TTE Training Ltd.

Phase 2

Electrical Course Notes

E2-CN-001

Electrical Isolation

http://www.tteltd.co.uk

PROCEDURES FOR ELECTRICAL ISOLATION

Before considering the procedure relating to electrical isolation, a brief review of the meaning of electrical isolation will be given:

Electrical isolation means the disconnection of **all** sources of electrical energy, to the plant or equipment under consideration, in such a way that the plant or equipment cannot be subjected to inadvertent or unauthorised reconnection. In other words, the disconnection must be secure.

The purpose of electrical isolation will be to render plant or equipment dead for undertaking work. EAW Regulation 13 states clearly the requirements for this, whilst EAW Regulation 12 makes provision for compliance with Regulation 13.

Isolation Methods

In meeting the requirements of Regulation 13, compliance with Regulation 12 will ensure that means are provided for cutting off the supply and for isolation.

Isolation usually effected by means of a switch (which meets the requirements of British Standards and the IET Wiring Regulations).

Procedures for isolation will, in general, be the subject of company policy. However, regardless of the procedure to be adopted, the requirements of EAW Regulations 12 and 13 and IET Regulations must be complied with. Many organizations exceed these requirements, and include within their procedures, additional measures to prevent the inadvertent energising of the equipment. Isolation procedures are, therefore, very much a matter of company policy.

Isolation switches are only suitable for breaking a circuit which has NO LOAD on it. They must NEVER be used to stop a motor. Severe damage may occur both to the switch and the person operating the switch.

Having stopped the motor with the correct stopping method, switch off the isolator and fit an “Isolock” hasp with the process lock and your lock.

Beware of Capacitors! Allow them time to discharge before commencing work.

Beware of other sources of energy! There may be additional sources within the same enclosures.

Permits to Work

It is imperative that no work may be undertaken without a PERMIT TO WORK being issued.

This itemises the details of the work to be carried out and bears the signatures of those people responsible for ensuring that safe isolation has been performed and that it is safe for the listed work to be carried out.

Fuse Removal Certificates

If part of the isolation procedure involves the removal of fuses, as in the requirements of this programme, then the details of the circuit identification should be listed on a FUSE CERTIFICATE, a copy of which is kept with the fuses for the duration of the task.

In practice, if the task is of short duration, i.e., will be complete within one shift, the need for the fuse certificate may be neglected.

If, however, the task is expected to overlap into another shift, then the fuses and the fuse certificate must be locked away in a secure box, until the task is completed.

Example of Fuse Removal Certificate

FUSE CERTIFICATE

Section A (Retained in book) **No.** **0060**

Issued to: ……

Please remove fuse from item number ……*and disconnect.
(*Delete if not required)

Requested by…… Appointed Production Person

Date…….. Time: ……

The fuses for item number: ……...Circuit way: ……

Have been removed by: ……...

*The item has been disconnected by: ……
(*Delete if not required)

Date: ……Time: ……..

The fuses for item number: ……...Circuit way: ……

Have been replaced by: ……

Date…….. Time: ……

DPU 3653/1

General Isolation procedure

1. Plan	General Permit to Work / Risk Assessment / Method Statement / Electrical Isolation Certificate.
2. Isolate	Identify the local Isolator. Or where the isolator is remote from the equipment a. Prove to check the system has power. b. Isolate. c. Prove the system has no power.
3. Lock Out	Adopt a method of securing keys.
4. Tag Out	Attach a warning notice at the point of Isolation or use company specific coded locks.
5. Prove Dead	Prove dead by the use of an approved voltage indicator (GS38)
6. Document	If appropriate i.e., third-party Isolation, hand over to oncoming shift, long term (overnight)

Step 5 is done <u>every</u> time a conductor is exposed.

If in doubt – chicken out!

Example of electrical Isolation Certificate

Electrical isolation certificate

For 3rd party and extended term isolations

Certificate No.	

