

HEALTH AND SAFETY GUIDANCE NOTE

ELECTRICAL SAFETY



NFU Mutual

Risk Management Services

INTRODUCTION

Electricity can kill. Every year people are killed or seriously injured at work due to electric shock or associated burns. Even non-fatal shocks can cause severe and permanent injury.

Electricity is supplied in two forms, referred to as ‘alternating’ and ‘direct’ current. This guidance note concentrates on the most hazardous form of supply normally encountered in the workplace, namely ‘alternating’ current or ‘mains’ electricity. Alternating current is usually supplied at a voltage of either 240 volts (single phase supply) or 415 volts (three phase supply) both of which have the potential to be fatal.

Faulty electrical systems are responsible for a large number of workplace accidents and fires each year. The safe management of electrical systems can be relatively straightforward as long as suitable control systems are in place and basic safety procedures followed.

Please note that specific guidance on working with overhead power lines and underground services is provided in separate guidance notes.

WHAT ARE THE HAZARDS ASSOCIATED WITH ELECTRICITY?

The hazards associated with the use of electricity include:

- Contact with live parts resulting in:
 - Electric shock that could result in muscular spasms and cramps, respiratory failure, irregular beating of the heart (fibrillation), which can lead to cardiac arrest;
 - Electric burns – due to the conductive nature of the human body, particularly beneath the skin. Burns that may appear superficial on the skin surface may often be deep-seated and extensive.
- Electric arcing – arcing is the process that occurs when electrical energy ‘jumps’ between conductors when the gap between them is too close;
- Electric fires and explosions as a result of:
 - Overloading electrical circuits causing overheating;
 - Leakage of current due to poor insulation;

- Placing flammable materials too close to electrical equipment;
- Faulty or poorly maintained protective devices;
- Sparks being emitted from electrical equipment;
- Ignition of flammable substances in the working atmosphere;
- Overloading of equipment resulting in catastrophic failure.
- Associated injuries – e.g. fall from a height if receiving an electric shock whilst working on a ladder etc.

WHO IS AT RISK?

As you may predict, electricians are most at risk from electricity-related accidents. But it’s not only electricians who might be affected by an electrical accident – it can be users of equipment too. Have you ever found a plug with water in it after cleaning? Have you ever cleaned equipment and slopped water over it? Have you, or someone working for you, ever had a shock from equipment such as scales or conveyors? Did you register it as an electric shock or did you just brush it off as a ‘bit of static’?

Electrical fires and explosions will in turn increase the number of people that are at risk.

WHAT ARE MY LEGAL RESPONSIBILITIES?

The Electricity at Work Regulations 1989 [Electricity at Work Regulations (Northern Ireland) 1991] apply to electrical installations at virtually all premises. They require precautions to be taken against the risk of death or personal injury from electricity in work activities.

As an employer you have to:

- Assess the risks from electricity;
- Take action to address the risks from electricity;
- Ensure people working on or with your electrical equipment or systems are ‘competent’ for the task;
- Ensure electrical installations are safe and provided with protective devices;
- Provide safe and suitable equipment;
- Carry out preventive maintenance and inspection.

HOW DO I ASSESS THE RISKS FROM ELECTRICITY?

The first stage in ensuring protection from electricity is to identify the risks involved by carrying out a risk assessment. A risk assessment is about identifying and taking sensible and proportionate measures to control the risks in your workplace, not about creating huge amounts of paperwork. You are probably already taking steps to protect your employees, but your risk assessment will help you decide whether you should be doing more. Specific guidance on how to carry out a risk assessment is also provided in the Risk Assessment Guidance Note.

