



Electrical Guidance Policy



Explanatory Note

The purpose of this guidance is to provide both practical advice on compliance and an indication of the minimum levels of activity necessary to comply with Company Policy and Legislation. Although failure to comply with the guidance would not necessarily amount to non compliance with Company policy it is expected that the procedures set out in this guidance will be followed unless it can be demonstrated that the policy and legal requirements are being met in some other equally effective manner. Standards which are less stringent than those set out in this guidance will not be regarded as acceptable.

Electrical Safety Policy

1 General

- a) It is Company policy that the Electricity at Work Regulations will be complied with. To this end, the Company Code of Practice on Electrical Safety must be followed by all who use, or are responsible for, electrical installations and equipment. The Code of Practice is included in this document after this Policy statement.
 - b) The Code of Practice sets out, in broad terms, the strategy followed by the Company in undertaking to comply with its obligations under the Electricity at Work Regulations.
 - c) Attention is particularly drawn to the Introduction to the Code of Practice which sets out the purpose of the Code, its interpretation, basic requirements, and information on the levels of competence required by workers with electricity. The Introduction also describes those parts of the Code applicable to differing types of user.
-

2 Responsibility

- a) Responsibility for the safety of electrical installations and equipment is that of the company. This responsibility is delegated via the Health and Safety Policy.
- b) The senior electrician is responsible for the supply of electrical energy to all areas and buildings as necessary. His responsibility for safety comprises the fixed supply installation up to and including the socket outlets for socket fed equipment. In the case of 'hard wired' equipment, his responsibility will extend up to and including the isolator or switch controlling the equipment.
- c) Departmental electrical equipment (including portable appliances and their plug connectors) beyond the points defined in (a) and (b) above, is the responsibility of the Head of Department. However, the Senior Electrician will still maintain the right to withdraw or alter portable appliances if he feels safety is compromised.
- d) These areas of responsibility may be varied in specific instances to suit individual situations. Where such agreements are made, they shall be in writing and their extent and application will be clearly stated so as to be understood by all parties.



Electrical Guidance Policy



3 Testing and Inspection

- a) Electrical equipment shall be tested, inspected and maintained, as specified in the Code of Practice, so as to ensure safety so far as is reasonably practicable.
- b) Persons responsible for safety shall appoint electrically competent persons to carry out testing, inspection, and maintenance of electrical equipment in accordance with specifications laid down in the Code of Practice.
- c) In this context, an 'electrically competent person' is one approved as competent for the purpose by the Senior Electrician.
- d) Any equipment brought back into use after repair shall be re-tested before being put back into service.
- e) Adequate records of tests and inspections shall be kept in such a way that each piece of equipment is identifiable and can be related to its test and maintenance record. Equipment shall be marked to indicate its availability for use.
- f) Equipment owned by staff and brought to work for use at work shall be subject to inspection and testing, as indicated in (a) to (e) above.
- g) Equipment owned by staff and brought into Company owned residential accommodation is the responsibility of the owner. Notwithstanding this, the company reserves the right to remove items that are found to be unsafe.



Code of Practice for Electrical Safety

1 Introduction

- 1.1 Although electricity causes relatively few occupational accidents, those that do occur are responsible for a high proportion of deaths. Electrical faults are also the second most frequent cause of fires in industry and commerce in the United Kingdom. The majority of electrical accidents involve equipment that has become defective due to insulation failure, inadequate earthing, incorrect over-current protection (fuses, breakers etc) or faulty wiring. Electricity is widely used throughout the Company and in normal circumstances no hazards should arise. However, neglect and misuse of electricity poses a threat to personal safety and can cause electric shock, burns, explosions and fires.
- 1.2 The purpose of this Code of Practice is to advise all who use or work with electricity on practical ways and means of avoiding electrical danger and of complying with the Electricity at Work Regulations, and to detail how Heads of Departments must assess and implement their arrangements for electrical safety.
- 1.3 In this Code of Practice, wherever the word 'must' is used, it indicates either a statutory or Company requirement. The word 'should' and all other clear recommendations are advisory, which means that people who choose not to comply with them need to satisfy themselves that an alternative practice has been adopted which can be shown to be as safe or safer than that recommended.
- 1.4 The Code forms part of the Companies Electricity Policy. Failure to observe the requirements of the Code would not necessarily constitute an offence under the Electricity at Work Regulations or any other statutory provisions. In any criminal proceedings, however, the onus rests on the accused who must show that he or she "took all reasonable steps and exercised all due diligence to avoid the commission of that offence". Compliance with the Code would tend to contribute positively to that person's defence.
- 1.5 The basic requirements for electrical safety are covered by parts A, B and C of this Code of Practice. Where departments have specific electrical hazards which fall outside the scope of this document, it is their responsibility to seek advice from the Senior Electrician.
- 1.6 It is of critical importance that those engaged in work with electricity to any degree must have the necessary level of competence to carry out their work safely. It is also important to bear in mind that ensuring the competence of those working with electricity is a statutory requirement, failure to observe which is a serious offence, carrying with it heavy penalties. The following is extracted from the Health and Safety Executive's official guidance on the Electricity at Work Regulations.
- 1.7 The Code has three separate parts, A, B and C. According to circumstances, departments will normally need to be concerned with either Part A alone, Part B alone, or Parts B and C together.