JOB DETAILS	
NAME and COMPANY	
SYSTEM ISOLATED	

This section is only valid when all sections in yellow are completed If you are in doubt or don't understand, then please ask. Remember, all accidents are preventable, and it is people who get hurt and suffer pain. Please use this permit in the spirit intended to protect yourself and others. Please ensure that you sign this permit to work.
Do not proceed with your work until your permit has been authorised by the relevant member of staff.

HAZARDS AND PRECAUTIONS TO BE TAKEN

PRIMARY HAZARDS – Electrics

PLEASE ANSWER THE FOLLOWING QUESTIONS	DETAILS	NO
CONTRACTOR: Are you trained/qualified to undertake this work? Qualification and years of experience		
CONTRACTOR: Extent and Limitations (what system or part, are you NOT permitted to touch, area NOT to encroach)		
CONTRACTOR: Extent and limitations agreed with who?		
CONTRACTOR: Have you read and/or provided a method statement?		
Have you read and/or provided a risk assessment?		
How have you proved the point of isolation? Local; tried to run; observed indicators; live voltage test; etc.		
Where is the system isolated?		
How is the system isolated?		
Lock number		
Personal lock attached		
How have you proved dead?		
Is all PPE being used adequate for the job?		
Safety boots		
Gloves		
Light eye protection		
Ear defenders		
Dust mask		
Rubber mats in place where appropriate		
CONTRACTOR: Emergency arrangements in place?		
CONTRACTOR: First aid: who, where.		

CONTRACTOR: Fire extinguishers: where.		
CONTRACTOR: Fire alarm: where.		
CONTRACTOR: Means of egress and access: where		

Other precautions required	
Other safety equipment required	

AUTHORISATION AND ACCEPTANCE

I confirm that I have verified the above information and ensured that the necessary precautions have been taken. It is safe to carry out the work as defined above and the permit information has been explained to all workers involved. I accept responsibility for this work.

				EXPIRY DETAILS		
PERSON IN CHARGE (contractor)						
COMPANY						
SIGNATURE						
AUTHORISED ELECRICAL PERSON carrying out the isolation		DATE	TIME	DD	MM	YY

This certificate should be kept with the 'lock out key' and placed in the safe until work is complete.

A copy of this certificate should be placed in a plastic wallet and attached to the 'Locked out isolator.'

HANDBACK AND CANCELLATION

I confirm that the work has been **completed/partially completed*,** checked by myself and the area left in a safe and tidy condition. (* delete as appropriate)

CONTRACTOR AUTHORISED ELECTRICAL PERSON	

I have inspected the completed/partially completed work* and hereby cancel this permit. (*delete as appropriate)

AUTHORISING SIGNATURE		DATE	TIME

An introduction to the Electricity at Work Regulations 1989

- They are statutory.
- They apply to all electrical systems and electrical equipment.
- They apply to all places of work.
- They are only concerned with electrical safety.
- They affect anyone working on/or near electrical equipment.

Who is affected by the EAW regulations?

a) Employers

b) Self-employed

c) Employees (including Trainees and Apprentices)

All electrical systems are covered by these regulations e.g., signaling to super grid 400KV.

Types of duty

Absolute
If the requirement in a regulation is "absolute" (for example if the requirement is not qualified by the words "so far as is reasonably practicable"), the requirement must be met regardless of cost or any other consideration.

Reasonably practicable
Someone who is required to do something "so far as is reasonably practicable" must assess, on the one hand, the magnitude of the risk of a particular work activity or environment and, on the other hand, the costs in terms of the physical difficulty, time, trouble, and expense, which would be involved in taking steps to eliminate or minimise those risks. If, for example, the risks to health and safety of a work process are very low, and the cost or technical difficulties of taking certain steps to prevent those risks are very high, it might not be reasonably practicable to take those steps.
In the context of these Regulations, where the risk is very often that the death, for example, from electrocution and where the nature of the precautions which can be taken are so often very simple and cheap, e.g., insulation, the level of duty to prevent that danger approaches that of an absolute duty.

