commercially available computer programs, such as the ROBUST software (Resilient Business Software Toolkit) that is available free of charge (ref 9), or similar product, to develop and check the adequacy of the plan.

5.3 Fire safety management

5.3.1 Fixed wiring for all installations, including lighting circuits, should be installed by a competent electrician in accordance with BS 7671 (ref. 10) and the installation instructions supplied by the manufacturer, and be subject to periodic inspection and testing in accordance with BS 7671. The inspection report will provide details of problems that have been identified and the remedial actions that are necessary. These actions should be undertaken in a timely fashion and records kept to allow an audit trail to be established to demonstrate that all necessary remedial work has been undertaken. The inspection report will also identify the interval between subsequent inspections.

5.3.2 Lighting should be wired and fused independently from circuits providing power for other equipment. (Mains powered smoke alarms, where their installation is appropriate, are an exception to this guidance as they may be installed on lighting circuits).

5.3.3 Periodic reviews of the lighting in the premises should be undertaken to ensure that it remains suitable and sufficient for the intended purpose both in terms of the illumination and controls that are provided.

5.3.4 Planned maintenance programmes for large commercial facilities should include periodic thermographic surveys of the lighting installations to allow potential problems to be identified and remedied before they present a significant risk to safety. Following the initial survey, the frequency of further thermographic re-inspections should be subject to a risk assessment undertaken by a competent thermographer. It should be recognised that the optimum frequency of inspection will be determined by the needs of the equipment assets. As they age, are heavily loaded, or poorly maintained, inspections may become more frequent. (The competence of the thermographer should be demonstrated by recognition by the United Kingdom Thermography Authority (UKTA) competent person scheme or a similar recognised form of certification.)

5.3.5 The lights should introduce the minimum of fire hazards to the workplace and be economic to operate.

5.3.6 Managers should liaise closely with contractors working in their premises. Contractors should be prohibited from covering lights and be required to inform managers where it is necessary to place combustible materials close to luminaires or make changes to the switching arrangements.

5.3.7 While there are advantages in leaving lights in buildings on at night as a security measure, significant energy savings may be made by reducing the number of luminaires left switched on without reducing the deterrent value of the lighting.

5.3.8 Specialist advice should be taken when designing or adjusting the position, operation and form of external security lighting, especially when it is an important ancillary to a CCTV installation.

All staff should be vigilant and report:

- any instances of combustible materials seen in the immediate vicinity of luminaires in the workplace
- any instance of water seen leaking into buildings or from around ceiling roses and the like
- any indication of overheating of fittings (such as discolouration of plastic bayonet fittings or support materials)
- any malfunction or prolonged flickering of lights
- any fish-like odour that may be arising from the luminaire or its fittings
- areas where additional lighting is required or the existing lighting is perceived as being too intense
- any unauthorised attempts that are made by to reduce the intensity of a light by covering or shading the unit (replacing the bulb or tube with one of lower wattage is a much safer alternative)

5.4 General precautions

5.4.1 When planning lighting installations, the need to be able to reach the luminaires safely for periodic inspection, cleaning and maintenance, including the changing of bulbs, should be borne in mind.

5.4.2 All lighting circuits other than separated extra low voltage systems should be provided with an earth conductor.

5.4.3 Metal casings, brackets, shades, reflectors and similar components of lighting fittings should be bonded and earthed.

5.4.4 All lighting fittings should be properly secured in position. Where they are suspended, the material used for that purpose should be sufficiently strong to withstand the effects of movement caused by draughts and similar influences.

5.4.5 Unless designed to be connected directly to the circuit wiring, at each fixed lighting point one of the following should be used:

- a ceiling rose
- a luminaire supporting coupler
- a batten lampholder

5.4.6 Where small lights are to be suspended by their cables, care should be taken that the weight to be supported is not excessive for the cable and accessories to be installed.

5.4.7 When the reflectors, shades or other components are to be changed, or there is any doubt concerning the adequacy of the means of supporting the lighting, the mode of suspension should be re-assessed.

5.4.8 The periodic inspection of the lighting should include a visual inspection of the means of suspension to ensure that remains fit for purpose.

5.4.9 A lighting installation should be controlled by means of a switch or switches, or other suitable control system which, where necessary, should be designed for use with discharge lighting circuits. Switches and other control systems should be installed in readily accessible positions where they will not put the operator in danger.

5.4.10 Care must be taken in all instances where lights are controlled by timers, whether for security purposes or otherwise. Timers should not be used if there is a possibility that a light unit may be inadvertently covered or knocked over while not in use. Similar care must also be taken with lights that are activated by photoelectric cells.

5.4.11 The use of lighting controlled by timing mechanisms or photoelectric cells should be reviewed whenever contractors are at work on the premises.

5.4.12 All replacement lamps should be suitable for the fittings in which they are to be introduced, manufactured by reputable companies and comply with appropriate international standards.

5.4.13 Light units that are damaged or broken should not be used; suitable remedial action should be taken as soon as possible.

5.4.14 When a fuse ruptures or circuit breaker trips as a result of a light bulb blowing or a fault in a light fitting, the problem must be identified and the unit repaired, replaced or taken out of service before the power is restored.

5.4.15 Equipment and facilities including electrical light fittings and bulbs should be compatible with the hazard zones identified as part of any assessment undertaken in compliance with the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR (as amended) (ref. 7). For example, if a bulb breaks, the filament remains glowing for only a very short time before it oxidises and burns but nevertheless is capable of igniting materials such as the vapours of flammable liquids and flammable gases in the vicinity. DSEAR assessments should be undertaken by a competent person. Further information is set out in RISCAuthority Recommendation RC30 (ref. 11).

5.4.16 Damaged bulbs should be replaced and not used.

5.4.17 Personnel should not stare at discharge tubes when they are in operation. Staff likely to work on the light units should be instructed in the ultraviolet light hazards associated with the units and the necessary safety measures to be taken.

5.4.18 Relevant staff, such as lift truck drivers, should be instructed in the hazards of the lights installed and the measures to be observed when operating in their vicinity.

5.5 Firefighters' switches

5.5.1 A firefighters' switch should be provided in the low voltage circuit supplying:

- exterior electrical installations operating at a voltage exceeding low voltage
- interior discharge lighting installations operating at a voltage exceeding low voltage

This requirement does not apply to a portable discharge lighting luminaire or to a sign of rating not exceeding 100W and fed from a readily accessible socket outlet.

5.5.2 Firefighters' switches should be provided on the low-voltage side of the relevant circuits.

5.5.3 The Regulatory Reform (Fire Safety) Order (ref. 1) requires that not less than 42 days before the installation of a firefighters' switch, the fire authority be notified of the proposed location and how it is to be coloured and marked. A switch installed in compliance with BS 7671 (ref. 10) is deemed to meet this requirement but the fire authority should still be informed of the proposed installation for their records.

5.5.4 Every discharge lighting installation on the exterior of each premises should, where practicable, be controlled by a single firefighters' switch to simplify the process of isolating all circuits in an emergency.

5.5.5 Similarly, every internal discharge lighting installation shall be controlled by a single firefighters' switch, independent of any switch for the exterior installation.

FAQ

Are fire fighters' switches necessary on internal discharge lighting circuits? (5,5,1)

5.5.6 Firefighters' switches should be located out of reach of the public but accessible to the fire brigade.

5.5.7 Prominent notices should be displayed identifying the switches and the equipment they control.

5.5.8 Before pitching a ladder against a building to which luminous discharge lights are

What form(s) of lighting unit should be installed in a suspended fire rated ceiling?

fitted, or working near such signs, the circuit should be isolated by pushing the switch upwards.

