

23 Electrical Safety

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Annex A - Inspection and Testing of Electrical Equipment/Systems

Introduction

23.1.1 This chapter sets out the MOD procedures and guidance for electrical safety which includes the management, maintenance and safe use of electrical equipment and systems¹ on defence premises, ships, vessels, vehicles and workplaces.

23.1.2 In addition to the guidance contained in this chapter, any activity which may expose personnel to live electrical conductors above Extra Low Voltage (over 50 volts AC or 120 volts DC) or in high risk environments is subject to JSP 375 Part 2, Vol 3 which takes precedence over volume 1 chapters. This chapter may need to be read in conjunction with other JSP's (e.g. 480, 482) that contain requirements for electrical safety.

23.1.3 There are many sources of electrical energy within the workplace, from small batteries in electronic systems, through power distribution systems at extra low voltage (ELV), low voltage (LV), high voltage (HV) and up to static electricity and lighting. Variations in the voltage, current and the frequency of the electricity affects the way in which the electrical energy will act, but basically there are common dangers associated with all the different forms of electricity.

23.1.4 The dangers from electricity include the risk of electrical burns, electrical shock and even electrocution. A person forming a path for an electrical current to flow will suffer an electric shock or burn. The severity being dependent on the nature of the electricity, the duration of the contact, the amount of current which flows and the route it takes as it passes through the body. Susceptibility to electric shock is increased if a person is in good electrical contact with earth. This potential for increased risk should be taken into account when using electricity in damp/wet conditions or in conducting locations such as inside a metal tank.

23.1.5 Each year many people die from electric shock or from burns received from an electric shock at work. An electrical accident may result in a fatal electric shock, serious injury, or a major fire affecting the whole premises. Most electrical accidents occur because people are working on or near electrical equipment:

- that is thought to be dead but which is still live;

¹ "electrical systems" means an arrangement of devices that an electric current can flow through when connected to a power source .

- that is known to be live but those involved do not have adequate training and/or experience;
- with a lack of supervision and/or poor planning;
- when using equipment for the task that is not appropriate; or
- knowingly taking unnecessary risks (e.g. not following a safe system of work or permit to work).

23.1.6 A significant percentage of fires on the defence estate are either started by electrical faults or the misuse of electricity. Fires may be started by:

- overheating of electrical equipment/systems due to overloading;
- the failure of electrical equipment;
- the leakage of electrical current due to poor, inadequate or faulty insulation;
- overheating of materials placed too close to electrical equipment which is otherwise operating normally;
- the ignition of materials in the vicinity of electrical equipment caused by arcing or sparking.

23.1.7 Nearly a quarter of all reportable electrical accidents in the UK involve portable equipment; for which poor maintenance is a major cause. The recommended maintenance strategy is based on a straightforward, inexpensive system of visual inspection that can be undertaken by any member of staff; the HSE have estimated that around 95% of faults or damage could be identified this way.

23.1.8 The management, use and maintenance of electrical equipment/systems by defence personnel and on defence premises/equipment must be carried out in compliance with the Electricity at Work Regulations or the Merchant Shipping (Guarding of Machinery and Safety of Electrical Equipment) Regulations as appropriate.

23.1.9 In addition to the guidance contained in this chapter, any defence infrastructure activity which may expose personnel to live electrical conductors above Extra Low Voltage (or any voltage in a high risk environment) is governed by JSP 375 ,Part 2, Vol 3 which takes precedence over Vol 1 Chapters.

Roles and Responsibilities

Service/Infrastructure/Equipment Provider

23.2.1 The Service/Infrastructure/Equipment Provider should provide assurance to the CO/HoE that all electrical systems and/or installed equipment for which they have ownership and/or maintenance responsibilities for is regularly inspected and maintained to the correct standard.