Many different factors affect the actual risk posed by electrical systems including:

- The age and suitability of the electrical systems and whether any additions to the system have been undertaken;
- The operating voltage;
- Whether the system and equipment are subject to a programmed and systematic examination at prescribed intervals;
- Whether any work is undertaken on live systems;
- The likely abuse or damage that the equipment will suffer, e.g. extension leads are particularly liable to damage - to their plugs and sockets, to their electrical connections and to the cable itself;
- What type of environment the equipment will be used in. If the environment is wet or in a potentially flammable or explosive atmosphere, the risks will be increased;
- Whether the equipment is suitable for the job being undertaken;
- The type of equipment that is being used (generally speaking, double-insulated equipment is safer than Class 1 equipment which relies on the integrity of the earth wire to provide protection to the user);
- Who will be using the equipment and how competent they are;
- How often the equipment is used.

HOW DO I REDUCE THE RISK FROM ELECTRICAL DANGER?

Once the risks have been identified and assessed you need to take action to remove them, or where this is not possible, reduce them to an acceptable level. There are many things you can do to achieve this, including:

Ensure all work on electrical installations and electrical equipment is undertaken by a competent electrician or electrical contractor – Any person engaged in a work activity where technical knowledge or experience is necessary to prevent danger must be competent, or under close supervision. The level of supervision must be relative to the risks.

It is strongly recommended that anyone employed to undertake such work is registered with a voluntary regulatory body for the electrical contracting industry, e.g. NICEIC, ECA, NAPIT, or SELECT (Scotland's trade association for the electrical industry).

Anyone wishing to undertake electrical testing work would normally be expected to have more knowledge on the subject and be able to demonstrate competence through the successful completion of a suitable training course. A competent person should at least have adequate:

- Knowledge of electricity;
- Experience of the type of work;
- Understanding of the system to be worked on;
- Understanding of the hazards;
- Ability to recognise danger.

Depending on the extent of work on electrical systems being carried out, it may prove necessary to have persons trained in resuscitation techniques.

Ensure that the electrical installation and equipment is suitable and safe.

Make sure that you install any new electrical systems to a suitable standard, e.g. 'BS 7671 Requirements for electrical installations, IEE wiring regulations 17th edition', and then maintain them in a safe condition.

Modern systems installed according to current good practice should be well constructed and safe in normal use, although special attention should be paid to parts of the system that may be particularly vulnerable or where special working conditions are encountered.

Older systems will require a thorough examination by your competent person / electrical contractor to ensure that the system has not degraded and any alterations and extensions have been carried out satisfactorily. There is no requirement to upgrade electrical systems to present IEE standards unless the construction or condition of that system is likely to increase the risk of injury.

It is important that consideration is given to adequate protection measure and devices, such as:

- Earthing and bonding;
- Insulation and enclosure;
- Current limitation, e.g. RCDs;
- Ingress protection from dusts, gases and liquids;
- Switching and isolation.

Electrical systems should be designed and chosen to carry out their functions safely. Careful consideration should be paid to ensuring that the right equipment is selected for the right job with an assessment of the anticipated risks and equipment requirements being carried out before purchase.

Carry out preventative maintenance and inspection

– The maintenance of electrical systems needs to be carried out periodically in a systematic fashion and based on an appreciation of the risks posed by each electrical system.

There are no defined inspection periods for electrical systems. The periods between inspections should be based on your risk assessment and /or as recommended by a competent electrical contractor e.g. every 3-5 years. Bear in mind that the older the fixed installation, the greater the effort that should be placed into the maintenance programme.

Make sure you keep a written record of tests on fixed electrical systems together with the date of when any defects were rectified, as it will provide you with evidence that you are pro-actively managing your risks from electricity.

Ensure that your portable electrical equipment is safe

– Portable electrical appliances are responsible for many serious accidents each year and their use in the workplace must be strictly managed.

Portable electrical equipment can be defined as anything that is:

- Intended to be moved; or
- Likely to be moved; or
- Is connected to a fixed supply by a plug.

When purchasing new equipment, an assessment of the use to which it will be put should be made. If the equipment has to meet special requirements (IP rating) then this should be specified when ordering the equipment. If electrical equipment is to be used in potentially flammable atmospheres, the equipment must be safe for use in those conditions - electrical risks can sometimes be eliminated by using air, hydraulic or hand-powered tools instead. Equipment should also meet the standards laid down by the British Electrotechnical Approvals Board (BEAB) or have a British Standard Kite-mark.

