



Scottish Health Technical Memorandum 2007

(Part 1 of 4)

Overview and management responsibilities

Electrical services: supply and distribution

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1. Scope

General

- 1.1 The provision of electrical services in HCPs is a management responsibility at both new and existing sites. This guidance is equally applicable to premises which offer acute healthcare services under the Registered Establishments (Scotland) Act 1998.
- 1.2 This guidance also provides an insight into the requirements of the Electricity at Work Regulations 1989.
- 1.3 Healthcare and social services premises are totally dependent upon electrical power supplies, not only to maintain a safe and comfortable environment for patients and staff, but also to give greater scope for treatment using sophisticated medical equipment at all levels of clinical and surgical care. Changes in application, design and statutory requirements have led to the introduction of a new generation of equipment and new standards of reliability; hence, a large expansion of material is included in this SHTM.
- 1.4 Interruptions in electrical power supplies to equipment can seriously disrupt the delivery of healthcare, with serious consequences for patient well-being. Healthcare and social services premises must therefore ensure that their electrical installation provides maximum reliability and integrity of supplies. Every effort must be made to reduce the probability of equipment failure due to loss of power from the Public electricity supply company and from internal emergency power sources.

2. Management responsibilities

Statutory requirements

- 2.1 It is the responsibility of the general managers/chief executives to ensure that their premises comply with all statutes.
- 2.2 Managers (owners or occupiers) of healthcare and social services premises (the latter are premises registered on behalf of the Secretary of State under the Registered Establishments (Scotland) Act 1998) have an overriding general duty of care under the Health and Safety at Work etc Act 1974 (the HSW Act 1974).
- 2.3 Electrical supply and distribution services, including all manufactured equipment, must comply with the following legislation in all or in part as applicable:
- a. the Electricity Act 1989;
 - b. the Electricity Supply Regulations 1988 (as amended 1994). This imposes requirements regarding the installation and use of electric lines and apparatus of suppliers of electricity, including provisions for connections with earth. These Regulations are administered by the Engineering Inspectorate of the Electricity Division of the Department of Energy and may impose requirements which are in addition to those of the Electricity at Work Regulations;
 - c. the Electricity at Work Regulations 1989. The principal statutory requirement for electrical safety in the workplace is the Electricity at Work Regulations 1989 (SI No 1989/635). The Regulations came into force on 1 April 1990. The purpose of the Regulations is to require precautions to be taken against the risk of death or personal injury from electricity in work activities;
 - d. the Health and Safety at Work etc Act 1974;
 - e. the Clean Air Act 1993;
 - f. the Health and Safety Executive document 'Occupational Exposure Limits' (OEL), 'Annual Guidance Note EH40' (this document is updated annually);
 - g. the Control of Substances Hazardous to Health Regulations (COSHH) 1999;
 - h. the Energy Act 1983;
 - i. the Health and Safety (Safety Signs and Signals) Regulations 1996;
 - j. G59/1: Recommendations for Embedded Generator Plant connected to Public electricity supply company Supplies (Electricity Association);



- k. report ET113 Protection of Generating sets up to 5 MW for parallel operations with Public electricity supply company supplies (Electricity Association).

Other obligations

- 2.4 Management has a responsibility for ensuring that all electrical systems and equipment are specified, designed, installed, operated and maintained correctly.
- 2.5 In order to satisfy these requirements, management has to:
 - a. formulate an electrical services policy indicating their commitment to the safe operation and maintenance of the electrical system;
 - b. monitor this policy to ensure its effectiveness;
 - c. keep abreast of the appropriate training for relevant professional and technical staff.

Functional guidance

- 2.6 Management should ensure that all electrical services meet their functional requirements to a high degree of reliability. Guidance and advice is given in SHTM 2007 on the various aspects of electrical design, installation, commissioning, operation and economies. The following topics are included:
 - a. scheme planning;
 - b. liaison with other disciplines;
 - c. electricity supply tariff and voltage;
 - d. electricity distribution philosophy;
 - e. detailed project specification;
 - f. load growth and change;
 - g. maximum demand and power factor;
 - h. diversity;
 - i. emergency supply arrangements;
 - j. patient safety in clinical locations.