Commanding Officers (COs)/Heads of Establishment (HoEs)

23.2.2 The CO/HoE should ensure that where the infrastructure or equipment is managed, owned and/or maintained by a third party organisation (e.g. Maintenance Management Organisation (MMO), project team, external contractor) that the point of demarcation (and responsibility) is agreed (e.g. at the equipment isolator switch, domestic supply wall socket, or power distribution board), clearly defined and documented. The

CO/HoE should ensure that effective two way communication exists with any such third party organisations to provide assurances that all electrical systems and/or installed equipment is regularly inspected and maintained to the correct standard.

23.2.3 Suitable procedures should be put in place to identify; inspect; test and maintain electrical equipment/systems not managed by third party organisations and maintain records of formal tests/inspections of any such electrical equipment/systems. The procedures should include the isolation/removal and reporting of defective portable and fixed electrical equipment/systems on the establishment, ship, vessel, vehicle or workplace. The planned maintenance, inspection and test regime should be risk based (minimum frequencies/requirements at Annex A). Any defective items should be removed from service and/or secured and identified as 'unsafe do not use'. Inspection and testing can be performed simultaneously and should be carried out:

- where there is a reason to suspect equipment may be faulty, damaged or contaminated but this cannot be confirmed by visual inspection; and
- after any repair, modification or similar work to the equipment, when its integrity needs to be established.

23.2.4 The decision to allow personal portable electrical equipment and appliances to be used on the defence establishment (including clubs etc) or vessel rests with the CO/HoE. A local policy/procedure should be developed and promulgated to all defence personnel which defines where the use of personal electrical equipment/appliances is allowed, and the control measures (i.e. test and inspection) to be adhered to. Local policy/procedures should define what is and what isn't covered in the scope of personal electrical equipment and any restrictions on their use. In an office or in living accommodation, mobile phone or e-book should be out of scope; however in an explosive atmosphere they may be classified as electrical equipment and their use prohibited. The charger for a mobile phone or e-book which plugs into the mains should be included as personal electrical equipment and subject to inspection (Annex A). Local procedures should, where appropriate, include the use of adaptors for electrical equipment with different plugs or voltages to the host nation domestic electrical system.

Managers

23.2.5 Managers should ensure that for all areas and defence personnel under their control, risk assessments (JSP 375, Part 2, Vol 1, Chapter 08) consider the potential electrical hazards that may arise when working on or using electrical equipment/systems due to damage, age, history, users, the environment in which it is installed/used etc. and that suitable and sufficient control measures (Safe Systems of Work, Permits to work, etc.) are in place. The frequency and regime to which electrical equipment/systems are inspected/tested should be established (based on a combination of risk and where appropriate the table at annex A, and in line with local procedures) and all relevant electrical equipment/systems made readily available for inspection/testing in accordance with this regime/local procedure. Any inspection/test only identifies that a piece of electrical equipment is safe to use at the time of that inspection/test. To ensure ongoing electrical safety, managers should ensure that personnel using electrical equipment routinely check that there is no visible damage to the equipment or leads before use.

23.2.6 Procedures for Defence Personnel under the control of the manager should be in place to ensure and record that they receive suitable and sufficient information, training

(induction and refresher) and where appropriate supervision, when working with electrical equipment/systems. Only competent persons (or, if in training, under supervision of a competent person) are allowed to maintain electrical equipment/systems (having sufficient knowledge, training, experience and ability, and where appropriate, qualified). The type of training that should be considered includes, but is not limited to:

- general safety induction training;
- training on particular pieces of electrical equipment;
- training on working in high risk areas;
- regular refresher training.

Inspection and test will determine whether equipment/systems are fully serviceable or if remedial action is necessary. Some extra low voltage or battery operated equipment does not require testing; however mains operated battery chargers may need to be subject to test/inspection (Annex A).