Part A is for departments with no electrically competent technical staff and which use only commercially produced equipment.

Part B is for departments which may construct, repair and maintain their own equipment and which will normally have technical staff competent to carry out the recommended maintenance and testing of equipment.



Electrical Guidance Policy



Part C deals with *additional* hazards which may arise in departments which undertake the design, manufacture, repair and testing of electrical apparatus.

- 1.8 This document is not intended to cover installation and other work by staff who have their own working systems.

2 General

- 2.1 Privately-owned space heaters may not be used in Company premises.
- 2.2 The use of open-bar radiant electric fires is specifically prohibited. Flamingo Land's insurance company prohibit there use.
- 2.3 The use of 13 amp plugs with sleeved pins is particularly recommended.

Part A

A1 General

- A1.1 This part of the Code applies essentially to Departments having no electrically competent technical staff and which use commercially produced electrical equipment
- A1.2 Where standard commercial equipment is in use the correct fuse must be fitted

A2 Checks Before Use

- A2.1 Manufacturers of any electrical equipment have a legal obligation to ensure that it is safe when properly used. When new equipment is purchased without a plug connector this must be fitted by a competent person. Provided that the plug and correct fuse have been properly fitted, commercial equipment should be safe without modification. However, instructions given by the manufacturer should be brought to the attention of all users. Wherever possible, apparatus should be connected to its own individual socket outlet with as short a lead as possible. The use of extension leads and trailing cables should be avoided. Extension leads should not be used in conjunction with cooking or heating appliances under any circumstances.
- A2.2 The equipment must be visually checked before being put into use to ensure initial safe condition. This includes checking that the flex is in good condition, that cable terminations and the plug itself are adequately secured and the casing is undamaged. The label referred to in A3.4 must be attached at this.
- A2.3 When equipment without a label is brought back into use after storage, arrangements should be made to ensure that it conforms with current safety standards, and that its condition is such that the original built-in safety has not been degraded by wear or misuse. It is the Department's responsibility to ensure that equipment is safe to use. Reference may be made to the Senior Electrician for necessary inspection and test.
- A2.4 Similar checks apply when equipment has been out of the Department on loan or otherwise. Before being put back into use the Department must ensure that it is in a safe condition.
- A2.5 Equipment to be used out of doors should be protected by a residual current device (RCD) to provide optimum protection at the supply point. In such cases, advice is available from the Senior Electrician.