- 2.7 Guidance notes and other publications issued from time to time by the Department, the Health and Safety Executive (HSE) and by the Institution of Electrical Engineers, give detailed advice or legal requirements on such matters as design of certain equipment, safe working practices, maintenance and repair of equipment, and installation methods for particular environments.
- 2.8 There exist many national and international organisations, for example BSI (British Standards Institution), IEC (International Electrotechnical Commission), ISO (International Organisation for Standardisation) and CENELEC (the European Committee for Electrotechnical Standardisation). These bodies produce written standards, codes of practices and procedures applicable to particular industries, processes or hazards. Such codes may provide useful detailed expansion of the guidance given in this SHTM.
- 2.9 The IEE Wiring Regulations (BS 7671: 1992) are published by the IEE. They relate principally to the design, selection, erection, inspection and testing of electrical installations. These regulations are framed to guide and protect against hazards arising in any installation that may cause electrical shock, burns, injury, or induced fire. They are intended to be cited as a guidance document, if referred to in any contract, and compliance with them will satisfy the requirements of the Building Standards (Scotland) Regulations 1990. They are not intended to take the place of a detailed specification or to provide for every circumstance.
- 2.10 Compliance with British Standards or IEC, ISO and harmonised European Standards (EN) should be specified insofar as they are applicable. Where no accepted standard or independent EC type-examination certification or "CE" mark is available, special care should be taken with the manufacturers' specifications.
- 2.11 IEC or ISO standards, by agreement, are harmonised and adopted by those EC and EFTA countries represented on CENELEC. These standards are recognised as the minimum standard of manufacture by the European Court of the EC.

Installation and commissioning of electrical services

- 2.12 Before being put into service, every electrical installation should be inspected and tested to verify that the requirements of the contract document and appropriate regulations are met.
- 2.13 At the appropriate stages of installation/commissioning and following periodic testing, formal completion and inspection certificates should be provided to form part of the record documentation.



Quality assurance

- 2.14 Reliability is of prime importance with equipment used in electrical installations. Equipment manufacturers and suppliers subject to the internal assessment and inspectorate services based upon BS 5750 (ISO 9000) - 'Quality systems' and BS 9000 - 'Electronic components of assessed quality' should be encouraged and supported. Independent inspection should be used wherever practical or possible.

Operation and maintenance of electrical equipment

- 2.15 Regular maintenance enhances the safety standards associated with an electrical system. A policy to carry out planned preventive maintenance should be introduced.
- 2.16 Irrespective of the scale of operation, maintenance programmes are essential to ensure that electrical equipment is checked, inspected, tested, repaired or replaced at times when operating demand is at a minimum. The frequency of maintenance will be influenced by several operating factors:
- quality of manufacture;
 - frequency of use;
 - environmental conditions;
 - skill of the operator;
 - importance of the service.

Additional electrical load

- 2.17 The connection of small or large items of electrical equipment to an electrical supply system should be regulated. All fixed or portable items of electrical equipment which are connected to the electrical supply should be subject to registration for approved use by the authorised person responsible for the electrical supply and distribution systems.
- 2.18 The on-cost of any new equipment or service, which increases the electrical load, should include any additional retro-fit costs where necessary to continue the safe operation of the electrical system.

Safety at work

- 2.19 Management is responsible for the provision of clear guidance on safe electrical working practices and emergency procedures. This is indicated in SHTM 2020; *Electrical safety code for low voltage systems* and SHTM 2021; *Electrical safety code for high voltage systems*.
- 2.20 It is a requirement of the Electricity at Work Regulations 1989 (the regulations) that the management, design, installation, testing, commissioning and operation of an electrical system and connected equipment is performed in a manner so as to prevent danger.

Monitoring and Recording procedures

- 2.21 Full recording of original and amended drawings, planned preventive maintenance, routine maintenance, breakdown maintenance and incidents, etc. should be formally kept. Effective monitoring and record-keeping will assist duty holders to demonstrate their compliance with the requirements of the Health and Safety at Work etc Act 1974 and supporting Electricity at Work Regulations 1989.
- 2.22 Enquiries or proceedings may arise related to an offence contravening the Regulations. Management's strategy and effectiveness of monitoring procedures may be a duty holder's main or only defence in proving that all reasonable steps had been taken in the exercise of due diligence to avoid such an offence.
- 2.23 At appropriate stages in the installation/commissioning of a new project, a formal "construction certificate" should be completed by the design engineer. This certificate will confirm that the contractor has completed the installation in accordance with the design, calculations and drawings issued by the designer. Test certificates, "as-fitted" drawings, operation and maintenance manuals should be provided by the installation contractor where applicable.
- 2.24 A statement of "design intent" should be provided by the design engineer. This is to be included within the operations manual and give full details of the operation, interlocking and control of the electrical system.
- 2.25 Any alterations carried out since commissioning should be recorded on the original "as-fitted" drawings, documents and schedules.



