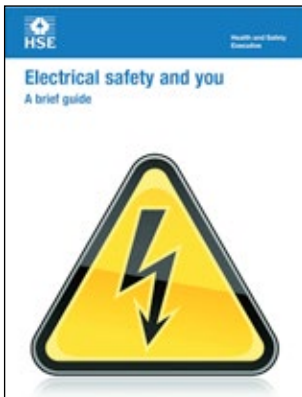


# Electrical safety and you

## A brief guide



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### Introduction

Electricity can kill or severely injure people and cause damage to property. Every year many accidents at work involving electric shock or burns are reported to the Health and Safety Executive (HSE). Most of the fatal incidents are caused by contact with overhead power lines.

Even non-fatal shocks can cause severe and permanent injury. For example, shocks from faulty equipment may lead to falls from ladders, scaffolds or other work platforms.

Those using or working with electricity may not be the only ones at risk – poor electrical installations and faulty electrical appliances can lead to fire, which may also cause death or injury to others. Most of these accidents can be avoided by careful planning and straightforward precautions.

This leaflet provides some basic measures to help you control the risks from your use of electricity at work. Further guidance for particular industries or subjects can be found on HSE's website ([www.hse.gov.uk](http://www.hse.gov.uk)).

### What are the hazards?

The main hazards are:

- contact with live parts causing shock and burns – normal mains voltage, 230 volts AC, can kill;
- faults which could cause fire; and
- fire or explosion where electricity could be the source of ignition in a potentially flammable or explosive atmosphere.

### Assessing the risk

Your health and safety risk assessment should take into account the risks associated with electricity. It will help you decide what action you need to take to use and maintain your electrical installations and equipment and also how often maintenance is needed. See HSE's website for further guidance ([www.hse.gov.uk/risk](http://www.hse.gov.uk/risk)).

The risk of injury from electricity is strongly linked to where and how it is used. The risks are greatest in harsh conditions, for example:

- in wet surroundings – unsuitable equipment can easily become live and can make its surroundings live;
- outdoors – equipment may not only become wet but may be at greater risk of damage; and
- in cramped spaces with a lot of earthed metalwork such as inside a tank – if an electrical fault developed it could be very difficult to avoid a shock.

Some items of equipment can also involve greater risk than others. Extension leads are particularly liable to damage – to their plugs, sockets, connections and the cable itself. Other flexible leads, particularly those connected to equipment which is often moved, can suffer from similar problems.

## Reducing the risk

Once you have completed the risk assessment, you can use your findings to reduce unacceptable risks from the electrical equipment in your workplace. There are many things you can do to achieve this, and some of them are listed below.

### ***Ensure people working on or with your electrical equipment or systems are 'competent' for the task***


Competent means having suitable training, skill, and knowledge for the task to prevent injury to themselves and others.

### ***Ensure the electrical installation is safe***

Make sure that:

- new electrical systems are installed to a suitable standard, eg BS 7671 *Requirements for electrical installations*,<sup>1</sup> and then maintain them in a safe condition;
- existing installations are maintained in a safe condition; and
- you provide enough socket outlets because overloading socket outlets by using adaptors can cause fire.

### ***Provide safe and suitable equipment***

- Choose equipment that is suitable for its working environment.
- Electrical risks can sometimes be eliminated by using air, hydraulic or hand-powered tools which are especially useful in harsh conditions.
- Make sure that equipment is safe when supplied and that it is then maintained in a safe condition.
- Provide an accessible and clearly identified switch near each fixed machine to cut off power in an emergency.
- For portable equipment, use socket outlets which are close by so that equipment can be easily disconnected in an emergency.
- The ends of flexible cables should always have the outer sheath of the cable firmly clamped to stop the wires (particularly the earth) pulling out of the terminals.
- Replace damaged sections of cable completely.
- Use proper connectors or cable couplers to join lengths of cable. Do not use strip connector blocks covered in insulating tape.
- Some types of equipment are double insulated. These are often marked with a 'double-square' symbol . The supply leads have only two wires – live (brown) and neutral (blue). Make sure they are properly connected if the plug is not moulded.
- Protect light bulbs and other equipment which could easily be damaged in use.
- In potentially flammable or explosive atmospheres, only special electrical equipment designed for these areas should be used. You may need specialist advice.