Electrical Guidance Policy



Maintenance

- A3.1** Particular attention is drawn to the high standards of maintenance needed in respect of electrical appliances in category (i). (See **Appendix 1** for categories and classes of electrical equipment.)
- A3.2** It is the Department's responsibility to ensure that the electrical equipment is maintained in a safe condition and that the condition of all appliances is kept under review so as to prevent danger.
- A3.3** The most important arrangement to be made is a visual check of the condition of the connecting cables and of the plug. The connecting cable must be undamaged and securely fastened both at the appliance and plug ends. The plug must be undamaged and should not rattle, which may indicate loose terminals and potential danger. Check for visual evidence (blackening, scorching, etc) of arcing or overheating. Any apparent defect must be investigated and remedial action taken.
- A3.4** A full electrical test may be required from time to time (see **Appendices 1 and 2**). How often these safety checks should be carried out depends on the category of equipment and amount, type and conditions of use. The recommended frequency of inspection and/or testing for the different categories is set out in Appendix 2. Records must be kept by, or for, the Department preferably in a register and on the equipment itself by means of a securely attached label, so that the test and inspection history can be checked. Tests should also form part of any repair procedure. (It should be noted that many service contracts will be concerned only with the correct functioning of the equipment and not with its electrical safety.) Labelling requirements are detailed in Appendix 2.
- A3.5** The Senior Electrician is prepared to arrange for inspections and tests to be carried out on behalf of Departments who do not have qualified staff available. Alternatively he can arrange suitable training for departmental staff.
- A3.6** Where equipment is shared by Departments, or is present in accommodation shared by Departments, specific arrangements must be made to ensure that the equipment is checked regularly.

Part B

B1 General

- B1.1** This part of the Code is for departments which may construct, repair and maintain their own equipment and which will normally have technical staff competent to carry out the recommended maintenance and testing of equipment.
- B1.2** See Part C of the code for additional hazards which may arise during the design, manufacture, maintenance, repair and testing of equipment.
- B1.3** The Senior Electrician should be notified in advance of the acquisition of any equipment that is not run from a 13 amp plug, to ensure that the necessary supply is available. When equipment is installed by a contractor, the contract must make it clear where responsibility for electrical safety lies during the installation and commissioning period.

B2 Checks Before Use

- B2.1** Manufacturers of any electrical equipment have a legal obligation to ensure that it is safe when properly used. When new equipment is purchased without a plug connector, this must be fitted by a competent person. Provided that the plug and correct fuse have been properly fitted,



Electrical Guidance Policy



commercial equipment should be safe without modification. However, instructions given by the manufacturer should be brought to the attention of all users. Wherever possible, apparatus should be connected to its own individual socket outlet with as short a lead as possible. The use of extension leads and trailing cables should be avoided.

- B2.2** The same standards of safety must apply to electrical apparatus constructed within the Company. Equipment must conform in all respects with acceptable standards of electrical safety.
- B2.3** The equipment must be visually checked before being put into use to ensure initial safe condition. This includes checking that the flex is in good condition, that cable terminations and the plug itself are adequately secured and the casing is undamaged. The label referred to on B3.4 must be attached at this stage.
- B2.4** When equipment without a safety label is brought back into use after storage, arrangements should be made to ensure that it conforms with current safety standards, and that its condition is such that the original built-in safety has not been degraded by wear or misuse. It is the Department's responsibility to ensure that equipment is safe to use.
- B2.5** Similar checks apply when equipment has been out of the Department on loan or otherwise. Before being put back into use, the Department must ensure that it is in a safe condition.
- B2.6** Equipment to be used out of doors should be protected by a residual current device (RCD) to provide optimum protection at the supply point. In such cases, advice is available from the Senior Electrician

B3 Maintenance and Testing

- B3.1** Particular attention is drawn to the high standards of maintenance needed in respect of electrical appliances in category (i). (See **Appendix 1** for categories and classes of electrical equipment.)
- B3.2** It is the Department's responsibility to ensure that the electrical equipment is maintained in a safe condition and that the condition of all appliances is kept under review so as to prevent danger.
- B3.3** The most important arrangement to be made is a visual check of the condition of the connecting cables and of the plug. The connecting cable must be undamaged and securely fastened both at the appliance and plug ends. The plug must be undamaged and should not rattle, which may indicate loose terminals and potential danger. Check for visual evidence (blackening, scorching, etc) of arcing or overheating. Any apparent defect must be investigated and remedial action taken.
- B3.4** A full electrical test may be required from time to time (see Appendices 1 and 2). How often these safety checks should be carried out depends on the category of equipment and amount, type and conditions of use. The recommended frequency of inspection and/or testing for the different categories is set out in Appendix 2. Records of the test must be kept by, or for, the department preferably in a register and on the equipment itself by means of a securely attached label, so that the test and inspection history can be checked. Tests should also form part of any repair procedure. (It should be noted that many service contracts will be concerned only with the correct functioning of the equipment and not with its electrical safety.) Labelling requirements are detailed in **Appendix 2**.
- B3.5** Departments to which this part applies may carry out the test themselves using the schedule in **Appendix 3** as a guide. The Senior Electrician may be able to give further guidance to appropriate personnel from the



Electrical Guidance Policy



Department and will also give advice on appropriate testing instruments for departmental use.