5.6 Installations in ceilings

5.6.1 Where a quartz halogen downlighter or other form of recessed luminaire is used in a fire rated ceiling, a suitable back plate or cover should be fitted so as to maintain the fire resistance of the ceiling.

5.6.2 Suspended ceilings are often installed in commercial premises. Where these consist of a metal framework supporting acoustic or decorative panels they are not considered to be extraneous or exposed conductive parts and do not require to be bonded and earthed.

5.6.3 Electric cables should not be laid directly on the metal grid of a suspended ceiling so as to avoid contact with any sharp edges that may be present. They should be supported by a suitable catenary system, by cable trays or trunking, or be attached to the ceiling support rods by cable ties or clips.

5.6.4 Where cable ties are used these should be composed of metal rather than plastic to prevent cables falling and presenting a hazard to firefighters in the event of a fire.

5.6.5 Final connections to luminaires should be by means of a luminaire support coupler, keeping the final flex connection as short as possible. This method of connection has the benefit of allowing some degree of flexibility regarding the positioning of the luminaire.

5.6.6 Lighting diffusers are translucent or open structured elements that allow light to pass through. Diffusers intended to form parts of a fire rated ceiling should have been satisfactorily tested as part of the ceiling system that is to be used. This condition does not apply to any diffuser that forms part of a light fitting fixed beneath or suspended from the ceiling.

5.6.7 In the case of diffusers that form part of a fire rated ceiling, the wall and ceiling surfaces exposed within the space above the diffuser should be lined with materials suitable for the location in which lights are situated. All holes around cables passing through these structural elements should be fire stopped so as to provide an equivalent degree of fire resistance as the element in which they are located.

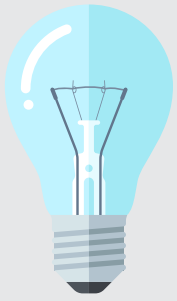
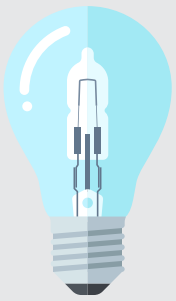
	Traditional incandescent	Halogen incandescent	Compact fluorescent (CFL)	Light emitting diode (LED)
				
Approximate wattage needed to produce 1600 lumens	100	77	23	20
Decsription	Electric current heats an incandecent bulb's tungsten filament until it glows	Halogen gas, such as iodine, inside the bulb prevents wear on the filament allowing it to glow brighter	Excited gas in a CFL tube emits ultraviolet photons, which coax the bulb's coating to emit visible light	An LED bulb contains many small semiconductor units; each emits light when a voltage is applied
Life span (hours)	750	1000	10,000	20,000
Indicative cost	£0.37	£1.59	£2.23	£45.00

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Figure 3: Comparison of common forms of lamp

What form of lighting should be installed to replace incandescent lights of poor efficiency?

5.6.8 There are no restrictions on the extent of diffusers that may be installed if they are of classification TP(a) (rigid). If the diffusers are of classification TP(b), however, the conditions on their use as set out in paragraphs 6.13-6.15 of Approved Document B Volume 2 to the Building Regulations (ref. 12) should be complied with.

5.7 Incandescent lamps

Incandescent lamps, or bulbs, are the least efficient form of lighting. They operate by heating a filament in an atmosphere of argon at low pressure in order to make it glow and produce light. During this process a significant amount of heat is formed. This form of light bulb is becoming much less readily available; they tended to have a short life of 500 to 3,000 hours but were cheap and easy to install and replace.

The envelope temperature of a filament bulb depends on the wattage of the bulb but in the case of domestic light bulbs is not normally high enough to ignite cellulose materials with which they come into brief contact. A small piece of paper or fabric in contact with bulbs may scorch but does not normally ignite. Larger quantities of paper or cloth, however, present an insulating effect and cause the envelope temperature of even a low wattage bulb to rise significantly (to over 500°C), resulting in the ignition of the material. Incandescent light bulbs are therefore a significant fire hazard.

Compact fluorescent lamps are now commonly available as economic direct replacements for incandescent lamps. These bulbs, together with those incorporating LEDs, operate at lower temperatures and thus do not present such a severe fire hazard.

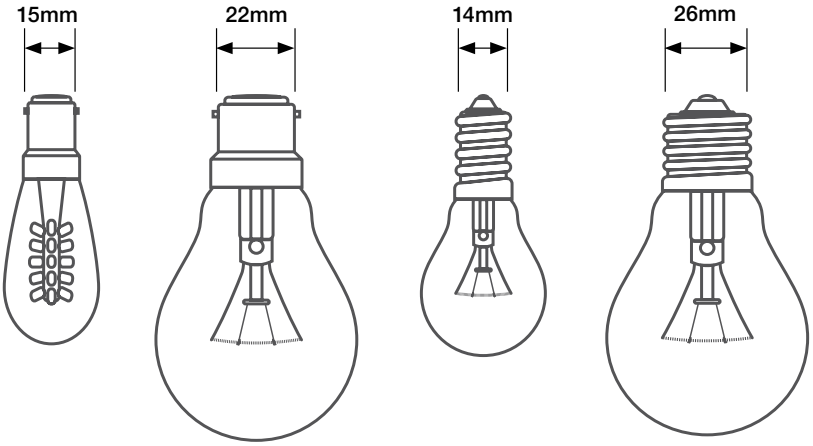

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Figure 4: The four main types of light bulb cap sizes

5.7.1 Light bulbs, and especially incandescent light bulbs should not be allowed to come into prolonged contact with combustible materials.

5.7.2 Where the maximum wattage of a bulb is specified on a shade or fitting this should not be exceeded.

5.7.3 While incandescent bulbs may be replaced by energy saving lamps, this should only be done where it can be undertaken without modifying the light fittings in any way. Advice should be sought prior to any change where the lamp is controlled by a dimmer circuit.

5.7.4 Care should be taken to ensure that replacement lamps with Edison screw fittings are screwed fully into place (but are not over tightened) to prevent arcing occurring at the base of the fitting.

5.7.5 In the rare cases where connection is to a direct current supply, care should be taken to ensure that Edison screw fittings are connected with the correct polarity.

5.7.6 Except in certain circumstances, for example where a lampholder and its wiring are enclosed in earthed metal or insulating material, or where separate overcurrent protection is provided, a lampholder shall not be connected to any circuit where the rated current of the overcurrent protective device exceeds the value indicated in Table 2.

Type of lamp holder	Type of fitting		Maximum rating (amps) of overcurrent device protecting the circuit
Bayonet fittings (BS EN 61184)	B15	SBC	6
	B22	BC	16
Edison Screw (BS EN 60238)	E14	SES	6
	E27	ES	16
	E40	GES	

Figure 5: Overcurrent protection of lampholders

5.7.7 A filament lamp should not be installed in a circuit operating at a voltage exceeding 250V.

5.7.8 A ceiling rose shall not be used for the attachment of more than one flexible cord unless it has been specially designed for multiple pendants.

5.8 Fluorescent lights

Some forms of modern energy efficient bulbs incorporate miniature fluorescent light tubes formed to fit in a small volume (compact fluorescent lights). These may be considered to be very similar to incandescent bulbs although they use less energy and produce less heat.

Traditional fluorescent tubes consist of a sealed glass tube containing an electrode at each end. The tube is filled with mercury vapour at a low pressure, and coated internally with a mixture of chemicals that fluoresce in ultraviolet light. A choke is present in the circuit to assist in the starting of the light and prevent a harmful rise in voltage. When switched on, a starter circuit provides a sufficiently high voltage to initiate a discharge in the mercury vapour in the tube. The arc produced results in the emission of light, especially ultraviolet light that in turn causes the coating of the tube to glow.