3. Design of installation for growth

- 3.1 The design of electrical services in HCPs should be flexible within cost limits to allow for future additions/alterations.
- 3.2 Subsequent additions to an installation, unless planned or allowed for during the original construction, can prove costly. The aim should be to make adequate provision for known requirements. This includes spare capacity in transformers, cables and bus-bars and, where practicable, suitable provision should be made to extend the installation. It is important to note that an increase in cable size initially is relatively inexpensive compared with the cost of installing an additional cable later.

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4. Electrical supplies, tariffs and maximum demand

- 4.1 The type and choice of tariff available to HCPs can vary considerably. Tariffs should be discussed at an early stage with the commercial engineer of a Public electricity supply company or any other supplier. The discussions should focus on preferential tariffs. Guarantees for the reliability and integrity of electrical supplies should be emphasised.
- 4.2 Normally, two basic types of tariff are available. These are “block” or “maximum demand”. There is a maximum limit for block tariffs and a minimum limit for maximum demand tariffs. These values vary with different electricity suppliers. Possible variations in both the basic types of tariff include reduced rates for off-peak (night and/or weekend) consumption.
- 4.3 The estimated maximum power demand will partly determine the capacity of the supply load rating and location of main distribution equipment.
- 4.4 The maximum power demand in kW and maximum load in kVA, together with the method of distribution, will influence negotiations on the final tariff agreed.
- 4.5 Among the factors which will increase maximum demands are deep plan designed buildings which require higher standards of illumination and mechanical ventilation.
- 4.6 The power factor (pf) of an electrical system is a simple arithmetical ratio of the electrical supply input in kilowatts (kW) divided by the product of the input kilovolt x amperes. This is represented arithmetically as:

$$pf = \frac{kW}{kVA}$$

- 4.7 The power factor of an HCP is always inductive. This is indicated by a lagging pf of less than unity. Low values of lagging pf can invoke a penalty charge by the PES because of the introduction into its system of unforeseen current overloading and loss of potential earnings.
- 4.8 The penalty charge can be reduced by the use of equipment known as power factor correction (or compensation) (PFC) equipment.

5. Supply voltage

- 5.1 The voltage at which the PES will supply electrical power is determined by the facilities available, the prospective load and the extent of the distribution system. There are three options:
- low voltage supply (normally 240 V/415 V, 50 Hz, single phase or three phase -four wire) direct from the PES's low voltage network;
 - a low voltage supply provided from a high voltage transformer belonging to the PES, housed in a sub-station compound located on the HCP. This transformer could either be for the sole use of those premises or could jointly supply other consumers. This type of supply is suitable for medium-sized operations (less than 300 kVA);
 - a dedicated high voltage supply (normally 11 kV, three-phase) from the PES high voltage network. At the consumer side of the supply terminals, that is, after the metering equipment, the HCP will be responsible for providing, operating and maintaining the high voltage transformers, associated switchgear and cabling.
- 5.2 Consultation with the PES is necessary at an early stage. This will ensure a secure facility is available to meet load demands, based on best technical and economical terms.
- 5.3 In urban areas and where the maximum demand of the HCP is high, the PES could provide a second high voltage feeder. In rural areas, the additional cost of a second feeder will only be economically advantageous where suitable overhead lines and/or buried cable routes are available.

6. Distribution systems

General

- 6.1 The distribution system should be designed to provide:
- security of supply;
 - flexibility in adaptation;
 - safety in operation and maintenance.

All these factors should be considered within the cost constraints.

- 6.2 Provision in the design should allow space for future expansion. At an early stage in the design, the distribution system should be assessed for safe and flexible operational requirements and the provision of an emergency supply (see SHTM 2011; *Emergency electrical services*).

Essential services supply

- 6.3 The increasing dependence of medical and nursing procedures on electrical equipment calls for special attention to the HCP electrical distribution system. Emergency generating plant should be available to provide electrical power to those areas which will enable the HCP to carry out its essential functions. Within this general objective, the aim should be to simplify the electrical installations as far as is practicable, and avoid unnecessary segregation and repetition in essential and non-essential circuits, particularly for lighting circuits where comparatively small loads are involved.

- 6.4 Where new HCPs are built in separate construction phases, the essential power supply for the whole should as far as possible be planned and evaluated at the design stage. This will enable the total emergency power supply to be assessed in the early planning stages and appropriate areas of accommodation allocated. A.c. generator sets, as required, should be installed early in each of the phases of development to ensure that the maximum security of emergency power is available from the outset, and suitable staff training obtained.

- 6.5 The essential power supply facilities for existing HCP should be periodically re-assessed and upgraded to ensure that sufficient emergency power supplies will always be connected to maintain essential clinical and surgical life-support facilities.