The greater the degree of risk, the less weight that can be given to the cost of measures needed to prevent that risk.
The comparison does not include the financial standing of the duty holder. Furthermore, where someone is prosecuted for failing to comply with a duty "so far as is reasonably practicable", it would be for the accused to show the court that it was not reasonably practicable for him to do more than he had in fact done to comply with the duty (section 40 of the HSW act).

THE ELECTRICITY AT WORK REGULATIONS 1989

Part 1 – Introduction

Regulation 1: Citation and commencement

These Regulations may be cited as the Electricity at Work Regulations 1989 and shall come into force on 1st April 1990.

Regulation 2: Interpretation

In these Regulations, unless the context otherwise requires –

"circuit conductor" means any conductor in a system which is intended to carry electric current in normal conditions, or to be energised in normal conditions, and includes a combined neutral and earth conductor, but does not include a conductor provided solely to perform a protective function by connection to earth or other reference point.

"*conductor"* means a conductor of electrical energy.

"danger" means risk of injury.

Q. What voltage is considered 'hazardous' (electric shock)?

"*electrical equipment*" includes anything used, intended to be used or installed for use, to generate, provide, transmit, transform, rectify, convert, conduct, distribute, control, store, measure or use electrical energy;

"*injury*" means death or personal injury from electric shock, electric burn, electrical explosion or arcing, or from fire or explosion initiated by electrical energy, where any such death or injury is associated with the generation, provision, transmission, transformation, rectification, conversion, conduction, distribution, control, storage, measurement or use of electrical energy.

Q. What minimum amount of current flowing through the body, are you at risk of fatal ventricular fibrillation?

"*system*" means an electrical system in which all the electrical equipment is, or may be, electrically connected to a common source of electrical energy, and includes such source and such equipment.

Words and phrases which are in **bold** type in the text of the regulation proceeding the guidance on each regulation are those which have been assigned a special meaning by being defined in regulation 2.

Regulation 3: Persons on whom duties are imposed by these Regulations

(1) Except where otherwise expressly provided in these regulations it shall be the duty of every -

(a) employer and self-employed person to comply with the provisions of these regulations in so far as they relate to matters which are within his control; and

What is under the MDs control concerning electricity at work?

How is it that the company owner(s) could be responsible if an electrician inadvertently electrocutes a work colleague?

Under what circumstances would the company owner be innocent after an accident?

(2) It shall be the duty of every employee while at work:

(a) to **co-operate** with his employer so far as is necessary to enable any duty placed on that employer by the provisions of these Regulations to be complied with; and

(b) to **comply** with the provisions of these Regulations in so far as they relate to matters which are within his control.

What is under the process operators 'control' concerning electricity at work?

Under what circumstances would the employee be innocent after an accident?

Part II – General

Regulation 4: Systems, work activities and protective equipment

(1) All systems shall at all times be of such construction as to prevent, so far as is reasonably practicable, danger.

What aspect of construction are you responsible for?

How can you ensure you 'construct' (install, assemble or mount) equipment to prevent danger?

(2) As may be necessary to prevent danger, all systems shall be maintained so as to prevent, so far as is reasonably practicable, to danger.

Which equipment needs to be maintained?

What degree of maintenance is required for?

a kettle

control panels

an industrial coating oven

(3) Every **work activity,** including operation, use and maintenance of a system and work near a system, shall be carried out in such a manner as not to give rise, so far as is reasonably practicable, to danger.

How does a company ensure that its staff follow 'safe systems of work'?

(4) Any equipment provided under these Regulations **for protecting persons** at work on or near electrical equipment shall be suitable for the use for which it is provided, be maintained in a condition suitable for that use, and properly used.

Give examples.

Regulation 5: Strength and capability of electrical equipment

No **electrical equipment** shall be put to use where its strength and capacity may be exceeded in such a way as may give rise to **danger**.