Fluorescent light tubes are an effective method of producing light from electricity and produce less heat than incandescent bulbs. They can have a life of up to 24,000 hours. Fluorescent lamps, however, are more expensive and complex as they incorporate components to start and control the arc.

Fluorescent light tubes do not get excessively hot apart from in the region of the electrodes, where temperatures of 60-80°C may be attained. The chokes, however, can overheat and ignite the surface on which the fitting is mounted, Several fires have been attributed to this cause.

A disadvantage of the use of these tubes is the need for their safe disposal due to the small amounts of mercury that they contain.

Fluorescent lights should not be attached directly to a combustible surface. (5.8.1)

5.8.1 Fluorescent lights should not be attached directly to a combustible surface.

5.8.2 When fluorescent light tubes start to flicker they should be replaced as the faulty tube is likely to overheat.

5.8.3 Leaving a failed tube in position, using tubes of the wrong specification, incorrect wiring, incorrect voltage or power surges can lead a ballast to fail. One of the symptoms of ballast failure is that they can become very hot and thus be a fire hazard. The ballast should incorporate a thermostat, but after operating and allowing the ballast to cool down the power then comes back on again. Fluorescent lights that turn off and then on again intermittently may therefore be suffering from a ballast failure and should be taken out of service.

5.8.4 Lights incorporating old (pre 1979) forms of ballast should be replaced. If the ballast is found to be leaking a clear or light coloured oil, it should not be touched until specialist advice has been sought as the leakage may contain polychlorinated biphenyls (PCBs), which are now recognised as being carcinogenic.

5.8.5 Where a ballast unit has failed it is normally economic to replace the whole lighting assembly and this is the preferable course of action. Where this is not possible, a competent person should be engaged to select and fit a new ballast unit.

5.8.6 Where ultraviolet tubes are in use in discos and similar places of entertainment, they should be protected or positioned so as to be out of the direct eyesight to protect the eyes of everyone in the vicinity.

5.8.7 Used fluorescent light tubes should not be disposed of with normal commercial rubbish but be treated as hazardous waste. Tubes that are no longer serviceable should be collected together to await safe disposal. It is sound practice to protect used tubes by storing them in the packaging that has been removed from the replacement lamps.

Figure 6: Overheating fluorescent light

5.8.8 Care should be taken when handling fluorescent light tubes as if they break and a cut results, the healing process may be interfered with by the phosphor-coated glass. If a cut is received, medical attention should be sought and the medical staff informed of the cause of the injury.

5.8.9 The breaking of used lamps to reduce the bulk for storage should be avoided.

5.8.10 If a fluorescent tube is broken accidentally all pieces should be swept up and stored safely to await disposal. Specialist advice should be sought regarding the safe disposal of fluorescent light fittings, especially any containing mercury.

5.8.11 Modern energy saving bulbs that incorporate fluorescent tubes should be disposed of by taking them to a household hazardous waste collection centre (usually part of a local authority recycling centre).

5.9 High intensity discharge lamps

This form of lighting is ideal for large buildings or areas such as stores, warehouses, auditoriums, outdoor parking and applications where efficiency is a priority. High intensity discharge (HID) lighting is also used in medical equipment and in domestic and commercial sunlamps.

The lamps operate at high internal temperature (up to 1300°C) and high pressure (up to 6 bar in the case of metal halide lamps, 3.5 bar otherwise) and thus the consequences of a catastrophic failure can be serious. For this reason lamps are now fitted with enclosures that in the event of catastrophic failure minimise the likelihood for hot particles to present ignition sources.

The lamps, which range in output from 75W to 1500W, have a life of between 5,000 and 24,000 hours and produce a greater amount of light than a standard halogen bulb while consuming less power.

Street lighting is of this form, the lamps commonly incorporating sodium in the construction to emit an intense yellow colour. Other lamps incorporate other gases, mercury vapour or metal halides, such as sodium iodide or scandium iodide to stimulate light production.

The light is produced from an arc discharge between two tungsten electrodes in a translucent or transparent fused quartz or fused alumina arc tube. To operate, the bulb requires a ballast circuit, which supplies the correct starting voltage to strike and maintain the arc, and regulate the current once the arc is established.

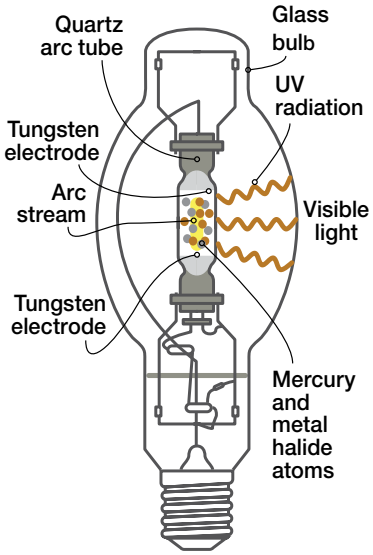

Figure 7: HID lamp technology

High intensity discharge lights require a warm-up period, typically of the order of 20 seconds, before reaching their full light output. If power to the lamp is lost, or the lamp is turned off, the tube must be allowed to cool before it is turned on again.

5.9.1 Care should be taken when planning the locations of high intensity discharge lamps. They should not be installed directly over combustible materials where hot particles from a broken bulb could ignite materials below. Stock should be arranged so that the lamps are above aisles.

5.9.2 High intensity discharge lamps should be sited at least 1m laterally from combustible elements of construction.

5.9.3 Care should be taken to avoid water ingress into light fittings, especially in the case of sodium lights.

5.9.4 Although lamps are available separately, they should always be fitted within enclosures. New lamps should be fully enclosed, the use of light fittings with integral containment barriers made of tempered or borosilicate glass is recommended. Plastic or aluminium components may melt and should not be used. The need for enclosures extends to shatter protected lamps, especially those where a pulse start ballast is fitted.

5.9.5 The installation of high intensity discharge lamps from 'kits' of parts should only be undertaken by a competent person. Existing fittings should not be modified nor non-approved enclosures or containment barriers be introduced without consulting the manufacturer.

5.9.6 Wherever possible, MP rated metal halide lamps (i.e. lamps with an integral quartz shroud) should be used. Where lamps that are not MP or open rated have to be used a containment barrier or other form of shroud should be introduced to protect the arc tube. Plans should be made for the replacement of these types of fittings.

5.9.7 The advice of the manufacturer should be sought before retrofitting containment barriers as this can cause overheating of some types of lamp.

5.9.8 The types and ratings of the lamps selected for specific locations should be appropriate for the fittings and meet the manufacturer's specifications.

5.9.9 Care should be taken to ensure that HID lights are used in the specified horizontal or vertical orientation.

5.9.10 If turned off, several minutes should be allowed for the gas to cool before turning HID lights on again unless the installation incorporates suitable hot restrike devices.

5.9.11 The bulb and ballast must be correctly matched. If the rating of the bulb is too low for the ballast, it can overheat and explode. Conversely, if the rating of the bulb is too high it will have a shortened life and, in addition, the ballast may overheat as the bulb is not able to reach the correct working temperature.

5.9.12 In all cases where bulbs or ballast units are being replaced, care must be taken to ensure that electronic ballast units and the intended bulbs are compatible.

5.9.13 When assessing the risks associated with the location of high intensity lamps, the temperatures reached by the fittings and the radiant heat flux from the bulb should be taken into consideration.