Voltage fluctuations

- 6.6 To comply with the IEE Wiring Regulations, (BS 7671) the low voltage installation conductors should be selected to ensure that the fall in voltage, at full load currents, does not exceed 4% measured from the supply terminals to the fixed equipment.

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7. Designated staff functions

- 7.1 Only trained authorised and competent persons should be appointed by management to control the operation of electrical services.
- 7.2 **Management:** the owner, occupier, employer, general manager, chief executive or other person who is accountable for the premises and is responsible for issuing or implementing a general policy statement under the HSW Act 1974.
- 7.3 **Designated person:** an individual who has overall authority and responsibility for the premises containing the electrical supply and distribution system, and has a duty under the HSW Act 1974 to prepare and issue a general policy statement on health and safety at work, including the organisation and arrangements for carrying out that policy. This person should not be the authorising engineer.
- 7.4 **Duty holder:** a person on whom the Electricity at Work Regulations 1989 impose a duty in connection with safety.
- 7.5 **Employer:** any person or body who:
- employs one or more individuals under a contract of employment or apprenticeship;
 - provides training under the schemes to which the Health and Safety (Training for Employment) Regulations 1990 (SI 1380) apply.
- 7.6 **Authorising engineer (high voltage):** a Chartered Electrical Engineer with appropriate experience and possessing the necessary degree of independence from local management, who is appointed in writing by management to implement (as appropriate), administer and monitor the safety arrangements for the high voltage electrical supply and distribution systems of that organisation to ensure compliance with the Electricity at Work Regulations 1989, and to assess the suitability and appointment of candidates in writing to be authorised persons (see SHTM 2021; *Electrical safety code for high voltage systems*).
- 7.7 **Authorising engineer (low voltage):** a Chartered Engineer or Incorporated Electrical Engineer with appropriate experience and possessing the necessary degree of independence from local management, who is appointed in writing by management to advise on and monitor the safety arrangements for the low voltage electrical supply and distribution systems of that organisation to ensure compliance with the Electricity at Work Regulations 1989, and to assess the suitability and appointment of



candidates in writing to be authorised persons (see SHTM 2020; *Electrical safety code for low voltage systems*).

7.8 **Authorised person:** an individual possessing adequate technical knowledge and having received appropriate training, appointed in writing by the authorising engineer to be responsible for the practical implementation and operation of management's safety policy and procedures on defined electrical systems (see SHTMs 2021 and 2020).

7.9 **Competent person:** an individual who in the opinion of an authorised person has sufficient technical knowledge and experience to prevent danger while carrying out work on defined electrical systems (see SHTMs 2021 and 2020).

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8. Definitions

- 8.1 **Department:** an abbreviation of the generic term “UK Health Departments” (the Department of Health, the Scottish Office).
- 8.2 **Injury:** death or personal injury from electrical shock, electrical burn, electrical explosion or arcing, or from fire or explosion initiated by electrical energy.
- 8.3 **Danger:** a risk of injury.
- 8.4 **System:** a system in which all the electrical equipment is, or may be, electrically connected to a common source of electrical energy, including such source and such equipment.
- 8.5 **Essential circuits:** circuits forming part of the essential services electrical supply, so arranged that they can be supplied separately from the remainder of the electrical installation.
- 8.6 **Generator set:** an engine-driven synchronous a.c. generator with exciter and other essential components to generate electrical power, that is, it can be started and run independently of any external electrical supply.
- 8.7 **Emergency supply:** any form of electrical supply which is intended to be available in the event of a failure in the normal supply.
- 8.8 **Essential service electrical supply:** the supply from an engine-driven a.c. emergency generator which is arranged to come into operation in the event of a failure of the normal supply and provide sufficient electrical energy to ensure that all basic functions of the HCP are maintained in service.
- 8.9 **No-break supply:** a circuit continuously energised whether or not the normal supply is available.
- 8.10 **Electrical equipment:** includes anything used, intended to be used or installed for use to generate, provide, transmit, transform, conduct, distribute, control, measure or use electrical energy.
- 8.11 **Equipment:** abbreviation of electrical equipment.
- 8.12 **High voltage (HV):** the existence of a potential difference (rms value for ac.) normally exceeding 1000 volts a.c. between circuit conductors or 600 volts between circuit conductors and earth.



- 8.13 **Low voltage (LV):** the existence of a potential difference (rms value for a.c.) not exceeding 1000 volts a.c. or 1500 volts d.c. between circuit conductors or 600 volts a.c. or 900 volts d.c. between circuit conductors and earth.