Concerning 'low voltage' equipment where do we refer to verify the correct size and rating of cable?

Regulation 6: Adverse or hazardous environments

Electrical equipment which may reasonably foreseeable be exposed to –
(a) mechanical damage.
(b) the effects of weather, natural hazards, temperature, or pressure.
(c) the effects of wet, dirty, dusty, or corrosive conditions; or
(d) any flammable or explosive substance, including dusts, vapours, or gases,

shall be of such construction or as necessary protected as to prevent, so far as is reasonably practicable, danger arising from such exposure.

What effect will exposure to the sun have on plastic electrical equipment?

What IP number is 'finger proof'?

Regulation 7: Insulation, protection and placing of conductors

All conductors in a system which may give rise to danger shall either –

(a) be suitably covered with insulating material and as necessary protected as to prevent so far as is reasonably practicable, danger, or

(b) have such precautions taken in respect of them (including, where appropriate, their being suitably placed) as will prevent, so far as is reasonably practicable, danger.

How can we test if the insulation is still sufficiently healthy?

What options are available other than insulation?

What is the company policy concerning authorised access into a live control panel?

Regulation 8: Earthing or other suitable precautions

Precautions shall be taken, either by earthing or by other suitable means, to prevent danger arising when any conductor (other than a circuit conductor) which may reasonably foreseeable become charged as a result of either the use of a system, or a fault in a system, becomes so charged; and, for the purposes of ensuring compliance with this regulation, a conductor shall be regarded as earthed when it is connected to the general mass of earth by conductors of sufficient strength and current-carrying capacity to discharge electrical energy to earth.

What could cause earthing to deteriorate so to pose a risk of electric shock?

How can we verify a sufficiently low earth resistance to ensure safety?

Why might it be necessary to earth a large, isolated cable while work is carried out on it?

Regulation 9: Integrity of reference conductors

If a circuit conductor is connected to earth or to any other reference point nothing which might reasonably be expected to give rise to danger by breaking the electrical continuity or introducing high impedance shall be placed in that conductor unless suitable precautions are taken to prevent that danger.

What must you NOT put in line with an earth conductor?

Regulation 10: Connections

Where necessary to prevent danger, every joint and connection in a system shall be mechanically and electrically suitable for use.

What methods of connection would not satisfy the law?

Regulation 11: Means of protecting from excess current

Efficient means, suitably located, shall be provided for protecting from excess of current every part of a system as may be necessary to prevent danger.

List some devices used to satisfy this law.

It is against the law to leave a motor without protection, what do you set an overload device to?

Regulation 12: Means of cutting off the supply and for isolation

(1) Subject to paragraph (3), where necessary to prevent danger, suitable means (including, where appropriate, methods of identifying circuits) shall be available for:

(a) cutting off the supply of electrical energy to any electrical equipment and

(b) the isolation of any electrical equipment.

Give an example of (a)

Give an example of (b)

(2) In paragraph (1), “isolation” means the disconnection and separation of the electrical equipment from every source of electrical energy in such a way that this disconnection and separation is secure.

How could you verify if a device satisfies the requirements of an ‘isolator’?

(3) Paragraph (1) shall not apply to electrical equipment which is itself a source of electrical energy but, in such a case as is necessary, precautions shall be taken to prevent, so far as is reasonably practicable, danger.

give an example.

Regulation 13: Precautions for work on equipment made dead

Adequate precautions shall be taken to prevent electrical equipment, which has been made dead in order to prevent danger while work is carried out on or near that equipment, from becoming electrically charged during that work if danger may thereby arise.

List 4 general steps to isolation procedure

List the 4 steps to proving dead.

How many tests are required on a three phase and neutral supply?

When locating and identifying an isolator remote from the equipment, can you trust drawings and labels?

Why is it important to 'tag' the lock off?

Why is it important to test and re-test the tester after proving dead?

Why is it not recommended to use 'multi-meters' for proving dead (HSG 85)?