- B3.6** Where equipment is shared by departments, or is present in accommodation shared by departments, specific arrangements must be made to ensure that the equipment is checked regularly.
- B3.7** Electrical testing should be carried out in accordance with the procedures indicated in **Appendix 3**.

B4 Use of Electrical Equipment in Workshop Environments

- B4.1** There are special hazards in the use of electrical equipment in workshops in that the equipment may be used in less than ideal conditions. The following are examples of such special hazards:
- particular problems arise when electrical equipment is used in the vicinity of water or other conducting fluids. Care should be taken to ensure adequate segregation and protection to avoid fluids coming into contact with any electrical equipment not specifically protected
 - when electricity is used for heating, problems may arise due to deterioration of the supply cables near to heat sources and suitable high temperature insulated cables or thermal shielding should be provided
 - in work places where flammable vapours may be present, special precautions are essential. See British Standard 5345 parts 1 - 9.
 - hand-held lamps or lamps used in connection with workshop machinery are particularly vulnerable to damage and rapid wear and they should be adequately protected. Extra low voltage (25v) hand-held lamps are preferred.

B5 Batteries

- B5.1** Batteries, both primary and secondary, most of which operate at extra low voltage, may nevertheless be high current sources. They present special problems. Battery users should consult **Appendix 4**.

B6 Connection of Electrical Equipment to Human Beings

- B6.1** There are not only those dangers which are inherent in the equipment itself but those unforeseen earth paths being created by the subject touching other electrical apparatus, sockets, conduits and other conductive material in the vicinity.

B7 Minimum Manufacturing Standards

- B7.1** Where electrical equipment is manufactured in departments, the basic principles of electrical safety outlined in **BS 2754**, Chapter 41 of the **IEE Wiring Regulations**, 16th Edition (BS 6771) and in **BS EN 292** Parts 1 and 2 should be followed.
- B7.2** Designers of electrical equipment:-
- should specify the function and limits of the equipment, e.g. intended use, foreseeable life; range and type of movement (if any); voltage, current and energy required and/or produced
 - must identify the hazards and assess the risk associated with the equipment
 - must remove or limit the risks as much as possible, e.g. by use of extra low voltage
 - must design guards, interlocks, enclosures or safety devices to guard against any remaining risks



Electrical Guidance Policy



against any remaining risks

e) must ensure that adequate instructions about use and any residual risks are made available to users

f) should consider any necessary additional precautions which may be necessary

B7.3 Where electrical equipment incorporates control systems, they must be designed and constructed so that they are safe and reliable in a way that will prevent a dangerous situation arising. Above all, they must be designed and constructed in such a way that they can withstand the rigours of normal use and external factors so that errors in logic do not lead to dangerous situations.

Control devices must be clearly visible and appropriately marked where necessary. They must be positioned so that they can be easily operated without approaching dangerous parts and so designed or protected that inadvertent operation is unlikely where a risk may result from that operation.

B7.4 All flexible cords, plugs, sockets and connectors should be of good quality and standard. Sheathed flexible cable should be used for connections between equipment and the mains supply.

B7.5 Main input switches must be suitably placed on or close to the machines, and the 'On' and 'Off' positions properly identified and accessible.

B7.6 All phases must be disconnected by the operation of the switch.

B7.7 An effective over-current protection device (e.g. a fuse) must be provided in each phase of the circuit and arranged so as to disconnect the electricity supply to the equipment in the event of overload or short circuit.

B7.8 If the supply to the equipment is made through an isolator, provision should be made for securing the isolator switch against inadvertent and unauthorised operation, e.g. by use of padlocks. Note particularly that, if it is necessary for an operator to have access to particular parts of the interior of the machine, this should not allow access to live electrical parts at the same time. All live conductors and terminals carrying dangerous voltages should be securely screened and suitable warning notice indicating the danger placed in' a prominent position.