The following points should be considered when using portable electrical appliances in the workplace:

- The lowest voltage equipment for the job should be used where reasonably practicable;
- Wet or damp working environments should be avoided where possible;
- User checks should be undertaken prior to using the equipment;
- A system for reporting faults should be developed;
- RCD protection should be considered;
- Excessive trailing leads should be avoided – provide enough socket outlets to prevent overloading;
- Personal protective equipment may be required.

Effective maintenance of portable electrical equipment can help to prevent electrical accidents. Maintenance of portable electric equipment can be achieved by a combination of:

- before use checks by the user – a basic checklist is provided at the end of this guidance note;
- formal visual inspections by a competent person; and
- where necessary a combined inspection and test, also known as a portable appliance test (PAT), by an electrically competent person.

Maintenance will need to be carried out more frequently where the risk is high, where the equipment is more likely to be subject to physical and/or environmental damage e.g. on farms, construction sites and less frequently where the risk is lower, e.g. in offices.

Contrary to popular belief, there are no statutory requirements for portable electrical appliances to be inspected and tested on a fixed annual or six-monthly basis and you need decide on the appropriate frequency of testing based upon the evaluation of risks.

The following table sets out the suggested initial frequency for the various types of checks on portable electrical equipment. These are a guide for anticipated average use conditions. More demanding conditions of use will require more frequent formal visual inspections, and/or combined inspections and tests. Alternatively you may wish to seek advice from a competent person who has the knowledge and experience to make the necessary judgement.

Type of equipment	Users checks	Formal visual inspection	Combined inspection and test
Equipment hire	N/a	Before issue/ after return	Before issue
Battery operated equipment (less than 40V)	No	No	No
Extra low voltage (less than 50V ac), telephone equipment, low-voltage desk lights	No	No	No
Construction - 110V equipment	Yes, weekly	Yes, monthly	Yes, before first use on site, then 3-monthly
Construction - 230V equipment	Yes, daily/ every shift	Yes, weekly	Yes, before first use on site then monthly
Construction - Fixed RCDs	Yes, daily/ every shift	Yes, weekly	Yes, before first use on site, then 3-monthly (portable RCDs monthly)
Construction - Equipment site offices	Yes, monthly	Yes, 6-monthly	Yes, before first use on site, then yearly
Heavy industrial/ high risk of equipment damage (not construction)	Yes, daily	Yes, weekly	Yes, 6-12 months
Light industrial	Yes	Yes, before initial use, then 6-monthly	Yes, 6-12 months
Office information technology rarely moved, e.g. desktop computers, photocopiers, fax machines	No	Yes, 2-4 years	No, if double insulated, otherwise up to 5 years
Double insulated (class II) equipment moved occasionally (not hand-held), e.g. fans, table lamps	No	Yes, 2-4 years	No
Hand-held double insulated (class II) equipment, e.g. some floor cleaners, some kitchen equipment	Yes	Yes, 6 months – 1 year	No
Earthed (class I) equipment, e.g. electric kettles, some floor cleaners	Yes	Yes, 6 months – 1 year	Yes, 1-2 years
Cables, leads and plugs connected to class I equipment, extension leads and battery charging equipment	Yes	Yes, 6 months – 4 years, depending on type of equipment it is connected to	Yes, 1-5 years depending on the equipment it is connected to

Source HSE

Over time, and with practical maintenance experience, it may be possible to extend maintenance intervals if results of checks, inspections or tests show that few faults are found. However, if faults are common it may be necessary to reduce intervals or take other action to improve maintenance and reduce risk.