5.9.14 Because metal halide bulbs operate at very high temperatures and pressures the glass lamps should be handled with care and kept clean. New bulbs should not be touched with bare hands; contamination can degrade the lamp performance and cause premature failure. If necessary, the lamp may be carefully cleaned by wiping with a lint-free cloth or swab moistened with denatured alcohol.

5.9.15 Lamps with evidence of scratching or other form of damage should not be used.

5.9.16 Symptoms of the approach of the end of life for a discharge tube include low light output and intermittent starting. Visual signs include blackening at the ends of the tube. It is advisable to replace discharge tubes at 70% of their rated life before they fail completely. This is also an economic factor as lights reaching the end of their life draw more power and thus become less economic to operate.

New metal halide bulbs should not be touched with bare hands; contamination can degrade the lamp performance and cause premature failure. (5.9.14)

HID lamps should only be replaced by a qualified electrician, and only when the lamps are cold and the power has been locked off. Care should be taken to avoid touching the inside surface of the reflector and the connecting wires during the replacement process. (5.9.18)

5.9.17 The use of HID lamps incorporating a monel switching element which extinguishes the discharge when the lamp is broken or reaches the end of its working life is recommended.

5.9.18 HID lamps should only be replaced by a qualified electrician, and only when the lamps are cold and the power has been locked off. As well as avoiding touching of the bulb with bare hands (see 5.9.14), care should be taken to avoid touching the inside surface of the reflector and the connecting wires during the replacement process.

5.9.19 When replacing lamps, the new bulb must have the correct coding letter. It should not be assumed that the coding letter on the lamp being removed is correct. Substituting a different type of bulb may result in incompatibility with the ballast, arc voltage or power supply.

5.9.20 In some fittings the discharge tubes operate at direct current (DC) and thus the polarity of the wiring must be strictly observed.

5.9.21 No attempt should be made to remove discharge tubes while they are hot, and they should never be handled while operating.

5.9.22 Bulbs that flash on and off need to be replaced immediately, following testing of the unit. The fault may be caused by problems with the ballast or overheating.

5.9.23 Failed discharge tubes should be disposed of as hazardous waste; they should not be discarded with other rubbish as they may contain traces of metals such as mercury that are hazardous to health and the environment.

5.9.24 Because of the hazards associated with sodium, mercury or other metals, high intensity discharge lamps should not routinely be broken prior to disposal.

5.9.25 Where lamps are operated continuously, they should be switched off for at least 15 minutes every week. Any defective lamps liable to fail should be identified by this control procedure.

ThinkStock/DG303Pilot

Figure 8: Luminous discharge tube signs can take many forms

5.10 Luminous discharge lamps

The form of luminous discharge lamp commonly used for advertising signs is a type of high intensity discharge lamp. These tend to be long tubes of small diameter that can be bent to form letters or symbols.

When a high voltage is applied to electrodes in such a tube containing an inert gas at low pressure, the gas becomes luminous and emits wavelengths of light that are characteristic of that gas. Thus neon produces a red light, carbon dioxide white light and hydrogen green.

The tubes require a voltage of at least 3000V to operate and thus transformers are used to step up the voltage from a commercial supply. In practice, there may be several such transformers and associated control circuits installed as part of a single installation; the hazard being addressed by the provision of a firefighters' switch or in some cases multiple switches.

5.10.1 Luminous discharge lamps forming advertising and similar signs should be positioned so as to be out of reach from ground level and any walkways in the vicinity.

5.10.2 Luminous discharge lamps should be protected by a firefighters' switch. Further details are set out in section 5.5.

5.11 Quartz halogen lamps

Quartz halogen lamps are relatively cheap and require no starter circuits. They consist of a small bulb with an incandescent tungsten filament in the envelope with a gas containing traces of a halogen, usually iodine. They are more expensive to run than discharge lamps.

As the bulb is small and strong, it is filled with inert gas, (in the case of quartz halogen lamps krypton or xenon), to a higher pressure than is the case for normal incandescent bulbs.

The compact filament area may be used to focus light onto small areas and therefore these lamps are often used for feature lighting. Quartz halogen lamps may operate at mains voltage or a lower voltage through a transformer.

ThinkStock/EvilWata

ThinkStock/Yastrebinsky

Figure 9: Quartz halogen lamps

When mains voltage halogen lamps come to the end of their life there is a chance that internal arcing may occur and thus they should be designed to prevent this from occurring (sometimes by incorporating an internal fuse). Some lamps, however, can shatter, and this can lead to serious injury and damage.

In order to work efficiently, the glass envelope of the bulb must be small and very hot, generally over 250°C, it is therefore made of either quartz or heat resistant glass. Although this form of envelope withstands heat better than glass, it has a disadvantage of absorbing less ultraviolet radiation. Exposure of the skin to ultraviolet radiation increases the risk of developing skin cancer.

Temperatures of the envelopes of quartz halogen lights have been found to be as high as 600-900°C in some instances. The temperature of the housing or reflector associated with the lamp may be proportionately high. Combustible materials in contact with a quartz halogen bulb, or in some cases in the reflector or fittings, may therefore ignite in a short period of time.

Halogen lamps also have the capability to ignite fuels by radiant heat and melt diffusers, shades and fixtures.

Some bulbs have also been known to shatter as a result of traces of sweat being left on the glass by the installer. When heated this has charred to carbon resulting in local overheating of this small black spot on the surface of the bulb.

5.11.1 When assessing the hazards associated with the location of quartz halogen lamps, the temperatures reached by the fittings and the radiant heat flux from the bulb should also be taken into consideration.

5.11.2 Quartz halogen lamps should not be attached directly to combustible elements of construction.

5.11.3 When fitted to the outside of buildings, quartz halogen lamps should not be sited where the heat from the bulb or casing will present a hazard to soffits, eaves or other combustible materials.

5.11.4 Where necessary, measures should be taken to prevent birds from nesting on top of external quartz halogen lighting units.

5.11.5 Quartz halogen lamps should not be fitted anywhere on the outside of buildings with thatched roofs without first consulting the insurers of the property.

5.11.6 Care must be taken to ensure that if incandescent bulbs are replaced with quartz halogen lamps, the fittings are suitable for use with the larger heat outputs that may result.

5.11.7 As quartz halogen lamps are available to operate at reduced voltage from transformers as well as at mains supply it must be ensured that when replacing lamps, those of the correct specification are selected.

5.11.8 Where possible, the use of dimmer controls in retail and similar premises should be avoided. Instead, the lamps should be replaced with units with lower light output. Where dimmers are used to ‘soft start’ the lamps to prolong their life, the equipment must be compatible for use with the particular lamps that are installed.

5.11.9 A minimum distance of 450mm or the minimum distance recommended by the manufacturer, whichever is the greater, should be kept between a halogen light bulb and any combustible material. Particular care in this respect should be taken in retail premises and similar properties or where there may be some movement of combustible materials in the immediate vicinity of quartz halogen lights.

5.11.10 The use of unfiltered desk top lamps should not be permitted if they are used for more than two hours a day, and are sited within 600mm of the user.

5.11.11 All tungsten halogen lamps should either be fitted with an appropriate UV filter or a bulb with a glass outer element. In some forms of modern devices a quartz halogen tube is supplied within a conventional glass bulb with standard caps fittings (see figure 9).

Quartz halogen lamps should not be fitted anywhere on the outside of buildings with thatched roofs without first consulting the insurers of the property. (5.11.5)

What measures can be taken to prevent birds from nesting on top of external quartz halogen lighting units?

5.12 LED lighting

LED lights have been available for several years and have gained popularity as a result of the quality of light provided and their economy in use. LED lighting fixtures have a light spectrum much better than that of discharge lamp and can be used in virtually any environment.