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References

NOTE:

Where there is a requirement to address a listed reference, care should be taken to ensure that all amendments following the date of issue are included.

Publication ID	Title	Publisher	Date	Notes
Acts and Regulations				
	The Building (Scotland) Act	HMSO	1959	
	Clean Air Act	HMSO	1993	
	Electricity Act	HMSO	1989	
	Energy Act	HMSO	1983	
	Health and Safety at Work etc Act	HMSO	1974	
	Registered Establishments (Scotland) Act	HMSO	1988	
	The Water (Scotland) Act	HMSO	1980	
SI 2179 & 187	The Building Standards (Scotland) Regulations (as amended)	HMSO	1990	
	The Building Standards (Scotland) Regulations: Technical Standards Guidance	HMSO	1998	
SI 2092	Carriage of Dangerous Goods (Classification, Packaging & Labelling) and Use of Transportable Pressure Receptacles Regulations	HMSO	1996	
SI 1460	Chemicals (Hazard Information and Packaging for Supply) Regulations (CHIP2)	HMSO	1997	
SI 3140	Construction (Design and Management) Regulations	HMSO	1994	
SI 437	Control of Substances Hazardous to Health Regulations (COSHH)	HMSO	1999	
SI 635	Electricity at Work Regulations	HMSO	1989	
SI 1057	Electricity Supply Regulations (as amended)	HMSO	1988 (amd. 1994)	
SI 2372	Electromagnetic Compatibility Regulations (as amended)	HMSO	1992	
SI 95	Environmental Protection (Disposal of Polychlorinated Biphenyls and other Dangerous Substances) (Scotland) Regulations 2000	HMSO	2000	
SI 2451	Gas Safety (Installation and Use) Regulations	HMSO	1998	
SI 917	Health & Safety (First Aid) Regulations	HMSO	1981	



Publication ID	Title	Publisher	Date	Notes
SI 682	Health & Safety Information for Employees Regulations	HMSO	1989	
SI 2792	Health and Safety (Display Screen Equipment) Regulations	HMSO	1992	
SI 341	Health and Safety (Safety Signs and Signals) Regulations	HMSO	1996	
SI 1380	Health and Safety (Training for Employment) Regulations	HMSO	1990	
SI 2307	Lifting Operations and Lifting Equipment Regulations (LOLER)	HMSO	1998	
SI 3242	Management of Health and Safety at Work Regulations	HMSO	1999	
SI 2793	Manual Handling Operations Regulations	HMSO	1992	
SI 1790	Noise at Work Regulations	HMSO	1989	
SI 3139	Personal Protective Equipment (EC Directive) Regulations (as amended)	HMSO	1992	
SI 2966	Personal Protective Equipment at Work (PPE) Regulations	HMSO	1992	
SI 128	Pressure Systems Safety Regulations (PSSR)	HMSO	2000	
SI 2306	Provision and Use of Work Equipment Regulations (PUWER)	HMSO	1998	
SI 3163	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR)	HMSO	1995	
SI 972	Special Waste Regulations (as amended)	HMSO	1996	
SI 3004	Workplace (Health, Safety and Welfare) Regulations	HMSO	1992	
British Standards				
BS 31	Specification. Steel conduit and fittings for electrical wiring	BSI Standards	1940	
BS 88	Cartridge fuses, for voltages up to and including 1000 V a.c. and 1500 V d.c. Part 2.2. Specification for fuses for use by authorised persons (mainly for industrial application). Additional requirements for fuses with fuse-links for bolted connections	BSI Standards	1988	
BS 89	Direct acting indicating analogue electrical measuring instruments and their accessories. Part 2: Specification for special requirements for ammeters and voltmeters (≡ EN 60051-2 : 1989, IEC 60051-2: 1984)	BSI Standards	1990	



