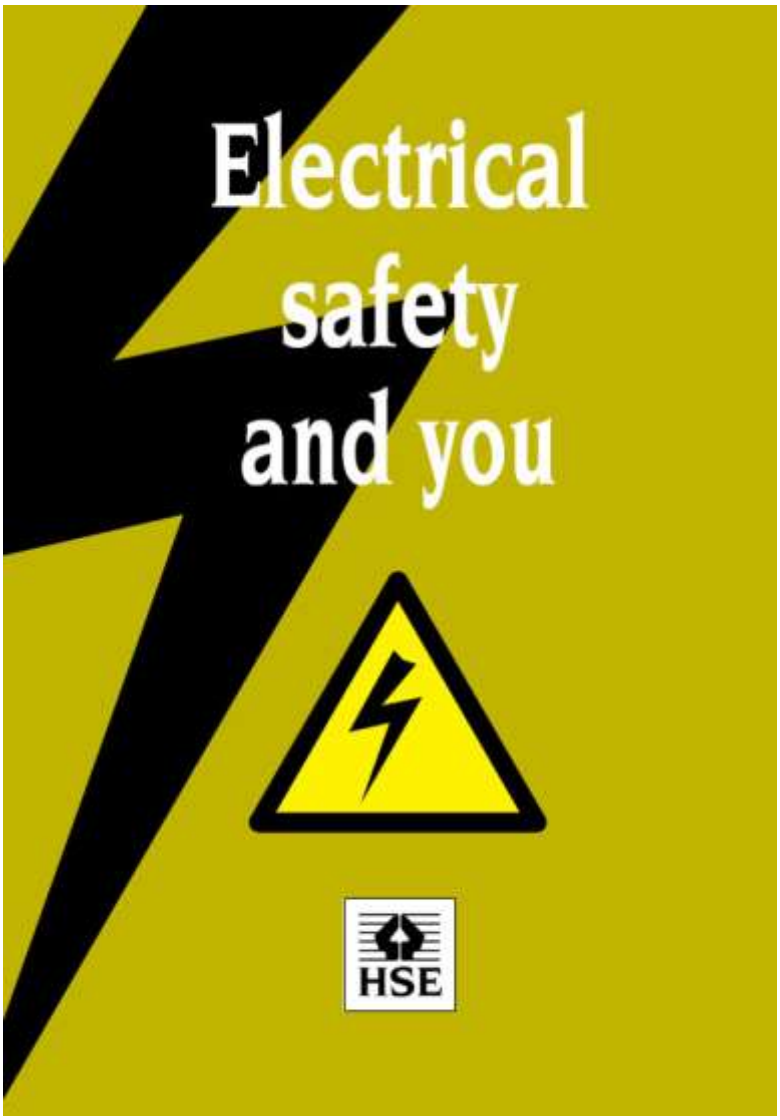
hammersmith & fulham

ELECTRICAL SAFETY

GUIDANCE FOR SCHOOLS



LEGISLATION

- Electricity at Work Regulations 1989
- Management of Health and Safety at Work Regulations 1999

WHAT YOU NEED TO DO

- When purchasing equipment, ensure that it is suitable for intended use and built to a relevant British Standard
- Establish a system for correctly wiring and fusing new appliances before use
- Ensure sufficient sockets are available before purchasing extra electrical equipment
- If extension leads or multi- blocks must be used ensure they are correctly fused, not overloaded and do not present a tripping hazard
- Ensure that no portable electrical equipment is brought onto premises and used unless it has been inspected by a competent person
- Consider other means of reducing risk e.g. low voltage equipment, RCDs. (circuit breakers)
- Ensure that a system is in place to ensure regular inspection and testing of portable electrical equipment and the fixed installation
- Ensure that a system is in place for reporting faulty electrical equipment
- Ensure systems exist to withdraw all faulty equipment from service until repaired by a competent person
- Monitor arrangements, follow-up action and risk assessment according to results
- Ensure all contractors working with electricity are competent.
- Keep records of maintenance throughout the life of the system/equipment

INTRODUCTION

On average, around 1,000 electrical accidents at work are reported to HSE each year and about 30 people die of their injuries. The main hazards are:

- Contact with live parts causing shock and burns (normal mains voltage, 230 volts AC, can kill)
- Faults which could cause fires
- Fire or explosion where electricity could be the source of ignition in a potentially flammable or explosive atmosphere

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

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

THE RISK OF INJURY

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;
- Out of doors - equipment may not only become wet but may be at greater risk of damage;
- In cramped spaces with a lot of earthed metalwork, such as inside a tank or bin - if an electrical fault developed it could be very difficult to avoid a shock.