Regulation 14: Work on or near live conductors

No person shall be engaged in any work activity on or near to live conductor (other than one suitably covered with insulating material so as to prevent danger) that danger may rise unless:

Are there any live conductors that danger would <u>not</u> arise when touching them?
How 'covered' do they need to be?

(a) it is unreasonable in all circumstances for it to be dead; and

When would it be 'unreasonable' for the system to be made dead?

(b) it is reasonable in all the circumstances for him to be at work on or near it while it is live; and

When would it be reasonable for 'you' to work on or near live?

(c) suitable precautions (including where necessary the provision of suitable protective equipment) are taken to prevent injury.

What precautions?

Regulation 15: Working space, access, and lighting

For the purpose of enabling injury to be prevented, adequate working space, adequate means of access, and adequate lighting shall be provided at all electrical equipment on which or near which work is done in circumstances which may give rise to danger.

What statutory procedure would identify any issues concerning space, access, and light?

Regulation 16: Persons to be competent to prevent danger and injury

No person shall be engaged in any work activity where technical knowledge or experience is necessary to prevent danger or, where appropriate, injury, unless he possesses such knowledge or experience, or is under such a degree of supervision as may be appropriate having regard to the nature of the work.

Who decides if you are competent to carry out certain tasks?

Does competency run out over time?

Regulation 29: Defence

In any proceedings for an offence consisting of a contravention of regulations 4(4), 5, 8, 9, 10, 11, 12, 13, 14, 15, 16 or 25, it shall be a defence for any person to prove that he took all reasonable steps and exercised all due diligence to avoid the commission of that offence.

How would you 'prove' that you took all reasonable steps etc.?

The Electricity at Work Regulations 1989 require those in control of all or part of an electrical system to ensure it is safe to use and is maintained in a safe condition. The following HSE publications are designed to give advice on how to achieve this.

HSG85 Electricity at work Safe working practices

Refer to http://www.hse.gov.uk/Pubns/priced/hsg85.pdf

HSG85 provides guidance on the key elements to consider when devising safe working practices and is for people who carry out work on or near electrical equipment. It includes advice for managers and supervisors who control or influence the design, specification, selection, installation, commissioning, maintenance or operation of electrical equipment.

GS38 Electrical Test Equipment for use on low voltage electrical systems

Refer to http://www.hse.gov.uk/Pubns/priced/gs38.pdf

GS38 provides guidance aimed at people who use electrical test equipment on low voltage systems and equipment. The regulations permit few circumstances where it is possible for live working activities to be carried out on electrical equipment or systems, this includes electrical testing and fault finding. Wherever possible, all work on electrical systems should be carried out with the system dead. This includes electrical testing where dead tests are often as effective as live measurements.

INDG354 Safety in electrical testing at work

Refer to http://www.hse.gov.uk/Pubns/indg354.pdf

INDG354 is aimed at people who manage or carry out electrical testing and gives guidance on controlling risks and preventing or reducing danger arising from these activities.

Electrical testing may be carried out for a number of reasons e.g.

- quality assurance tests on electrical components.
- diagnostic testing.
- fault finding on electrical plant.
- routine safety checks.

Key points about competency

- It is a **criminal offence** under the Health & Safety at Work Act (1974) s.33 to contravene this regulation. It should be noted that it is the failure to prevent danger which constitutes an offence; the event of an accident is not a necessary prerequisite of prosecution.

- A person cannot be described as competent per se, i.e., for every possible task or circumstance – neither does someone's title e.g., 'electrician', guarantee competence.

- The notion of competency is **task-related** – this means that before we can decide whether someone is competent, we must ask the question – 'to do what'? Someone may be competent to do one job – but not another.

- Competency is not just about personal proficiency – even the most skilled craftsman **may not be legally competent** if he is not in possession of all necessary information – that goes for 'electricians' too.