Publication ID	Title	Publisher	Date	Notes
BS 148	Specification for unused and reclaimed mineral insulating oils for transformers and switchgear	BSI Standards	1998	
BS 159	Specification for high-voltage busbars and busbar connections	BSI Standards	1992	
BS 171	Specification for power transformers Part 3: 1987 Part 5: 1978 (≡ IEC 60076-5: 1976)	BSI Standards	1970	
BS 697	Specification for rubber gloves for electrical purposes	BSI Standards	1986	
BS 921	Specification. Rubber mats for electrical purposes	BSI Standards	1976	
BS 970-1	Specification for wrought steels for mechanical and allied engineering purposes. General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels	BSI Standards	1996	
BS 1361	Specification for cartridge fuses for a.c. circuits in domestic and similar premises	BSI Standards	1971	
BS 1362	Specification for general purpose fuselinks for domestic and similar purposes (primarily for use in plugs)	BSI Standards	1973	
BS 1363	Specification for 13A fused plugs and switched and unswitched socket-outlets	BSI Standards	1984	
BS 1387	Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads	BSI Standards	1985	
BS 2484	Specification for straight concrete and clay ware cable covers	BSI Standards	1985	
BS 2692-2	Fuses for voltages exceeding 1000 V a.c. Expulsion fuses	BSI Standards	1956	
BS 2757	Method for determining the thermal classification of electrical insulation (≡ IEC 60085: 1984)	BSI Standards	1986	
BS 2898	Specification for wrought aluminium and aluminium alloys for electrical purposes. Bars, extruded round tube and sections	BSI Standards	1970	Partially Replaced
BS 3036	Specification. Semi-enclosed electric fuses (ratings of up to 100 amperes and 240 volts to earth)	BSI Standards	1958	



Publication ID	Title	Publisher	Date	Notes
BS 3535-1	Isolating transformers and safety isolating transformers. General requirements (≡ ISO 3740-1980)	BSI Standards	1990	
BS 3643-1	ISO metric screw threads. Principles and basic data	BSI Standards	1981	
BS 3968	Specification for current transformers	BSI Standards	1973	
BS 3941	Specification for voltage transformers	BSI Standards	1975	
BS 4066-3	Tests on electric cables under fire conditions. Tests on bunched wires or cables (≡ IEC 60332-3: 1992))	BSI Standards	1994	
BS 4196-0	Sound power levels of noise sources. Guide for the use of basic standards and for the preparation of noise test codes (≡ ISO 3740-1980)	BSI Standards	1981	
BS 4293	Specification for residual current operated circuit breakers	BSI Standards	1983	Generally Replaced
BS 4568-1	Specification for steel conduit and fittings with metric threads of ISO form for electrical installations. Steel conduit, bends and couplers	BSI Standards	1970	
BS 4579	Specification for performance of mechanical and compression joints in electric cable and wire connectors. Part 1: Compression joints in copper conductors Part 2: Compression joints in nickel, iron and plated copper conductors Part 3: Mechanical and compression joints in aluminium conductors	BSI Standards	1970 1973 1976	
BS 4999-0	General requirements for rotating electrical machines. General introduction and information on other Parts	BSI Standards	1987	



Publication ID	Title	Publisher	Date	Notes
BS 5266	Emergency lighting Part 1: Code of practice for the emergency lighting of premises other than cinemas and certain other specified premises used for entertainment Part 2: Code of practice for electrical low mounted way guidance systems for emergency use Part 3: Specification for small power relays (electromagnetic) for emergency lighting applications up to an including 32A Part 4: Code of practice for design, installation, maintenance and use of optical fibre systems Part 5: Specification for component parts of optical fibre systems Part 6: Code of practice for non-electrical low mounted way guidance systems for emergency use. Photoluminescent systems Part 7: Lighting applications. Emergency lighting (= BS EN 1838: 1999)	BSI Standards	1999 1998 1981 1999 1999 1999 1999	
BS 5311	High-voltage alternating-current circuit-breakers	BSI Standards	1996	
BS 5378-1	Safety signs and colours. Specification for colour and design	BSI Standards	1980	
BS 5467	Specification for 600/1000 V and 1900/3300 V armoured electric cables having thermosetting insulation	BSI Standards	1997	
BS 5655	Lifts and service lifts Part 3: Specification for electric service lifts	BSI Standards	1989	
BS 5685	Electricity meters Part 1: Specification for Class 0.5, 1 and 2 single-phase and polyphase, single rate and multi-rate watt-hour meters Part 3: Specification for meters having Class 1 electro-mechanical maximum demand indicators	BSI Standards	1979 1986	
BS 5724-1	Medical electrical equipment. Specification for general safety requirements	BSI Standards	1979	
BS 5750	Quality Systems (5750-8: 1991) (= EN 29004-2: 1993, = ISO 9004-2: 1991)	BSI Standards	1991	