The useful life of LEDs is up to 50,000 hours, with a very slow decay in the quality of the light that is produced. In addition they may be switched on and off at will with the immediate reintroduction of high quality light.

LED fittings are now readily available for a wide range of applications including general illumination, display lighting, emergency lighting and for use in vehicles and process equipment.

5.12.1 LED products and related equipment should comply with BS 62504 (ref. 13)

5.12.2 Although in many cases replacing traditional lights with LED alternatives is not a complex process, all work on the electrical installation should be undertaken by a qualified electrician.

5.12.3 As LED bulbs contain small quantities of some heavy metals (but not mercury) advice should be taken when disposing of large numbers of LED units that are unwanted or no longer function.

5.13 External lighting

5.13.1 External motion activated lighting should preferably take the form of LED luminaires as they produce less heat than most other forms of lighting.

5.13.2 External lights should not be attached directly to combustible surfaces.

5.13.3 External lights should be located at least 250mm from overhanging eaves and be protected, where necessary, from nesting birds.

External lights should not be attached directly to combustible surfaces. (5.13.2)

5.14 Portable lighting

In addition to lighting on construction sites and work in other remote locations, the proliferation of electrical equipment in offices has resulted in the introduction of portable desk and standard lamps. These are often associated with extension leads and adaptors, which are themselves hazardous and require maintenance and management.

In common with all other items of portable electrical equipment, portable lamps of all types should be subject to in-service inspections in compliance with the Electricity at Work Regulations 1989 (ref. 14). This normally takes the form of periodic portable appliance testing (PAT).

The legislation does not define the period between tests. One solution is to test all portable lights at a defined period, say annually, but in large organisations a risk assessed approach is preferable. This may allow initial testing of items that are rarely moved around the premises to be undertaken every 2-4 years, while identifying lights, such as hand held lamps, inspection lamps on leads, or floodlights on tripods that are subject to a great deal of handling and use, to be tested more frequently, perhaps every three months, depending on usage and environment.

5.14.1 All portable lighting should be fused appropriately. Where connection is by means of a plug, it must be ensured that the cartridge fuse is suitable for the circuit (for lighting it should normally be a 3 amp fuse).

5.14.2 All portable lighting must be subject to an in-service inspection (PAT testing) periodically in compliance with the Electricity at Work Regulations 1989. The results of the tests should be recorded; this may be done electronically with the items of equipment each being labelled with an asset number or bar code.

5.14.3 Staff should remain vigilant and carry out a brief visual examination of portable electrical equipment on each occasion that it is used. Any fault involving the luminaire, fitting, flex or cable, including minor chaffing of cables and the like, should be reported to a competent person without delay with the apparatus being clearly labelled and taken out of service until the problem is rectified.

How often should portable electrical lights be PAT tested? (5.14)

www.prweb.com/releases/larsonelectronics/ledstringlights/prweb11960611.htm

Figure 10: LED arrays have many uses, including temporary catenery lighting

5.14.4 When portable lighting is being used staff should prevent a lamp coming into contact with combustible materials, being dropped, knocked over or otherwise misused to create a potential source of ignition.

5.14.5 Decorative lights and similar features used in the workplace temporarily (for example, at the time of Christmas and other festivals) should also be PAT tested. These lights should be turned off and unplugged when the premises are vacated at the end of the work period.

5.14.6 Decorative lights (and decorations) should not be suspended from luminaires, automatic fire detectors, sprinkler heads or other safety equipment.

5.14.7 All portable lamps should be enclosed with guards to protect them from mechanical damage.

5.14.8 Portable lamps (other than desk lamps) should be turned off at the socket and unplugged at the end of the period of work.

5.14.9 Unless designed specifically for that purpose, portable lights (including many forms of torches) must not be used in areas where there is a possibility of a flammable atmosphere being produced.

5.14.10 Because of the high temperatures reached by the lamps and fittings, it is recommended that quartz halogen lamps are not used for portable illumination.

5.14.11 All types of light bulbs and luminaires retained for use in specialist applications should be clearly labelled as to the equipment for which they are intended, to avoid wrong bulbs being fitted resulting in the production of excessive heat.

FAQ

What form of temporary lighting may be used on a construction site? (5.15.4)

5.15 Temporary installations

5.15.1 All temporary installations, including those on construction sites, should be installed in accordance with the requirements of BS 7671 (ref. 10).

5.15.2 All temporary electrical work on construction sites, including the provision of electric lighting, should be carried out by a competent electrician.

5.15.3 Temporary lighting installations should be inspected regularly and tested at intervals not greater than every three months. The results of the tests should be recorded and any remedial action identified implemented without delay.

5.15.4 Where low voltage festoon lighting cannot be used on construction sites and other outdoor areas, sealed fluorescent light tubes are recommended.

5.15.5 Temporary lighting used externally for visual effects should operate at extra low voltage and, unless specially designed for the purpose, should be sited away from water features and similar hazards.

5.15.6 Where a large number of temporary lights, or a temporary installation with a significant demand on power supplies is being planned (for example in the case of a temporary stage production), a competent electrician should be consulted with regard to the provision of an additional or temporary power supply.

5.15.7 All luminaires and catenary installations installed outside buildings should be planned so as to be safe from passing vehicles.

5.15.8 Similarly, any temporary installations planned within buildings should be well clear of hazards such as travelling cranes and other moving plant.

5.15.9 All signs for decorative and publicity purposes should be designed and constructed in accordance with the requirements of BS 559 (ref. 15).

5.15.10 Specialist advice should be sought with regard to health and safety hazards associated with the introduction of unenclosed lasers into the workplace. Great care must be taken to ensure that lasers cannot shine directly into peoples' eyes.

5.15.11 Lighting designed for use outside the equipotential bonding zone (i.e. lights used in gardens and grounds) should be protected by residual current devices or operate at extra-low voltage.

Only torches, hand lamps and other portable equipment specifically designed for the purpose should be used in areas where a flammable atmosphere may be produced. (5.16.3)

5.16 Stored energy supplies

The powering of a lamp by a battery rather than a conventional power supply does not necessarily render the equipment safe as a potential source of fire. Many incidents have occurred where incorrect replacement of bulbs or fuses has led to overheating and subsequent ignition, on occasion leading to serious fires.

5.16.1 The manufacturer's instructions as to the use and care of the batteries and similar equipment must be followed, particularly with regard to recharging in the case of lamps powered by rechargeable cells. The charging should be undertaken in an area away from combustible materials.

5.16.2 No attempt should be made to recharge batteries that were not designed for this purpose.

5.16.3 Only torches, hand lamps and other portable equipment specifically designed for the purpose should be used in areas where a flammable atmosphere may be produced.

5.16.4 Where several chargers may be in use in the same area, the equipment for which each is intended should be clearly identified.

5.16.5 Spare batteries for torches should be stored in a clean, dry place away from direct sunlight. Where rechargeable or non-standard batteries are kept for a particular purpose these should be labelled prominently to avoid them being selected for use in the wrong equipment.

5.17 Fire protection

5.17.1 If smoke or flames are seen coming from any form of lighting unit, the circuit should be isolated by use of the switch where possible. In many cases removing the source of heat in this way may serve to solve the problem.

5.17.2 In the case of a sustained fire, water-based firefighting media should be avoided, although spray foam extinguishers are safe if the spray should accidentally come into contact with live components or wiring.