B7.9 If this is achieved by provision of guards with interlock switches, the switches should be of such design and construction as to prohibit deliberate overriding or inadvertent operation (see, for example, **BS 5304** 'Safeguarding of Machinery'). The standard and frequency of maintenance and testing is all important in such circumstances.

B7.10 If heating elements are used in any equipment they should be placed and installed so as to cause no deterioration of electrical equipment or overheating that would result in hazard to persons or plant.

Part C

C1 General

C1.1 This part of the Code deals with additional hazards which may arise in departments which undertake the design, manufacture, repair and testing of electrical apparatus.

C1.2 This part must be read in conjunction with **Part B** of the Code.

C2 Methods of Working

C2.1 Access to areas where conductors live at dangerous voltages* are exposed must be restricted to authorised persons only. All persons under their



Electrical Guidance Policy



must be restricted to authorised persons only, or persons under their immediate supervision. All other persons should be excluded from these areas. This may be done by physical barriers, self-closing doors, warning signs or other equally effective means.

**dangerous voltages under normal dry working conditions are considered to be voltages exceeding 50V AC RMS at normal power frequency or 120V ripple-free DC.*

- C2.2 Authorised persons must be trained to understand the hazards of the equipment in use.
- C2.3 In assessing any situation for possible hazards, the knowledge and experience of the authorised persons should obviously be taken into account, but must not be relied on as the sole or main means of securing safe conditions. It should be borne in mind that even the most experienced operator may accidentally touch an exposed high voltage conductor because of a slip or fall or by being momentarily distracted. If the conditions are unfavourable, such a momentary lapse could result in death or severe injury.
- C2.4 When dangerous voltages are necessarily exposed, authorised persons should be in continuous attendance.

C3 Emergency Arrangements

- C3.1 A detailed risk assessment must be carried out and a 'worst typical' situation should then be assumed, on which appropriate arrangements for use in an emergency can be based. Amongst other things, these points will need to be considered:
 - Sources of assistance in case of electric shock and fire.
 - Adequate means of raising the alarm.
 - Access for, and the safety of, first aiders, firefighters, police, ambulance crews.
 - Location of power cut-off devices.
 - Evacuation routes.
- C3.2 Wherever possible, emergency trip buttons (**red in colour**) should be fitted so that all electrical supplies (except for lighting) can be cut off in an emergency. These must be clearly marked. In areas with potentially high risks, persons should only work with another person within sight and sound. All persons should be aware of the emergency procedures and should be able quickly and safely to isolate the electrical supply, summon help and to start resuscitation treatment where necessary.
- C3.3 Instructions on the treatment of persons suffering from electric shock should be prominently displayed in all places where conductors live at dangerous voltages are exposed.

C4 Repairs

- C4.1 During repairs, protective covers may have to be removed thereby exposing live parts.
- C4.2 In these circumstances, the hazard to be avoided is contact between one dangerous voltage conductor and another, or between a dangerous voltage conductor and earth, via the human body with consequential risk of shock and/or burn.
- C4.3 This type of work may only be carried out when precautions are taken as detailed in this Code. When movable equipment is to be worked on, it



Electrical Guidance Policy



detailed in this Code. When moveable equipment is to be worked on, it should be done in a dedicated workshop.

- C4.4** Electrical equipment may involve a mains transformer which reduces the voltages in the secondary to values less than 50 volts AC. In such a system, the main risk will therefore be on the connections to the input to the primary of the transformer. Equipment must always be examined before use and further protection given to any exposed terminals in the mains circuit to minimise the risk. However, there will always be a residual risk.

C5 Repairs on Site

- C5.1** With bulky apparatus, it may be necessary to undertake repairs on the spot away from specially equipped testing facilities. Under these circumstances, operators must be especially aware of the potential risks in carrying out faultfinding on live apparatus and means of avoiding danger. Once the fault has been found, equipment should be isolated before repairs are carried out.
- C5.2** Where necessary, temporary insulation, for example dry PVC sheeting, must be used to prevent inadvertent contact with conductors live at dangerous voltages.
- C5.3** Good quality test instruments with, where appropriate, fused test leads, must be used for tests on equipment live at dangerous voltages.
- C5.4** Portable barriers should be used to protect the person carrying out the tests from interference by passers-by and to restrict access to the area.
- C5.5** Suitable warning notices should be provided.