Publication ID	Title	Publisher	Date	Notes
BS 5839-1	Fire detection and alarm systems for buildings. Code of practice for system design, installation and servicing	BSI Standards	1988	
BS 6004	Electric cables. PVC insulated, non-armoured cables for voltages up to and including 450/700 V for electric power, lighting and internal wiring	BSI Standards	2000	
BS 6007	Electric cables. Single core unsheathed heat resisting cables for voltages up to and including 450/750 V, for internal wiring	BSI Standards	2000	
BS 6121	Mechanical cable glands (all parts)	BSI Standards	1989	
BS 6207-2	Mineral insulated cables with a rated voltage not exceeding 750 V. Terminations	BSI Standards	1995	
BS 6234	Specification for polyethylene insulation and sheath of electric cables	BSI Standards	1987	
BS 6346	Specification for 600/1000 V and 1900/3300 V armoured electric cables having PVC insulation	BSI Standards	1997	
BS 6387	Specification for performance requirements for cables required to maintain circuit integrity under fire conditions	BSI Standards	1994	
BS 6423	Code of practice for maintenance of electrical switchgear and controlgear for voltages up to and including 1 kV	BSI Standards	1983	
BS 6480	Specification for impregnated paper-insulated lead or lead alloy sheathed electric cables of rated voltages up to and including 33000 V	BSI Standards	1988	
BS 6500	Electric cables. Flexible cords rated up to 300/500 V, for use with appliances and equipment intended for domestic, office and similar environments	BSI Standards	2000	
BS 6622	Specification for cables with extruded cross-linked polyethylene or ethylene propylene rubber insulation for rated voltages from 3.8/6.6 kV up to 19/33 kV	BSI Standards	1999	
BS 6626	Code of practice for maintenance of electrical switchgear and controlgear for voltages above 1 kV and up to and including 36 kV	BSI Standards	1985	
BS 6651	Code of practice for protection of structures against lightning	BSI Standards	1999	



Publication ID	Title	Publisher	Date	Notes
BS 6724	Specification for 600/1000 V and 1900/3300 V armoured electric cables having thermosetting insulation and low emission of smoke and corrosive gases when affected by fire	BSI Standards	1997	
BS 6899	Specification for rubber insulation and sheath of electric cables	BSI Standards	1991	
BS 7071	Specification for portable residual current devices	BSI Standards	1992	
BS 7211	Specification for thermosetting insulated cables (non-armoured) for electric power and lighting with low emission of smoke and corrosive gases when affected by fire	BSI Standards	1998	
BS 7354	Code of practice for design of high-voltage open-terminal stations	BSI Standards	1990	
BS 7361-1	Cathodic protection. Code of practice for land and marine applications	BSI Standards	1991	
BS 7430	Code of practice for earthing	BSI Standards	1998	
BS 7671	Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition	HMSO	1992	
BS 7735	Guide to loading of oil-immersed power transformers (≡ IEC 60354: 1991)	BSI Standards	1994	
BS 9000	General requirements for a system for electronic components of assessed quality (9000-1: 1989)	BSI Standards	1989	
BS EN 755-6	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Hexagonal bars, tolerances on dimensions and form	BSI Standards	1996	
BS EN 1172	Copper and copper alloys. Sheet and strip for building purposes	BSI Standards	1997	
BS EN 1652	Copper and copper alloys. Plate, sheet, strip and circles for general purposes	BSI Standards	1998	
BS EN 1653	Copper and copper alloys. Plate, sheet and circles for boilers, pressure vessels and hot water storage units	BSI Standards	1998	
BS EN 1654	Copper and copper alloys. Strip for springs and connectors	BSI Standards	1998	
BS EN 12163	Copper and copper alloys. Rod for general purposes	BSI Standards	1998	
BS EN 12164	Copper and copper alloys. Rod for free machinery purposes	BSI Standards	1998	



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BS EN 12167	Copper and copper alloys. Profiles and rectangular bar for general purposes	BSI Standards	1998	
BS EN 50265-1	Common test methods for cables under fire conditions. Test for resistance to vertical flame propagation for a single insulated conductor or cable. Apparatus	BSI Standards	1999	
BS EN 50265-2-1	Common test methods for cables under fire conditions. Test for resistance to vertical flame propagation for a single insulated conductor or cable. Procedures. 1 kW pre-mixed flame	BSI Standards	1999	
BS EN 60079-14	Electrical apparatus for explosive gas atmospheres. Electrical installations in hazardous areas (other than mines) (≡ IEC 60079-14: 1996)	BSI Standards	1997	
BS EN 60265-1	Specification for high-voltage switches. Switches for rated voltages above 1 kV and less than 52 kV (≡ IEC 60265-1: 1998)	BSI Standards	1998	
BS EN 60298	A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV (≡ IEC 60298: 1990)	BSI Standards	1996	
BS EN 60439-1	Specification for low-voltage switchgear and controlgear assemblies. Type-tested and partially type-tested assemblies (≡ IEC 60439-1: 1999)	BSI Standards	1999	
BS EN 60445	Basic and safety principles for man-machine interface, marking and identification. Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system (≡ IEC 60445: 1999)	BSI Standards	2000	
BS EN 60529	Specification for degrees of current protection provided by enclosures (IP code)	BSI Standards	1992	
BS EN 60551	Determination of transformer and reactor sound levels	BSI Standards	1993	
BS EN 60694	Common specifications for high-voltage switchgear and controlgear standards (≡ IEC 60694: 1996)	BSI Standards	1997	