All Personnel

23.2.7 All personnel should comply with all information, instruction and training provided by managers, local procedures and with manufacturers safety instructions for the safe use of electrical equipment/systems. Personnel should perform routine user visual checks (Annex A) ensuring that any suspected electrical faults are reported to their manager, the equipment taken out of service until it has been examined by a competent person and passed inspection/testing, as appropriate. Portable electrical equipment should be plugged into the nearest suitable socket to avoid over stretching of the equipment's cable and in the event of an emergency for it to be easily disconnected from the power supply. Sockets should not be overloaded; an extension lead of appropriate length may be used but only for temporary operations. Extension leads should be subject to the same inspection regime as applied to portable electrical equipment; unless they form an integral part of a static cable management system (e.g. built into a fixed desk) that is subject to a defined inspection schedule.

23.2.8 Under no circumstances should personnel change, modify or bypass safety related devices (e.g. fuses, circuit breakers or Residual Current Devices (RCDs)) as these are there to reduce the risk of harm to the user and/or protect the electrical system from overloading. Portable equipment used outdoors should always be plugged into an RCD protected socket.

23.2.9 Personnel should not modify or use modified electrical equipment provided for use at work unless the modification has been authorised and carried out and tested by a competent person.

23.2.10 Where personal electrical equipment is permitted to be used on the defence estate (including clubs etc), ship, vessel or workplace all personnel should comply with local policy relating to its use, testing and inspection.

Retention of Records

23.3.1 Risk assessments and associated documents should be retained in accordance with the requirements of JSP 375, Part 2, Volume 1, Chapter 39 - Retention of Records.

Related Documents

23.4.1 The following documents should be consulted in conjunction with this chapter:

JSP 375, Part 2, Vol 1

- Chapter 02 - Office & General Workplace Safety;
- Chapter 08 - Risk Assessment;
- Chapter 22 - Work Equipment;
- Chapter 30 - Permit to Work;
- Chapter 34 - 4C's System (The management of visiting workers and contractors);
- Chapter 39 - Retention of Records.

JSP 375, Part 2, Vol 3

- Chapter 3 - Electrical Systems.

Other JSP's, MOD Publications

- JSP 604 - Defence Manual for Information and Communication Technologies (ICT);
- JSP 482 - MOD Explosives Regulations;
- BR 2000(52)(1) - Ships High Voltage;
- BRd 167 - The SHE Manual;
- BRd 875 - Regulations for RFA Code of Safe working Practices for Merchant Seamen.

Legislation and Guidance

- [Legislation.Gov.uk](http://www.legislation.gov.uk) -Health and Safety at Work Etc Act;
- [Legislation.Gov.uk](http://www.legislation.gov.uk) - Management of Health and Safety at Work Regulations;
- [Legislation.Gov.uk](http://www.legislation.gov.uk) - Electricity at Work Regulations;
- [HSE](http://www.hse.gov.uk) - HSR25 - Memorandum of guidance on the Electricity at Work Regulations;
- [The Merchant Shipping \(Guarding of Machinery and Safety of Electrical Equipment\) Regulations](http://www.legislation.gov.uk);
- [Legislation.Gov.uk](http://www.legislation.gov.uk) - Provision and Use of Work Equipment Regulations;
- [Legislation.Gov.uk](http://www.legislation.gov.uk) – The Merchant Shipping and Fishing Vessels (Provision and Use of Work Equipment) Regulations
- [HSE](http://www.hse.gov.uk) - HSG85 - Electricity at work – Safe working practices;
- [HSE](http://www.hse.gov.uk) - HSG107 - Managing portable and transportable electrical equipment;
- [HSE](http://www.hse.gov.uk) – INDG236 – Maintaining Portable Electrical Equipment in Offices and other Low Risk Environments
- [HSE](http://www.hse.gov.uk) - INDG231 - Electrical safety and you – A Brief Guide;
- [IET Wiring Regulations](http://www.hse.gov.uk)

Inspection and Testing of Electrical Equipment/Systems

User Visual Checks

User checks should include but not be limited to checking for:

- damaged, poorly maintained or poorly installed plugs or cables;
- correct connectors used to join cables (no twisted wires or taped joints);
- incorrect use of extension leads (e.g. two or more connected together)
- signs of scorching or burn marks;
- loose wires or missing or damaged insulation;
- damaged equipment casing;
- correct marking (e.g. in-date test labels).