Appendix 1

Categories and Classes of Electrical Equipment

Four main categories of electrical equipment are identified as follows:

Portable equipment which is held in the hand while in use.

Examples: Electric drills, portable saws, soldering irons, inspection lamps, vacuum cleaners, floor polishers, domestic irons, kettles.

Equipment used in fixed positions but frequently moved during use or which is used in wet or hazardous locations.

Examples: Bench top equipment such as hotplates, ovens, heaters, etc, desk lamps, electric fires and heaters, photographic equipment - lighting, etc - kitchen equipment mixers, slicers, etc.

Transportable, seldom moved or less hazardous items.

Examples: Desktop terminals and PCs, photocopiers, calculators, fax and telephone answering machines, TV and radio receivers and other video and audio equipment.

All other electrical plant and equipment including three phase equipment and items permanently connected to the supply without plug and socket connectors.

N.B. The examples given above are not intended to be an exhaustive list.

Appendix 2

PORTABLE APPLIANCE ELECTRICAL SAFETY TESTING



Electrical Guidance Policy



Intervals for Test and/or Inspection

Category	Formal Visual Inspection	Combined Inspection & Test
1	-	12 months, or 6 months if subject to arduous use, or used within a hazardous environment
2	-	12 months
3	2 years	4 years
4	-	5 years

These are **maximum** intervals and must be reduced if required by risk assessment.

Categories of Equipment

Four main categories of electrical equipment are identified as follows:

- 1 Portable equipment which is held in the hand while in use.
Examples Electrical drills, portable saws, soldering irons, inspection lamps, vacuum cleaners, floor polishers, domestic irons, hot air guns, blenders, etc.
- 2 All equipment used in wet or hazardous locations, e.g. workshops, kitchens etc, or which is frequently moved.
Examples Kitchen equipment such as mixers, slicers, microwave ovens, kettles, freezers;
Equipment frequently moved such as portable heaters, extension leads, etc.
- 3 Electrical equipment in offices.
Examples IT equipment and PCs, photocopiers, fax and telephone answering machines, video and audio equipment, laptop power supplies, task lighting, etc, but **not** portable heaters.
- 4 All other electrical plant and equipment including **three phase equipment** and items permanently connected to the supply without plug and socket connectors.

N.B. The examples given above are **not** intended to be an **exhaustive** list but are **illustrative** of the type of equipment concerned.

New equipment

New equipment in Categories 1, 2 and 4 should be formally visually inspected and tested before being put into use. Category 3 equipment should have at least a user inspection for physical damage.

Appendix 3

Checklist for Routine Checks of Portable Electric Equipment

Listed below are typical routine electrical checks for portable apparatus, to be carried out by a suitably competent person.



Note: This checklist is intended as a guide; certain apparatus may need different or additional inspections or tests. Further advice can be



Electrical Guidance Policy



obtained from the Senior Electrician.

	Item	Test	Pass Condition
1	Mains lead	visual inspection	two layers of insulation and BS colours
2	Mains plug	visual inspection	no damage; correctly connected; cable clamp gripped to sheath; correct fuse fitted.
3	either:		
	<i>mains lead instrument connector (if lead detachable)</i>	(a) visual inspection of panel male connector;.	BS type or equivalent
		(b) attempt to open socket without tool;	unopenable
		(c) attempt to pull cable from female connector.	no movement
	<i>or:grommet/clamp</i>	(a) inspection of grommet;	cable insulation protected
		(b) sharp pull on cable;	no appreciable movement
		(c) rotation of cable.	no rotation
4	mains on/off switch	visual inspection	correct operation; no damage
5	conducting case	(a) visual inspection: (if marked treat as  item 6)	no apparent damage
		Use of earth tester which will check resistance and pass a current of at least twice the fuse rating.	earth resistance 0.25 ohm <i>or</i> earth resistance 7 ohms for loads fused at 3A or less
		(b) high voltage insulation 500 V ac minimum test	no fault indicated after 5 seconds
6	insulating case	visual inspection	maker's double insulation mark  visible; case undamaged
7	accessible fuse holders	visual inspection	no damage removal of carrier does not permit live* part to be touched
8	exposed output connections	(a) visual inspection	no voltage greater than 50V
		(b) for outputs greater than 50V, test short-	short-circuit current less than SmA