5.17.3 Fires involving lighting units should be fought with carbon dioxide extinguishers. Where the burning materials are within an enclosure or lighting unit, carbon dioxide is the most effective extinguishing agent as it is able to reach the seat of the fire more easily. Once the power supply has been isolated, a water or other appropriate extinguisher may be used to extinguish other combustible materials in the area that may be alight.

5.17.4 When the fire is out, the lighting units involved should be inspected and replaced (or repaired in the case of minor damage only) by a competent person before being used again.

6 Checklist – Fire hazards of electrical lighting

This checklist is based on the guidance and certain recommendations made within RC37: *Recommendations for the control of fire hazards arising from electrical lighting* and designed for use by premises operators, and in particular members of the maintenance and facilties teams, as an audit tool for use on site. The references associated with each question below and shown in brackets relate to the relevant section of RC37.

The checklist can be printed, and a hard copy used or completed electronically and printed off (if needed); checklists created electronically will be saved with the document on closing as a digital record.

Additional blank copies of the checklist may be created as required for printing or electronic completion.

Premises

Location/area

Date **Time** **Inspection undertaken by**

			Action required	Due date	Sign on completion
6.1	**Fire safety management**				
6.1.1	Is the fixed wiring for all installations, including lighting circuits, inspected and maintained by a competent electrician in accordance with BS 7671 and the installation instructions supplied by the manufacturer? (5.3.1)	◯ Yes ◯ No ◯ N/A Clear			
6.1.2	Are lighting circuits wired and fused independently from circuits providing power for other equipment? (5.3.2)	◯ Yes ◯ No ◯ N/A Clear			
6.1.3	Are periodic reviews of the lighting in the premises undertaken to ensure that it remains suitable and sufficient for the intended purpose both in terms of the illumination and controls that are provided? (5.3.4)	◯ Yes ◯ No ◯ N/A Clear			
6.1.4	Do planned maintenance programmes include periodic thermographic surveys of the lighting installations to allow potential problems to be identified and remedied before they present a significant risk to safety? (5.3.5)	◯ Yes ◯ No ◯ N/A Clear			
6.2	**General precautions (section 5.4)**				
6.2.1	Can luminaires be reached safely for periodic inspection, cleaning and maintenance, including changing of bulbs?	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.2.2	Are all lighting circuits other than separated extra low voltage systems provided with an earth conductor? (5.4.2)	◯ Yes ◯ No ◯ N/A Clear			
6.2.3	Are metal casings, brackets, shades, reflectors and similar components of lighting fittings bonded and earthed? (5.4.3)	◯ Yes ◯ No ◯ N/A Clear			
6.2.4	Are all lighting fittings properly secured in position? (5.4.4)	◯ Yes ◯ No ◯ N/A Clear			
6.2.5	Is each fixed light connected by means of a ceiling rose, luminaire support coupler or batten lampholder? (5.4.5)	◯ Yes ◯ No ◯ N/A Clear			
6.2.6	Where small lights are to be suspended by their cables, is care taken that the weight to be supported is not excessive? (5.4.6)	◯ Yes ◯ No ◯ N/A Clear			
6.2.7	Is the means of suspension of lights in good condition and fit for purpose?	◯ Yes ◯ No ◯ N/A Clear			
6.2.8	Is the lighting installation controlled by means of a switch or switches, or other suitable control system which is, where necessary, designed for use with discharge lighting circuits? (5.4.9)	◯ Yes ◯ No ◯ N/A Clear			
6.2.9	Are all replacement lamps held in storage suitable for the fittings in which they are to be introduced, manufactured by reputable companies and compliant with appropriate international standards? (5.4.12)	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.2.10	When a fuse ruptures or circuit breaker trips as a result of a light bulb blowing or a fault in a light fitting, is the problem identified and the unit repaired, replaced or taken out of service before the power is restored? (5.4.14)	◯ Yes ◯ No ◯ N/A Clear			
6.2.11	In all areas where a flammable atmosphere (gas, vapours or dust) may occur, are appropriately protected fittings used? (5.4.15)	◯ Yes ◯ No ◯ N/A Clear			
6.2.12	Are relevant staff, such as lift truck drivers, instructed in the hazards of the lights installed and the measures to be observed when operating in their vicinity? Is appropriate signage provided in areas accessed by fork lift trucks warning of the lighting units sited locally? (5.4.18)	◯ Yes ◯ No ◯ N/A Clear			
6.3	**Firefighters' switches (section 5.5)**				
6.3.1	Are the firefighters' switches provided on the low-voltage side of relevant circuits? (5.5.2)	◯ Yes ◯ No ◯ N/A Clear			
6.3.2	Is every discharge lighting installation on the exterior of each premises controlled by a single firefighters' switch?	◯ Yes ◯ No ◯ N/A Clear			
6.3.3	Is every internal discharge lighting installation controlled by a single firefighters' switch, independent of any switch for the exterior installation? (5.5.5)	◯ Yes ◯ No ◯ N/A Clear			
6.3.4	Are firefighters' switches located out of reach of the public but accessible to the fire brigade? (5.5.6)	◯ Yes ◯ No ◯ N/A Clear			
6.3.5	Are prominent notices displayed identifying the switches and the equipment they control? (5.5.7)	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.4	**Installations in ceiling (section 5.6)**				
6.4.1	Where a quartz halogen downlighter or other form of recessed luminaire is used in a fire rated ceiling, is a suitable back plate or cover fitted so as to maintain the fire resistance of the ceiling? (5.6.1)	◯ Yes ◯ No ◯ N/A Clear			
6.4.2	Are electric cables above a metal grid ceiling supported by a suitable catenary system, cable trays or trunking, or attached to the ceiling support rods so as to prevent contact with sharp edges of the metal grid? (5.6.3)	◯ Yes ◯ No ◯ N/A Clear			
6.4.3	Where cable ties are used are these composed of metal rather than plastic to prevent cables falling and presenting a hazard to firefighters in the event of a fire? (5.6.4)	◯ Yes ◯ No ◯ N/A Clear			
6.4.4	Are final connections to luminaires made by means of luminaire support couplers, keeping the final flex connection as short as possible to allow some degree of flexibility regarding the positioning of the luminaire? (5.6.5)	◯ Yes ◯ No ◯ N/A Clear			
6.4.5	Where diffusers have been replaced in a fire-rated ceiling are they of an appropriate type designed for use and approved by the manufacturer for such locations?	◯ Yes ◯ No ◯ N/A Clear			
6.4.6	Are all holes around cables passing through structural elements (walls and ceiling) in the space above diffusers appropriately fire stopped so as to provide an equivalent degree of fire resistance as the element in which they are located? (5.6.7)	◯ Yes ◯ No ◯ N/A Clear			
6.5	**Incandescent lamps (section 5.7)**				
6.5.1	Are light bulbs, and especially incandescent light bulbs, prevented from coming into prolonged contact with combustible materials. (5.7.1)	◯ Yes ◯ No ◯ N/A Clear			
6.5.2	Where the maximum wattage of a bulb is specified on a shade or fitting does the bulb fitted comply? (5.7.2)	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.5.3	Where energy saving lamps have been used to replace incandescent bulbs has this been undertaken without modifying the light fitting in any way? (5.7.3)	◯ Yes ◯ No ◯ N/A Clear			
6.5.4	Is it ensured that replacement lamps with Edison screw fittings are screwed fully into place (but are not over tightened) to prevent arcing occurring at the base of the fitting? (5.7.4)	◯ Yes ◯ No ◯ N/A Clear			
6.5.5	In the rare cases where connection is to a direct current supply, is care taken to ensure that Edison screw fittings are connected with the correct polarity? (5.7.5)	◯ Yes ◯ No ◯ N/A Clear			
6.5.6	There are no lamp holders connected to a circuit where the rated current of the overcurrent protective device exceeds the recommended value? (5.7.6)	◯ Yes ◯ No ◯ N/A Clear			
6.5.7	There are no filament lamps installed in circuits operating at a voltage exceeding 250volts? (5.7.7)	◯ Yes ◯ No ◯ N/A Clear			
6.5.8	Are ceiling roses only used for the attachment of a single flexible cord unless they have been specially designed for multiple pendants? (5.7.8)	◯ Yes ◯ No ◯ N/A Clear			
6.6	**Fluorescent lights (section 5.8)**				
6.6.1	Are fluorescent lights only directly attached to non-combustible surfaces? (5.8.1)	◯ Yes ◯ No ◯ N/A Clear			
6.6.2	All fluorescent light tubes are in good working order, of the correct specification, wiring and voltage and show no sign of flickering? (5.8.2/5.8.3)	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.6.3	Have lights incorporating old (pre 1979) forms of ballast been replaced? (5.8.4)	◯ Yes ◯ No ◯ N/A Clear			
6.6.4	Where a ballast unit has failed is the whole lighting assembly normally replaced? (5.8.5)	◯ Yes ◯ No ◯ N/A Clear			
6.6.5	Where ultraviolet tubes are in use in nightclubs and similar places of entertainment, are they protected or positioned so as to be out of the direct eyesight to protect the eyes of everyone in the vicinity? (5.8.6)	◯ Yes ◯ No ◯ N/A Clear			
6.6.6	Are used fluorescent light tubes treated as hazardous waste rather than being disposed of with normal commercial rubbish? (5.8.7)	◯ Yes ◯ No ◯ N/A Clear			
6.6.7	Is the breaking of used fluorescent lamps to reduce the bulk for storage avoided? (5.8.9)	◯ Yes ◯ No ◯ N/A Clear			