Electrical injuries can be caused by a wide range of voltages but the risk of injury is generally greater with higher voltages and is dependent upon individual circumstances.

A voltage as low as 50 volts applied between two parts of the human body causes a current to flow that can block the electrical signals between the brain and the muscles. This may have a number of effects including:

- Stopping the heart beating properly
- Preventing the person from breathing
- Causing muscle spasms

The exact effect is dependent upon a large number of things including the size of the voltage, which parts of the body are involved, how damp the person is, and the length of time the current flows.

THE RISK OF FIRE

Approximately 25% of all fires in industrial and commercial premises are caused by the use of electricity. There are four main causes:

- Physical damage caused by environmental conditions, such as physical abrasion, excessive heat, misuse and contact with hazardous materials or substances.
- Damage caused by overloading the particular circuits, for example by using a multi-point adaptor in a single socket outlet. Overloading can generate excessive heat leading to melting of PVC insulation on cables and plastic plugs or to similar damage.
- Inadequate Ventilation: Ventilation is important in maintaining a safe temperature
- Overheating in Circuits Through Local Resistance: Heat can be generated locally due to high resistance at that point. This can be caused by badly made or corroded joints or connections or at connections where only a few strands of the core are joined.

PORTABLE ELECTRICAL EQUIPMENT

Generally, equipment that has a lead (cable) and plug and which is normally moved around or can easily be moved from place to place, e.g. vacuum cleaners, kettles, heaters, fans, televisions, desk lamps; and also equipment that could be moved, e.g. photocopiers, fax machines, and desktop computers.

Injury or fire may occur because of the following:

- The earth wire may be pulled out of its plug terminal (due to a loose or ineffective cord grip) and touches the live terminal thus making the metalwork of the apparatus live
- Flexible cable damaged by:

i) being run over
ii) being dragged over sharp surfaces
iii) making contact with moving parts of machinery
iv) making contact with hot surfaces or chemicals
v) being continuously flexed close to the point of termination
vi) being in contact with petrol, oils or solvents, thereby exposing live conductors to the touch

- Badly made joints in flexible cables which lose their insulation or pull apart when strained. Bare live conductors may then be exposed to the touch or the earth conductor may be severed so that the metalwork or frame may become live, for example through the damaged earth connection
- Wrong connections made to the plug or apparatus terminals, resulting in the metalwork being made live
- Covers damaged or missing, exposing bare live conductors to the touch
- Insulation failure, causing leakage currents, resulting in metalwork being made live if the equipment is not properly earthed
- Servicing apparatus without disconnecting it from the supply
- Misuse of equipment
- Overloading trailing leads caused by lack of electrical sockets.

FIXED INSTALLATION

A fixed installation is the wiring and appliances that are fixed to the building, such as sockets, switches, consumer units (fuse boxes) and ceiling fittings.

Only competent persons (as defined by the Electricity at Work Regulations 1989) will be authorised to carry out inspection and testing. The frequency of periodic inspection and testing must be determined taking into account:

- the type of installation
- its use and operation
- the frequency and quality of maintenance
- the external influences to which it is subjected.

REDUCING THE RISK OF INJURY AND FIRE

Ensure that the electrical installation is safe:

- Install new electrical systems to a suitable standard, e.g. BS 7671 requirements for electrical installations
- Existing installations should also be properly maintained
- Provide enough socket-outlets - overloading socket-outlets by using adaptors can cause fires.

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. These are especially useful in harsh conditions;
- Ensure that equipment is safe when supplied and then maintain it 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;
- Make sure wires are properly connected if the plug is not a moulded-on type;
- Protect lightbulbs and other equipment which could easily be damaged in use. There is a risk of electric shock if they are broken;
- Electrical equipment used in flammable/explosive atmospheres should be designed to stop it from causing ignition. 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 are safest
- Portable tools are readily available which are designed to be run from a 110 volts centre-tapped-to-earth supply.

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 should be regularly tested by pressing the 'test' button, and by making sure that the RCD trips. Faulty or inoperative RCDs should be removed from use.

Carry out preventative maintenance:

All electrical equipment and installations should be maintained to prevent danger. It is strongly recommended that this includes an appropriate system of visual inspection and, where necessary, testing. By concentrating on a simple, inexpensive system of looking for visible signs of damage or faults, most of the electrical risks can be controlled. (See below for further details)

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;
- Equipment is switched off and/or unplugged before cleaning or making adjustments.
- Do not place items on an electrical appliance that could cause it to overheat or obstruct cooling air supplies.