- Anyone may be liable to prosecution:
  - **Persons** generally have a legal duty **not to do work if they have any doubt** about their own competency to do that work safely.
  - **Supervisors** have a legal duty not to allow work to be done unless they **are certain** as to a person's competency.
  - **Managers** have a legal duty to ensure that work activities under their control are **structured and controlled** in a manner which would ensure that work is always carried out by competent persons.
  - **Companies** have a legal duty to ensure that persons in their employ **are competent** or receive suitable training/supervision to avoid danger.

- In the event of prosecution, the burden of proof lies with the defendant – he is **guilty until he proves himself innocent** – he must prove "that he took all reasonable steps and exercised all due diligence to avoid the commission of that offence" (*Electricity at Work Regulations; regulation 29*)

- The fact that a person has expressed the view that**, in his own opinion**, he is competent would not (with the exception of self-employed persons) be accepted as sufficient proof that a supervisor, manager or company had taken reasonable steps to ensure competency.

- Training records, logbooks, evidence of training, evidence of on-the-job experience, assessment, and certification etc., can all be used as **evidence** to support the assertion that a person is competent to do a particular task.

The 5 steps to ‘Assessing the risk’

For guidance see; http://www.hse.gov.uk/pubns/indg163.pdf

The ‘management of health and safety at work regulations 1999’ make it a statutory requirement to carry out risk assessment for every work activity,

3. *(1) Every employer shall make a suitable and sufficient assessment of—*

(a) the risks to the health and safety of his employees to which they are exposed whilst they are at work; and

(b) the risks to the health and safety of persons not in his employment arising out of or in connection with the conduct by him of his undertaking,

To simplify the requirements, see below.

1. **identify** the hazards.
2. decide **who** might be harmed, and how.
3. evaluate the risks arising from the hazards and decide whether existing **precautions** are adequate, or more should be taken.
4. if you have five or more employees, **record** any significant findings.
5. **review** your assessment from time to time and revise it if necessary.

This must be written where there are more than five employees

Note: The demands of industry sometimes put pressure on the maintenance crew to get the line back on as soon as possible if not quicker, it will require confidence and strength of character to stand back for a while and consider the situation calmly.

Take 5:

Many industries adopt a policy of ‘taking five minutes’ to carry out a brief risk assessment.

Ask yourself.

Is the job within my competence?

Do I have the tools and knowledge?

Who can I ask for assistance?

Other safe systems of work

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.
- Portable equipment is maintained properly, i.e., **PAT tested** iaw the IET Code of Practice
- Work standing on approved rubber mats.
- Wear the appropriate PPE.
- Adopt approved working techniques.
- Electrical equipment used in flammable/explosive atmospheres should be designed to stop it from causing ignition. You may need specialist advice.

How can you tell if portable equipment has been inspected and tested?

How often does portable equipment require inspection and testing?

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, e.g., 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.

Reduced low voltage supplies at 110 volts.

To reduce the danger from shock reduced low voltage supplies of 110 volts are used. 110v supplies are obtained from a 230/400v supply via a double wound transformer with the secondary winding centre tapped to earth. This increases safety by only allowing a maximum voltage of 55 volts to earth.

Summary of GS38

GS38 provides advice and guidance on how to achieve this. It offers advice in the selection and use of:

- test probes
- leads
- lamps
- voltage indicating devices.
- measuring equipment

Many accidents have occurred due to the wrong selection, wrong setting, bad condition or inappropriate choice of electrical test equipment, injuries such as arc burn and electric shock.

General requirements of test probes.

I. have finger guards.
II. an exposed metal tip of no more than 4.00mm, preferably 2.00mm.
III. fused test leads (max 0.5Amp HRC) or current limiting resistor

Leads.

I. adequately insulated.
II. coloured for correct polarity (where appropriate)
III. flexible
IV. sheathed
V. long enough but not too long
VI. no exposed conductive parts (other than the tips)

Voltage indicators must be in good condition. They come in two approved categories.

a) Test lamps
b) 2-pole voltage indicators

Test lamps are generally preferred because they do not require batteries or setting up and are more robust.