6.6.8	Are used modern energy saving bulbs that incorporate fluorescent tubes disposed of by taking them to a household hazardous waste collection centre? (5.8.11)	◯ Yes ◯ No ◯ N/A Clear			
6.7	**High energy discharge lamps (section 5.9)**				
6.7.1	Are high intensity discharge lamps sited at least 1m laterally from combustible elements of construction and not above combustible materials? (5.9.2)	◯ Yes ◯ No ◯ N/A Clear			
6.7.2	Are light fittings, especially sodium lights, clear of any evidence of water ingress? (5.9.3)	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.7.3	Are light fittings with integral containment barriers made of tempered or borosilicate glass used routinely? (5.9.4)	◯ Yes ◯ No ◯ N/A Clear			
6.7.4	Where lamps that are not MP or open rated have to be used, is a containment barrier or other form of shroud introduced to protect the arc tube? (5.9.6)	◯ Yes ◯ No ◯ N/A Clear			
6.7.5	Are any retrofitted containment barriers installed following the advice of the manufacturer (to protect against overheating)? (5.9.7)	◯ Yes ◯ No ◯ N/A Clear			
6.7.6	Are the types and ratings of the lamps selected for specific locations appropriate for the fittings and meet the manufacturer's specifications? (5.9.8)	◯ Yes ◯ No ◯ N/A Clear			
6.7.7	Are HID lights used in the specified horizontal or vertical orientation? (5.9.9)	◯ Yes ◯ No ◯ N/A Clear			
6.7.8	Are the bulb and ballast correctly matched in all luminaires? (5.9.11)	◯ Yes ◯ No ◯ N/A Clear			
6.7.9	In all cases where bulbs or ballast units are replaced, is care taken to ensure that electronic ballast units and the intended bulbs are compatible? (5.9.12)	◯ Yes ◯ No ◯ N/A Clear			
6.7.10	Is the location of high intensity lamps appropriate given the temperatures reached by the fittings and radiant heat flux from the bulb, and the siting of combustible lining or materials nearby? (5.9.13)	◯ Yes ◯ No ◯ N/A Clear			
6.7.11	Is the glass of metal halide lamps handled with care and kept clean with new bulbs not being touched with bare hands? (5.9.14)	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.7.12	Lamps with evidence of scratching or other signs of damage require replacement. Are all lamps in good condition? (5.9.15)	◯ Yes ◯ No ◯ N/A Clear			
6.7.13	Have discharge tubes been replaced at 70% of their rated life before they fail completely? (5.9.16)	◯ Yes ◯ No ◯ N/A Clear			
6.7.14	Is preference given to the use of HID lamps incorporating a monel switching element which extinguishes the discharge when the lamp is broken or reaches the end of its working life? (5.9.17)	◯ Yes ◯ No ◯ N/A Clear			
6.7.15	When replacing lamps, are checks made to ensure that the new bulb has the right coding letter? (It is not appropriate to assume that the lamp being replaced is correctly coded.) (5.9.19)	◯ Yes ◯ No ◯ N/A Clear			
6.7.16	Where discharge tubes operate at direct current (DC) is the polarity of the wiring strictly observed? (5.9.20)	◯ Yes ◯ No ◯ N/A Clear			
6.7.17	Are all bulbs operating correctly (i.e. not flashing on and off following testing of the unit)? (5.9.22)	◯ Yes ◯ No ◯ N/A Clear			
6.7.18	Are failed discharge tubes disposed of as hazardous waste? (5.9.23)	◯ Yes ◯ No ◯ N/A Clear			
6.7.19	Because of the hazards associated with sodium, mercury or other metals, are measures taken to ensure that high intensity discharge lamps are not routinely broken prior to disposal? (5.9.24)	◯ Yes ◯ No ◯ N/A Clear			
6.7.20	Where lamps are operated continuously, are they switched off for at least 15 minutes every week? (5.9.25)	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.8	**Luminous discharge lamps (section 5.10)**				
6.8.1	Are luminous discharge lamps forming advertising and similar signs positioned so as to be out of reach from ground level and any walkways? (5.10.1)	◯ Yes ◯ No ◯ N/A Clear			
6.8.2	Are luminous discharge lamps protected by a fireman switch? (5.10.2)	◯ Yes ◯ No ◯ N/A Clear			
6.9	**Quartz halogen lamps (section 5.11)**				
6.9.1	When assessing the hazards associated with the location of quartz halogen lamps, are the temperatures reached by the fittings and the radiant heat flux from the bulb taken into consideration? (5.11.1)	◯ Yes ◯ No ◯ N/A Clear			
6.9.2	Is the location of quartz halogen lamps appropriate given the temperatures reached by the fittings and radiant heat flux from the bulb, and the siting of combustible linings or materials nearby? (5.11.2)	◯ Yes ◯ No ◯ N/A Clear			
6.9.3	Is it ensured that there are no quartz halogen lamps attached directly to combustible elements of construction?	◯ Yes ◯ No ◯ N/A Clear			
6.9.4	When fitted to the outside of buildings, are quartz halogen lamps sited where the heat from the bulb or casing will not present a hazard to soffits, eaves or other combustible materials? (5.11.3)	◯ Yes ◯ No ◯ N/A Clear			
6.9.5	Are the measures in place (where necessary) to prevent birds from nesting on top of external quartz halogen lighting units in good condition and working effectively. (5.11.4)	◯ Yes ◯ No ◯ N/A Clear			
6.9.6	Where quartz halogen lamps have been used to replace incandescent bulbs, are the fittings are suitable for use with the larger heat outputs that may result? (5.11.6)	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.9.7	Are quartz halogen lamps of the correct specification in use in all circumstances? (Quartz halogen lamps are available to operate at reduced voltage from transformers as well as at main supply.) (5.11.7)	◯ Yes ◯ No ◯ N/A Clear			
6.9.8	Is the use of dimmer controls in retail and similar premises avoided? (5.11.8)	◯ Yes ◯ No ◯ N/A Clear			
6.9.9	Is a minimum distance of 450mm or the minimum distance recommended by the manufacturer (whichever is the greater) provided between a halogen light bulb and any combustible material? (5.11.9)	◯ Yes ◯ No ◯ N/A Clear			
6.9.10	Is the use of unfiltered desk top lamps prohibited if they are to be used for more than two hours a day and are sited within 600mm of the user? (5.11.10)	◯ Yes ◯ No ◯ N/A Clear			
6.9.11	Are all tungsten halogen lamps either fitted with an appropriate UV filter or is a bulb with a glass outer element used? (5.11.12)	◯ Yes ◯ No ◯ N/A Clear			
6.10	**LED lighting (section 5.12)**				
6.10.1	Do LED products and related equipment comply with BS 62504? (5.12.1)	◯ Yes ◯ No ◯ N/A Clear			
6.10.2	As LED bulbs contain small quantities of some heavy metals are appropriate arrangements in place for disposing of large numbers of LED units that are unwanted or no longer function? (5.12.3)	◯ Yes ◯ No ◯ N/A Clear			
6.11	**External lighting (section 5.13)**				
6.11.1	Does external motion activated lighting take the form of LED luminaires as they produce less heat than most other forms of lighting? (5.13.1)	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.11.2	Is it the case that no external lights are attached directly to combustible materials?	◯ Yes ◯ No ◯ N/A Clear			
6.11.3	Are external lights located at least 250mm from overhanging eaves and protected, where necessary, from nesting birds? (5.13.3)	◯ Yes ◯ No ◯ N/A Clear			
6.12	**Portable lighting (section 5.14)**				
6.12.1	Is all portable lighting fused appropriately? (5.14.1)	◯ Yes ◯ No ◯ N/A Clear			
6.12.2	Is all portable lighting (including temporary/seasonal decorative lights) subject to an in-service inspection (PAT testing) periodically in compliance with the Electricity at Work Regulations 1989? (5.14.2)	◯ Yes ◯ No ◯ N/A Clear			
6.12.3	Are decorative lights and decorations suspended away from luminaires, automatic fire detectors, sprinkler heads or other safety equipment? (5.14.6)	◯ Yes ◯ No ◯ N/A Clear			
6.12.4	Are all portable lamps enclosed with guards to protect them from mechanical damage? (5.14.7)	◯ Yes ◯ No ◯ N/A Clear			
6.12.5	Are portable lights (including torches) intended for use where a flammable atmosphere may be produced specifically designed for that purpose? (5.14.9)	◯ Yes ◯ No ◯ N/A Clear			
6.12.6	Because of the high temperatures reached by the lamps and fittings, is the use of quartz halogen lamps avoided for portable illumination? (5.14.10)	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.12.7	Are all types of light bulbs and luminaires retained for specialist applications clearly labelled as to the equipment for which they are intended, to avoid wrong bulbs being fitted? (5.4.11)	◯ Yes ◯ No ◯ N/A Clear			
6.13	**Temporary installations (section 5.15)**				
6.13.1	Are all temporary installations, including those on construction sites, installed in accordance with the requirements of BS 7671? (5.15.1)	◯ Yes ◯ No ◯ N/A Clear			
6.13.2	Are temporary lighting installations inspected regularly and tested at intervals not greater than every three months? (5.15.3)	◯ Yes ◯ No ◯ N/A Clear			
6.13.3	Where low voltage festoon lighting cannot be used on construction sites or other outdoor areas, are sealed fluorescent light tubes used? (5.15.4)	◯ Yes ◯ No ◯ N/A Clear			
6.13.4	Is temporary lighting used externally for visual effects operated at extra low voltage and, unless specially designed for the purpose, sited away from water features and similar hazards? (5.15.5)	◯ Yes ◯ No ◯ N/A Clear			
6.13.5	Are all luminaires and catenary installations installed outside buildings safe from passing vehicles? (5.15.7)	◯ Yes ◯ No ◯ N/A Clear			
6.13.6	Are any temporary installations within buildings kept well clear of hazards such as travelling cranes and other moving plant? (5.15.8)	◯ Yes ◯ No ◯ N/A Clear			
6.13.7	Are all signs for decorative and publicity purposes designed and constructed in accordance with the requirements of BS 559? (5.15.9)	◯ Yes ◯ No ◯ N/A Clear			