More complicated tasks, such as equipment repairs or alterations to an electrical installation, should only be tackled by people with a 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.

EXTENSION LEADS

- Position leads/extension leads carefully to avoid tripping hazards and so that you can reach the socket to switch off quickly if something goes wrong.
- If you use a multi-socket extension lead do not overload it and make sure it is fused.
- One extension lead is enough! Never add a further extension lead.
- Use an extension lead of appropriate length
- Avoid the use of coiled cable extension leads. Where this is not possible, always fully uncoil a wind-up extension lead before use.

ELECTRICAL INTAKE CUPBOARDS

All cupboards that contain main electrical intake switchgear should be free from all other items. They should not be used as additional storage space.

ELECTRICAL SOCKETS

Where practicable to do so, one socket should be available for each appliance. Before purchasing extra electrical equipment Managers must assess the need for extra sockets and budget for this accordingly (eg new computers for offices or computer suites).

If multi-blocks or extension leads are to be used they must be correctly fused, not overloaded.

UNDERGROUND POWER CABLES

Always assume cables will be present when digging in grounds 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.

OVERHEAD POWER 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. Over half of the fatal electrical accidents each year are caused by contact with overhead lines. If work is to take place close to overhead power lines, contact the Education Health & Safety Manager.

REPORTING DEFECTS

Any defects in the fixed wiring systems or sockets should be reported immediately to the appropriate person.

MAINTENANCE (INSPECTION & TESTING)

Maintenance is a general term that in practice can include visual inspection, testing, repair and replacement. Maintenance will determine whether:

1. Equipment is fully serviceable or
2. Remedial action is necessary.

Routine Inspection

Routine inspection work may be undertaken on a regular basis. The things to look out for on the equipment, the cable and plug (after disconnecting it) are signs of:

- Damage, eg cuts, abrasion (apart from light scuffing) to the cable covering

- Damage to the plug, eg the casing is cracked or the pins are bent
- Non-standard joints including taped joints in the cable;
- The outer covering (sheath) of the cable not being gripped where it enters the plug or the equipment. Look to see if the coloured insulation of the internal wires is showing;
- Equipment that has been used in conditions where it is not suitable, eg a wet or dusty workplace
- Damage to the outer cover of the equipment or obvious loose parts or screws; and
- Overheating (burn marks or staining).

Portable Appliance Testing (PAT)

In order to reduce the risk, Portable Appliance Testing (P.A.T. Testing) should be standard practice when:

- There is reason to suppose the equipment may be defective, but this cannot be confirmed by visual inspection.
- Any repair, modification or similar work has been done to the equipment;
- An interval has elapsed appropriate to the equipment, the manner and frequency of use and the environment

Those who wish to undertake electrical testing work would normally be expected to have more knowledge and to be able to demonstrate competence through the successful completion of a suitable training course.

A member of staff can do this if they have had suitable training. Greater knowledge and experience is needed than for inspection alone, and they need to have the right equipment to do the tests. They should know how to use the equipment correctly and how to interpret the results.

Where testing is done by a contractor invited to a site, safe working arrangements must be discussed and agreed before the work starts. This enables everyone concerned to know who is doing what and who is responsible for what, so that the work can be done safely and without risk to the contractor's employees, the site employees and others who might be affected.

Fixed Installation

The best way to find out if the electrical installation is safe is to have it inspected and tested by a person who has the competence to do so, such as an Electrical Contractors Association (ECA), National Inspection Council for Electrical Installation Contracting (NICEIC), or The Electrical Contractors' Association of Scotland (SELECT) approved electrical contractor.

All fixed installations in schools must be subject to an examination by a competent electrician every 5 years.

RECORDS

Records of testing and inspection of portable electrical equipment must be kept for the following reasons:

- As a management tool for monitoring and reviewing the effectiveness of the maintenance scheme
- To demonstrate that a scheme exists
- As an inventory of portable/transportable electrical equipment and a check on the use of unauthorised equipment (eg domestic kettles or electric heaters brought to work by employees)

The records will include faults found during inspection, and list any repairs carried out. This will be a useful indicator of places of use or types of equipment that are subject to a higher than average level of wear or damage. It will help monitor whether suitable equipment has been selected.

When equipment has been tested, each item of equipment should be labeled to indicate that the equipment has been inspected/tested and has been passed as safe.

FURTHER INFORMATION

- HSG 107 Maintaining Portable and Transportable Electrical Equipment
- IND(G)236 Maintaining Portable Electrical Equipment in Offices and Other Low Risk Environments
- Memorandum of Guidance on The Electricity at Work Regulations 1989