Testing of portable electrical appliances is carried out with the aid of testing equipment such as a voltmeter or a portable appliance tester (PAT). This normally requires a higher level of competence than that required for a visual examination. If testing of electrical appliances is to be carried out in-house, appropriate testing equipment must be available and the person carrying out the testing must be competent in its use.

Once any defects have been discovered, it is essential that the equipment is either discarded or effectively repaired.

Care should be taken to ensure that all equipment is logged for maintenance and all new appliances entered into the maintenance programme. If many appliances are involved, it would be worthwhile ensuring that each appliance has a unique reference code to avoid any possible confusion.

Ensure work is done 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.

When determining safe working procedures for working on or near electrical systems and / or equipment, consider the following:

- Precautions for working on dead electrical systems: If there is a need to work on electrical equipment, then wherever possible, that work should be carried out when the equipment is dead. In some situations, certain precautions will also need to be taken to ensure that the equipment does not become live while it is being worked on.
- Work on or near live conductors: There are certain situations where it is necessary to work on live conductors but this is only permissible when suitable precautions have been taken both to the workers and to anyone else who may be in the area.
- Working space, access and lighting: Adequate working space, lighting and access should be provided at all electrical equipment on which or near which work is being done so that persons can work safely.
- Provision, use and maintenance of protective equipment: There will be instances where certain protective equipment will be required when working with electrical systems. These may range from insulated tools, personal protective equipment to rubber mats etc.

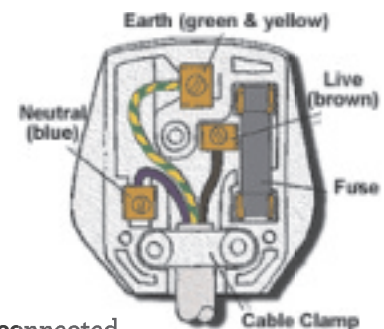
FURTHER GUIDANCE

- HSE Website “Electrical Safety at Work”
www.hse.gov.uk/electricity/
- HSG107 HSE Maintaining portable electrical equipment
www.hse.gov.uk/pubns/priced/hsg107.pdf
- HSR25 Memorandum of guidance on the Electricity at Work Regulations 1989
www.hse.gov.uk/pubns/priced/hsr25.pdf
- INDG231 Electrical Safety and You
www.hse.gov.uk/pubns/indg231.pdf
- INDG236 Maintaining portable electric equipment in low-risk environments
www.hse.gov.uk/pubns/indg236.pdf
- HSG85 Electricity at work: Safe working practices
www.hse.gov.uk/pubns/priced/hsg85.pdf

These documents are available to download free of charge from www.hse.gov.uk/pubns/books

BASIC PORTABLE APPLIANCE ELECTRICAL SAFETY CHECKS

When using electrical equipment it is important that you examine all portable electrical apparatus before use. Electrical faults (e.g. damaged leads, broken casing, loose plugs, etc.) must be reported for rectification by a competent person. Wherever possible, use low voltage equipment.



These checks should be carried out before use, with the equipment disconnected. Employees should look for:

- Is there damage (apart from light scuffing) to the cable sheath?
- Is there damage to the lead including fraying?
- Is the plug damaged (e.g. the casing cracked or pins bent)?
- Are there inadequate joints, including taped joints, in the cable?
- Are coloured wires visible where the lead joins the plug (the cable is not being gripped where it enters the plug)?
- Does the appliance appear to have been subjected to conditions for which it is not suitable (e.g. is it wet or excessively contaminated with dust/dirt)?
- Is there damage to the external casing of the equipment or are there loose screws or parts etc.?
- Is there evidence of overheating (e.g. burn marks, staining or discoloration)?
- Is the main on/off switch damaged, does it operate incorrectly?
- Have cables been trapped under furniture or in floor boxes?

If you answer **“YES”** to any of the above, it indicates that the appliance is potentially dangerous and must be taken out of use.

ELECTRICAL REPAIRS ARE AN ELECTRICIAN'S JOB

Do not touch or tamper with equipment unless you have been specifically trained and authorised.

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