Electrical Guidance Policy



	circuit current	
*	<i>i.e.</i> live at more than 50 volts when in use	

Appendix 4

Electrical Safety Aspects of Secondary Batteries

1.1	Battery accidents commonly fall into three main categories:
	a) injury from electrically ignited hydrogen/oxygen explosions, usually occurring inside or around the top of the battery resulting in emission of electrolyte which could be dangerous;
	b) burns etc resulting from the electrical melting of metallic objects inadvertently shorted across the battery terminals;
	c) injury to skin or eyes from electrolyte.
1.2	Preventative measures. An appropriate combination of some or all of the following measures is recommended:
	i) Goggles. All personnel working on filled batteries, or near batteries undergoing charge, should wear goggles. An eyewash bottle should be considered as a supplementary precaution if there is doubt about satisfactory discipline in wearing goggles.
	ii) Washing facilities. Easy access to washing facilities is important for rapid treatment of electrolyte splashes on the skin.
	iii) Ventilation. Good ventilation should be provided in battery charging areas, so as to secure rapid removal of hydrogen at the maximum rate of production which might inadvertently occur. Outlets should be at as high a level as possible and inlet positioned at or below the level of the battery vents. It is particularly important to avoid traps in which hydrogen can accumulate as it rises. Natural ventilation is most reliable and therefore preferable. When it is difficult to provide adequate natural ventilation, a properly designed forced ventilation system may be necessary and an appropriate choice will need to be made between single and dual fan systems. Venting of the battery itself must be unrestricted by filling devices or plugs.
	iv) Segregation of battery types. All maintenance and charging of batteries should be carried out in segregated areas designated by type. Alkaline and lead-acid batteries should not be processed in the same area.
1.3	Avoidance of ignition sources. The immediate vicinity of the battery should, as far as possible, be treated as a Zone I area (BS 5345 , Part I refers), the size of the zone depending on the amount of hydrogen which can be produced and on the efficiency of the ventilation. It should be noted, however, that electrical ignition sources cannot easily be totally eliminated, e.g. a faulty battery may occasionally generate sparks internally as previously mentioned. Smoking and naked lights should be banned from the charging area.
1.4	Mains isolation. The mains supply to the charger should be switched off before connecting or disconnecting batteries.
1.5	Circuit protection. Wherever possible, circuits fed by batteries should be protected by fuses or circuit breakers as close as possible to the source.



Electrical Guidance Policy



Avoidance of overcharging. Excessive charging should be avoided where

a) automatic reduction of charging current near the end of the charging

b) control of ampere hour input to the battery by means of an ampere hour

1.7 **Jewellery, watches, etc.** Personnel working batteries should remove their

1.8 **Battery isolation.** Work on electrical systems having a battery as power

1.9 **Insulated tools.** For connecting and disconnecting batteries and in other

1.10 **Cover.** Wherever possible batteries should be covered so that short circuits

1.11 **Charging equipment.** Charging equipment should be maintained in good

1.12 **Electrolyte levels.** Electrolyte levels should not be allowed to fall excessively



Electrical Guidance Policy



GS 37	Flexible leads, plugs, sockets, etc.
GS 38	Electrical test equipment for use by electricians
HS(G) 13	Electrical testing
HS(G) 22	Electrical apparatus for use in potentially explosive atmospheres
HS(G) 38	Lighting at work
HS(G) 85	Electricity at work. Safe working practices.

British Standards Institution (BSI) Publications

<i>Standard No.</i>	<i>Title</i>
BS 5345	Code of practice for selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres.
BS 6771	Chapter 41 of the IEE Wiring Regulations, 16th Edition.
BS 2754	Memorandum. Construction of electrical equipment for protection against electric shock.
BS 5304	Safeguarding of Machinery.
BS 4293	Residual current-operated circuit-breakers.
BS 2771	Electrical equipment of industrial machines.
BSEN 292	Safety of machinery - basic concepts, general principles for design.
BS 921	Rubber mats for electrical purposes.

Other Publications

IEE Wiring Regulations, 16th Edition.