

23 Electrical Safety

Contents

Title	Page
Introduction	1
Roles and Responsibilities	3
Retention of Records	5
Related Documents	5
Annex A - Inspection and Testing of Electrical Equipment / Systems	A1 – A3

Introduction

1. This chapter sets out the MOD policy and guidance for electrical safety which includes the management, maintenance and safe use of electrical equipment and systems¹ on Defence premises², ships, small vessels and workplaces. It outlines how MOD must comply with statute within GB and how it shall apply safe systems of work worldwide.

2. In addition to the guidance contained in this chapter, any activity which may expose personnel to live electrical conductors above Extra Low Voltage (ELV) (over 50 volts AC or 120 volts DC) or in high risk environments is subject to JSP 375, Volume 3 which includes instruction on High Voltage (HV) and amplifies the Chapters of Volume 1. This chapter should be read in conjunction with other JSPs, ISO-British Standards, and Defence Standards that contain requirements for electrical safety.

3. There are many sources of electrical energy within the workplace, from small batteries in electronic systems, through power distribution systems at ELV, low voltage (LV), high voltage (HV) and up to static electricity and lightning. 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.

4. The dangers from electricity include the risk of electrical burns, electric shock and 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 should be taken into account when using electricity in damp / wet conditions or in conducting locations such as inside a metal tank.

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

² SI-1998-494, The Health and Safety (Enforcing Authority) Regulations 1998.

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:

- a. that is thought to be dead, but which is still live;
- b. that is known to be live but those involved do not have adequate training and / or experience;
- c. with a lack of supervision and / or poor planning;
- d. when using equipment that is not appropriate; or
- e. knowingly taking unnecessary risks (e.g. not following a Safe System of Work or permit to work).

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:

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

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.

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.

9. The guidance within this Chapter is amplified by JSP 375, Volume 3, which includes instructions for any Defence infrastructure activity which may expose personnel to live electrical conductors above ELV (considered high risk environment). Additional requirements may be expected in high-hazard sites and capabilities within Statutory or Defence regulations.

Roles and Responsibilities

Service, Infrastructure and Equipment Providers

10. The Service, Infrastructure or Equipment Provider shall provide assurance to the Commanding Officer (CO) / Head of Establishment (HoE) that all electrical systems and / or installed equipment for which they have ownership and / or maintenance responsibilities are regularly inspected and maintained to the correct standard.

Commanding Officer / Head of Establishment

11. The CO / HoE shall ensure that where the infrastructure or equipment is managed, owned and / or maintained by a third party organisation (e.g. Maintenance Management Organisation, 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 shall 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.

12. Suitable procedures should be put in place to identify; inspect; test and maintain electrical equipment and systems not managed by third party organisations and maintain records of formal tests and inspections of any such electrical equipment or systems. The procedures should include the isolation or removal and reporting of defective portable and fixed electrical equipment and systems on the establishment, ship, vessel or workplace. The planned maintenance, inspection and test regime should be risk based (minimum frequencies and 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 shall be carried out:

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

13. 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 and procedure should be developed and promulgated to all Defence personnel which defines where the use of personal electrical equipment and appliances is allowed, and the control measures (i.e. test and inspection) to be adhered to. Local policy and procedures should define what is and what is not covered in the scope of personal electrical equipment and any restrictions on their use.

14. 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 tablet 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

15. Managers should ensure that for all areas and Defence personnel under their control, risk assessments (JSP 375, Volume 1, Chapter 8) 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, 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 or testing in accordance with this regime or local procedure. Any inspection or test only identifies that a piece of electrical equipment is safe to use at the time of that inspection or 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.

16. Procedures for Defence personnel shall be in place to ensure and record that there is suitable and sufficient information, training (induction and refresher) and where appropriate supervision, when working with electrical equipment and systems. Only competent persons (or, if in training, under supervision of a competent person) shall be allowed to maintain electrical equipment or systems (having sufficient knowledge, training, experience and ability, and appropriate qualification). The type of training shall include, as a minimum, but is not limited to:

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

17. Inspection and test shall be used to determine whether equipment or systems are fully serviceable or if remedial action is necessary. Some ELV or battery-operated equipment does not require testing; however, mains operated battery chargers may need to be subject to test or inspection (Annex A).

All Personnel

18. 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 and 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.

19. Portable electrical equipment should be plugged into the nearest suitable socket to avoid overstretching the equipment's cable and in the event of an emergency for it to be easily disconnected from the power supply.

20. 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.