### ***Reduce the voltage***

One of the best ways of reducing the risk of injury when using electrical equipment is to limit the supply voltage to the lowest needed to get the job done, such as:

- temporary lighting can be run at lower voltages, eg 12, 25, 50 or 110 volts;

- where electrically powered tools are used, battery-operated ones are safest; or
- portable tools designed to be run from a 110 volt centre-tapped-to-earth supply are readily available.

### *Provide a safety device*

If equipment operating at 230 volts or higher is used, an RCD (residual current device) can provide additional safety. An RCD is a device which detects some, but not all, faults in the electrical system and rapidly switches off the supply.

The best place for an RCD is built into the main switchboard or the socket outlet, as this means that the supply cables are permanently protected. If this is not possible, a plug incorporating an RCD or a plug-in RCD adaptor can also provide additional safety.

RCDs for protecting people have a rated tripping current (sensitivity) of not more than 30 milliamps (mA). Remember:

- an RCD is a valuable safety device, never bypass it;
- if it trips, it is a sign there is a fault – check the system before using it again;
- if it trips frequently and no fault can be found in the system, consult the manufacturer of the RCD; and
- the RCD has a test button to check that its mechanism is free and functioning – you should use this regularly.

### *Carry out preventative maintenance*

All electrical equipment, including portable equipment and installations, should be maintained (so far as reasonably practicable) to prevent danger; this is a requirement of the Electricity at Work Regulations 1989.

#### *What does 'so far as reasonably practicable' mean?*

You do not have to remove all the risks but the law requires you to do everything 'reasonably practicable' to protect people from harm. An explanation of what is 'reasonably practicable' means is provided at [www.gov.uk/risk/faqs/htm](http://www.gov.uk/risk/faqs/htm).

These Regulations state principles of electrical safety and apply to all electrical systems and equipment. **However, they do not specify what needs to be done, by whom or how frequently.**

Decisions on maintenance levels and the frequency of checks should be made in consultation with equipment users, based on the risk of electrical items becoming faulty. There is an increased risk of this happening if the equipment isn't used correctly, isn't suitable for the job, or is used in a harsh environment.

An appropriate system of maintenance is strongly recommended. This can include:

- user checks by employees, eg a pre-use check for loose cables or signs of fire damage;
- a visual inspection by someone with more knowledge, eg checking inside the plug for internal damage, bare wires and the correct fuse; and
- **where necessary**, a portable appliance test (PAT) by someone with the necessary knowledge and experience to carry out a test and interpret the results.

Damaged or defective equipment should be removed from use and either repaired by someone competent or disposed of to prevent its further use.

*Not every electrical item needs a PAT and those that do may not need to be tested every year*

By concentrating on a simple, inexpensive system of looking for visible signs of damage or faults, most of the electrical risks can be controlled.

There is no legal requirement to label equipment that has been inspected or tested, nor is there a requirement to keep records of these activities.

Although it is not a legal requirement, maintaining a record and labelling system can be a useful way to monitor and review the effectiveness of the maintenance scheme.

Guidance on portable appliance testing, including the frequency of checks, is available in the booklets mentioned later and in the frequently asked questions at [www.hse.gov.uk/electricity](http://www.hse.gov.uk/electricity).

It is recommended that fixed installations (the wiring and equipment between the supply meter and the point of use, eg socket outlets) are inspected and tested periodically by a competent person.

### **Work safely**

Make sure that people who are working with electricity are competent to do the job. Even simple tasks such as wiring a plug can lead to danger – ensure that people know what they are doing before they start.

Check that:

- suspect or faulty equipment is taken out of use, labelled 'DO NOT USE' and kept secure until examined by a competent person;
- where possible, tools and power socket outlets are switched off before plugging in or unplugging; and
- equipment is switched off and/or unplugged before cleaning or making adjustments.