Multi-meters are NOT recommended as voltage indicators proving for dead (see HSG85 paragraph 49).

Summary of IP (Index of Protection) code

Solid foreign bodies		Water	
0	Not protected	0	Not protected
1	Protected against objects of ***50mm*** diameter or greater	1	Protected against vertically falling water drops
2	Objects of ***12.5mm*** diameter or greater	2	Vertically falling drops with the item tilted 15 degrees
3	Objects of ***2.5mm*** diameter or greater	3	Spraying water
4	Objects of ***1.00mm*** diameter or greater	4	Splashing water
5	Dust protected	5	Water jets
6	Dust tight	6	Powerful water jets
		7	Temporary immersion
		8	Continuous immersion

Additional letters

XXA	Protected against access with the back of the hand	The access probe, a sphere of ***50mm*** diameter, is required to have clearance from hazardous parts
XXB	Protected against access with a finger	The jointed test finger of ***12mm*** diameter and ***80mm*** length, is required to have clearance from hazardous parts
XXC	Protected against access with a tool	The access probe of ***2.5mm*** diameter and ***100mm*** length is required to have adequate clearance from hazardous parts
XXD	Protected against access with a wire	The access probe of ***1mm*** diameter and ***100mm*** length is required to have adequate clearance from hazardous parts

Emergency Action

Electric shock – What should I do?

What to do if you believe someone has had, or is getting, an electric shock

It may not be immediately clear that someone is getting an electric shock. Smoke won't be pouring from their ears! If you think someone is suffering from electric shock, approach with extreme caution.

1) ***Assess the risk to yourself*** chemical spillage, gas etc.
2) ***Separate the person from the source*** of electricity as quickly as possible. The best way of doing this is to turn off the supply, for example by unplugging the appliance or by turning the mains off at the fuse box (consumer unit).

If this isn't possible, then try to remove the source of electricity from the person using a piece of insulating material, such as a length of wood.

NEVER touch the person receiving the electric shock, or you could suffer one too.

3) ***Call for an ambulance immediately***.

4) ***First Aid***. Carry out CPR if not breathing, stop any bleeding.

Where the person is conscious and seems well, it is still advisable to monitor their condition, as the effects of an electric shock may not be immediately obvious. In worst case conditions, an electric shock may lead to a condition known as electroporation, where cells within the body rupture, leading to tissue death. Additional problems might include deep-seated burns, muscle damage and broken bones.

References and further guidance

- HSR25. Memorandum of guidance on the Electricity at Work Regulations 1989.
- HSG85. Electricity at work: Safe working practices. (working live or dead).
- HSG65. Managing for health and safety.
- INDG231. Electricity safety and you, general electrical safety.
- GS38. Guidance on electrical test equipment.
- BS 6423:1938. Includes guidance on precautions to secure safety of maintenance, personnel isolation procedures.
- BS EN 60903:2003. Live working. Gloves of insulating material.
- BS 921:1976. Specification. Rubber mats for electrical purposes.
- BS EN 60529:1992. Specification for degrees of protection provided by enclosures (IP Codes).
- BS 7671: 2022, amendment 2. Requirements for electrical installations, 18th ed wiring regs.
- www.gov.uk/risk/faqs/htm. Guidance on risk assessment.
- www.hse.gov.uk/electricity. Guidance on portable appliance testing.
- HSG107. Maintaining portable and transportable electrical equipment.
- INDG236 (rev2) Maintaining portable electrical equipment in low-risk environments.
- GS6. Avoiding danger from overhead power lines.
- HSG47 (Second edition) Avoiding danger from underground services.
- HSG38. Lighting at work (Second edition)
- BS 6423:1983 Code of practice for maintenance of electrical switchgear and control gear for voltages up to and including 1Kv
- BS EN 60900:2004 Live working. Hand tools for use up to 1000 V ac and 1500 V dc British Standards Institution