Formal Visual Inspections

This does not have to be undertaken by a qualified electrician. Visual inspections can be carried out by a competent member of staff provided they have been given appropriate training and have acquired sufficient experience. A visual inspection must be conducted with the equipment isolated, and should ensure that:

- there is no damage e.g., cuts and abrasions (apart from light scuffing) to any cable covering;
- there is no damage to any plug e.g. the casing is not cracked or pins are bent or misaligned;
- the outer covering (sheath) of the cable is securely gripped where it enters the plug or the equipment, and that the coloured insulation of the internal wires are not visible without removing the plug or equipment cover;
- the equipment shows no sign of having been used in an environment where it is not suitable (eg, wet or muddy);
- there is no damage to the outer cover of the equipment, e.g. obvious loose parts, screws missing or cracks in the casing;
- there are no signs of overheating (burn marks or staining);

and may also include checking that:

- the cable terminations are secure and the correct polarity;
- the correct rated fuse is fitted.

Testing

Formal testing of electrical equipment shall only be performed by a competent person (having the required knowledge, training and experience). A person not skilled in electrical work but trained in the use of and routinely using a simple 'pass/fail' type of portable appliance tester (PAT) and the knowledge to calculate the correct fuse rating may be adequately competent for testing portable equipment; providing the appropriate test procedures are rigorously followed and acceptance criteria are clearly defined. The testing of any equipment/system that is hard-wired to an electrical supply above Extra Low Voltage must be carried out by a competent qualified electrician and in accordance with JSP 375 Part 2, Volume 3 .

Recommended Initial Inspection/Testing Intervals For Electrical Equipment

Equipment/environment	Daily User visual checks	Formal visual inspection	Combined inspection and test
Power leads, Extension leads, plugs and cables.	Yes	As per category used with below	As per category used with below
Heavy industrial use, high risk of equipment damage, e.g. circular saws and angle grinders.	Yes	Yes, Weekly	Yes, 6-12 months
Residual Current Devices (RCDs)	Yes Functional Test (socket outlet & portable RCDs)	Yes, Weekly	Yes, 6-12 months
Light industrial use, e.g. bench mounted diagnostic and test equipment.	Yes	Yes, 6 months	Yes, 6-12 months
Earthed equipment (Class 1): e.g. electric kettles, some floor cleaners	Yes	Yes, 6 months-1 year	Yes, 1-2 years
Hard wired equipment: cooker, engineering workshop machines (e.g. lathe or power-press),	Yes	Yes, 1 year	Yes, 1-5 years.
Information technology: e.g. desktop computers, VDU screens	No	Yes, 2-4 years or after reconfiguration	Yes, 1-5 years if not double insulated
Fixed systems and earthed equipment only moved occasionally, NOT hand-held, e.g. photocopiers and fridges.	No	Yes, 1-4 years	Yes, 1-5 years
Double insulated equipment frequently moved or hand-held e.g. phone/laptop chargers, irons, hair dryers.	Yes	Yes, 6 months-1 year	No
Double insulated Moved occasionally, NOT hand-held, e.g. fans, table lamps, slide projectors	No	Yes, 2-4 years	No
Battery operated (less than 40 volts)	No	No	No
Extra low voltage: (less than 50 volts AC) e.g. telephone equipment, low voltage desk lights	No	No	No

Risk assessments should identify changes to the above need and frequency of inspection and testing depending on the equipment type, its usage and the operating environment (some extra low voltage specialist equipment will require daily user checks and frequent formal inspections, e.g. Ex rated torches). Where the inspection/testing regime is picking up a number of faults then consideration shall be given to increasing the frequency of inspection and testing.

Records

Formal inspection and testing records should include:

- The description of the piece of equipment;
- An asset number or equipment serial number (unique identifier);
- Location of the equipment;
- Date of next inspection/test;
- Inspection/test Pass or Fail;
- Details of any inspection/test failures.