			Action required	Due date	Sign on completion
6.13.8	Is lighting designed for use outside the equipotential bonding zone (ie lights used in gardens and grounds) protected by residual current devices or operate at extra-low voltage? (5.15.11)	◯ Yes ◯ No ◯ N/A Clear			
6.14	**Stored energy supplies (section 5.16)**				
6.14.1	Are the manufacturer's instructions as to the use and care of the batteries and similar equipment followed, particularly with regard to recharging of lamps powered by rechargeable cells? (5.16.1)	◯ Yes ◯ No ◯ N/A Clear			
6.14.2	Are only torches, hand lamps and other portable equipment specifically designed for the purpose used in areas where a flammable atmosphere may be produced? (5.16.3)	◯ Yes ◯ No ◯ N/A Clear			
6.14.3	Where several chargers may be in use in the same area, is the equipment for which each is intended clearly identified? (5.16.4)	◯ Yes ◯ No ◯ N/A Clear			
6.14.4	Are spare batteries for torches stored in a clean, dry place away from direct sunlight? (5.16.5)	◯ Yes ◯ No ◯ N/A Clear			
6.14.5	Where rechargeable or non-standard batteries are kept for a particular purpose are these labelled prominently to avoid them being selected for use in the wrong equipment? (5.16.5)	◯ Yes ◯ No ◯ N/A Clear			

7 References

1. Regulatory Reform (Fire Safety) Order 2005, SI 2005 No 1541, The Stationery Office.
2. The Fire (Scotland) Act 2005, asp 5, The Stationery Office.
3. Fire Safety (Scotland) Regulations 2006, Scottish SI 2006 No 456, The Stationery Office.
4. Fire and Rescue Services (Northern Ireland) Order 2006, SI 2006 No 1254 (NI9), The Stationery Office.
5. Fire Safety Regulations (Northern Ireland) 2010, SI 2010 No 325 (NI), The Stationery Office.
6. RC67: Electricity and firefighter safety in the event of fire. 2017. Fire Protection Association.
7. Dangerous Substances and Explosive Atmospheres Regulations (DSEAR), 2002, SI 2002 No 2776 (as amended in 2015), The Stationery Office.
8. Business resilience: A guide to protecting your business and its people, 2005, Fire Protection Association.
9. The ROBUST software (Resilient Business Software Toolkit) may be found at https://robust.riscauthority.co.uk
10. BS 7671: 2008 + A3: 2015: Requirements for electrical installations. IET Wiring Regulations. British Standards Institution.
11. RC30: Recommendations for the selection of electrical and non-electrical equipment for use in atmospheres containing flammable and explosive gases or vapours. 2005. Fire Protection Association.
12. Approved Document B to the Building Regulations, Volume 2 – Buildings other than dwellinghouses, 2006 edition (as amended in 2010), Communities and Local Government.
13. BS62504: 2014: General lighting. Light emitting diode (LED) products and related equipment. Terms and definitions. British Standards Institution.
14. Electricity at Work Regulations 1989, SI No 635, 1989. The Stationery Office.
15. BS 559: 2009: Specification for the design and construction of signs for publicity, decorative and general purposes. British Standards Institution.

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