21. Under no circumstances shall 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.

22. Personnel shall 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. 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

24. All records should be kept in accordance with JSP 375, Volume 1, Chapter 39 (Retention of Records).

Related Documents

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

a. JSP 375, Volume 1:

(1) Chapter 02 - Office & General Workplace Safety;

(2) Chapter 08 - Risk Assessment;

(3) Chapter 22 - Work Equipment;

- (4) Chapter 30 - Permit to Work;
 - (5) Chapter 34 - 4Cs System (The management of visiting workers and contractors); and
 - (6) Chapter 39 - Retention of Records.
- b. JSP 375, Volume 3;
- (1) Chapter 3 - Electrical Systems.
- c. Other MOD Publications;
- (1) DSA01.1 – Defence Policy for Health, Safety and Environmental Protection;
 - (2) DSA01.2 Chapter 2 – Requirement for Safety and Environmental Management Systems in Defence;
 - (3) DSA01.2 Chapter 4 – Risk Management in Health, Safety & Environmental Protection
 - (4) JSP 480 - Defence Co-ordinating - Installation Design Authority - Manual of Regulations for Installation of Communication & Information Systems.
 - (5) DSA02-OME - Defence Ordnance, Munitions and Explosives Regulations.
 - (6) BR 2000(52)(1) - Ships High Voltage;
 - (7) BRd 10 - The SHE Manual;
 - (8) BRd 875 - Regulations for RFA Code of Safe working Practices for Merchant Seamen: and
 - (9) ESTC Standard N° 6 part 1: Electrical.
- d. British Standards – these can be accessed via the Dstan site³;
- (1) BS 7671- IET Wiring Regulations.
- e. Legislation and Guidance;
- (1) [Health and Safety at Work, etc. Act](#);

³- Access to British Standards is via the Dstan site: <http://dstan.uwh.diif.r.mil.uk/sol/index.htm>

- (2) [Management of Health and Safety at Work Regulations;](#)
- (3) [Electricity at Work Regulations;](#)
- (4) [HSR25 - Memorandum of guidance on the Electricity at Work Regulations;](#)
- (5) [Merchant Shipping \(Guarding of Machinery and Safety of Electrical Equipment\) Regulations;](#)
- (6) [HSE L22 – Safe use of work equipment;](#)
- (7) [HSG85 - Electricity at work – Safe working practices;](#)
- (8) [HSG107 - Managing portable and transportable electrical equipment;](#)
- (9) [INDG231 - Electrical safety and you;](#)
- (10) [INDG236 - Maintaining portable electric equipment in offices and other low-risk environments.](#)

Inspection and Testing of Electrical Equipment / Systems (ELV and LV)

Minimum Advised User Visual Checks

1. User checks should include but not be limited to checking for:
 - a. damaged, poorly maintained or poorly installed plugs or cables;
 - b. correct connectors used to join cables (no twisted wires or taped joints);
 - c. incorrect use of extension leads (e.g. two or more connected together);
 - d. signs of scorching or burn marks;
 - e. loose wires or missing or damaged insulation;
 - f. damaged equipment casing; and
 - g. correct marking (e.g. in-date test labels).

Formal Visual Inspections

2. Visual checks do 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 shall be conducted with the equipment isolated, and should ensure that:
 - a. there is no damage, cuts and abrasions (apart from light scuffing) to any cable covering;
 - b. there is no damage to any plug e.g. the casing is not cracked or none of the pins are bent or misaligned;
 - c. 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;
 - d. the equipment shows no sign of having been used in an environment where it is not suitable (e.g. wet or muddy);
 - e. there is no damage to the outer cover of the equipment, e.g. obvious loose parts, screws missing or cracks in the casing; and
 - f. there are no signs of overheating (burn marks or staining).

3. Checks may also include checking that:
 - a. the cable terminations are secure and the correct polarity; and
 - b. the correct rated fuse is fitted.

Minimum Advisory Testing

4. 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. Such tests are 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 ELV must be carried out by a competent qualified electrician and in accordance with JSP 375, Volume 3, or as instructed by the appropriate Safety Case and specific regulations.

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

5. Risk assessments and or formal reliability studies shall be used to identify changes to the above requirement and frequency of inspection and testing. This shall depend upon the equipment type, its usage and the operating environment (some ELV 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

6. Formal inspection and testing records should as a minimum include:
- a. the description of the piece of equipment;
 - b. an asset number or equipment serial number (unique identifier);
 - c. location of the equipment;
 - d. date of next inspection / test;
 - e. inspection / test Pass or Fail; and
 - f. details of any inspection / test failures.