More complicated tasks, such as equipment repairs or alterations to an electrical installation, should only be carried out by people with knowledge of the risks and the precautions needed.

You must not allow work on or near exposed, live parts of equipment unless it is absolutely unavoidable and suitable precautions have been taken to prevent injury, both to the workers and to anyone else who may be in the area.

### **Underground power cables**

Always assume cables will be present when digging in the street, pavement or near buildings. Use up-to-date service plans, cable avoidance tools and safe digging practice to avoid danger.

Service plans should be available from regional electricity companies, local authorities, highways authorities etc. More detailed guidance is available in HSE publication *Avoiding danger from underground services* (HSG47).<sup>2</sup>

### **Overhead power lines**

Over half of the fatal electrical accidents each year are caused by contact with overhead lines.

When working near overhead lines, it may be possible to have them switched off if the owners are given enough notice. If this cannot be done, consult the owners about the safe working distance from the cables.

Remember that electricity can flash over from overhead lines even though plant and equipment do not touch them. More detailed guidance is available in HSE publication *Avoiding danger from overhead power lines* (GS6).<sup>3</sup>

### **Electrified railways and tramways**

If you are working near electrified railways or tramways, consult the line or track operating company. Remember that some railways and tramways use electrified rails rather than overhead cables.

The regulation of health and safety on railways and tramways was transferred to the Office of Rail Regulation in April 2006 and some guidance is available on their website ([www.rail-reg.gov.uk](http://www.rail-reg.gov.uk)). The guidance in *Avoiding danger from overhead power lines* (GS6)<sup>3</sup> is also relevant.

## **References**

- 1 BS 7671:2008 (2011) *Requirements for electrical installations* British Standards Institution (Also known as IET Wiring Regulations 17th edition)
- 2 *Avoiding danger from underground services* HSG47 (Second edition) HSE Books 2000 ISBN 978 0 7176 1744 9 [www.hse.gov.uk/pubns/books/hsg47.htm](http://www.hse.gov.uk/pubns/books/hsg47.htm)
- 3 *Avoiding danger from overhead power lines* General Guidance Note GS6 (Fourth edition) HSE 2013 [www.hse.gov.uk/pubns/books/g6.htm](http://www.hse.gov.uk/pubns/books/g6.htm)

## **Further reading**

*Health and safety made simple: The basics for your business* Leaflet INDG449 HSE Books 2011 [www.hse.gov.uk/pubns/indg449.htm](http://www.hse.gov.uk/pubns/indg449.htm)

*Maintaining portable and transportable electrical equipment* HSG107 (Second edition) HSE Books 2004 ISBN 978 0 7176 2805 6 [www.hse.gov.uk/pubns/books/hsg107.htm](http://www.hse.gov.uk/pubns/books/hsg107.htm)

*Maintaining portable electrical equipment in low-risk environments* Leaflet INDG236(rev2) HSE Books 2012 [www.hse.gov.uk/pubns/indg236.htm](http://www.hse.gov.uk/pubns/indg236.htm)

*Electricity at work: Safe working practices* HSG85 (Second edition) HSE Books 2003 ISBN 978 0 7176 2164 4 [www.hse.gov.uk/pubns/books/hsg85.htm](http://www.hse.gov.uk/pubns/books/hsg85.htm)

*Memorandum of guidance on the Electricity at Work Regulations* 1989. Guidance on Regulations HSR25 (Second edition) HSE Books 2007 ISBN 978 0 7176 6228 9 [www.hse.gov.uk/pubns/books/hsr25.htm](http://www.hse.gov.uk/pubns/books/hsr25.htm)

HSE's 'Electrical safety at work' site: [www.hse.gov.uk/electricity](http://www.hse.gov.uk/electricity)

## Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit [www.hse.gov.uk/](http://www.hse.gov.uk/). You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

This leaflet is available at: [www.hse.gov.uk/pubns/indg231.htm](http://www.hse.gov.uk/pubns/indg231.htm).

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