Publication ID	Title	Publisher	Date	Notes
BS EN 60831	Shunt power capacitors of the self-healing type for a.c. systems having a rated voltage up to and including 1000 V. Part 1: General. Performance, testing and rating. Safety requirements. Guide for installation and operation (≡ IEC 60831-1: 1996) Part 2: Ageing test, self-healing test and destruction test (≡ IEC 60831-2: 1995)	BSI Standards	1998 1996	
BS EN 60871-1	Shunt capacitors for a.c. power systems having a rated voltage above 1 kV. General, testing and rating. Safety requirements. Guide for installation and operation (≡ IEC 60871-1: 1997)	BSI Standards	1998	
BS EN 60898	Specification for circuit-breakers for overcurrent protection for household and similar installations	BSI Standards	1991	
BS EN 60931	Shunt power capacitors of the non-self-healing type for a.c. systems having a rated voltage up to and including 100V. Part 1: General. Performance, testing and rating. Safety requirements. Guide for installation and operation (≡ IEC 60931-1: 1996) Part 2: Ageing test and destruction test (≡ IEC 60931-2: 1996) Part 3: Internal fuses (≡ IEC 60931-3: 1996)	BSI Standards	1998 1996 1997	
BS EN 60947	Specification for low-voltage switchgear and controlgear Part 1: General rules (≡ IEC 60947-1: 1999) Part 2: Circuit-breakers Part 3: Switches, disconnectors, switch-disconnectors and fuse combination units Part 4-1: Electromechanical contactors and motor-starters	BSI Standards	1999 1996 1999 1992	
BS EN 61000	Electromagnetic compatibility (EMC). Testing and measurement techniques (Parts 4-1 to 4-28) Part 4-1: Overview of immunity tests. Basic EMC publication (≡ IEC 61000: 1992)	BSI Standards	1995	
BS EN ISO 3766	Construction drawings. Simplified representation of concrete reinforcement	BSI Standards	1999	



Publication ID	Title	Publisher	Date	Notes
BS EN ISO 7518	Construction drawings. Simplified representation of demolition and rebuilding	BSI Standards	1999	
BS EN ISO 11091	Construction drawings. Landscape drawing practice	BSI Standards	1999	
Scottish Health Technical Guidance				
SHTM 2011	Emergency electrical services	P&EFEx	2001	CD-ROM
SHTM 2014	Abatement of electrical interference	P&EFEx	2001	CD-ROM
SHTM 2020	Electrical safety code for low voltage systems (Escode – LV)	P&EFEx	2001	CD-ROM
SHTM 2021	Electrical safety code for high voltage systems (Escode – HV)	P&EFEx	2001	CD-ROM
SHTM 2035	Mains signalling	P&EFEx	2001	CD-ROM
SHPN 1	Health service building in Scotland	HMSO	1991	CD-ROM
SHPN 2	Hospital briefing and operational policy	HMSO	1993	CD-ROM
SHPN 48	Telephone Services	HMSO	1997	CD-ROM
SHTN 1	Post commissioning documentation for health buildings in Scotland	HMSO	1993	CD-ROM
SHTN 4	General Purposes Estates and Functions Model Safety Permit-to-Work Systems	P&EFEx	2001	CD-ROM
	NHS in Scotland – PROCODE	P&EFEx	2001	Version 1.1
	PCB Regulations Guide	P&EFEx	2000	
NHS in Scotland Fire Safety Management				
SHTM 81	Fire precautions in new hospitals	P&EFEx	1999	CD-ROM
SHTM 82	Alarm and detection systems	P&EFEx	1999	CD-ROM
SHTM 83	Fire safety in healthcare premises: general fire precautions	P&EFEx	1999	CD-ROM
SHTM 84	Fire safety in NHS residential care properties	P&EFEx	1999	CD-ROM
SHTM 85	Fire precautions in existing hospitals	P&EFEx	1999	CD-ROM
SHTM 86	Fire risk assessment in hospitals	P&EFEx	1999	CD-ROM
SHTM 87	Textiles and furniture	P&EFEx	1999	CD-ROM
SFPN 3	Escape bed lifts	P&EFEx	1999	CD-ROM
SFPN 4	Hospital main kitchens	P&EFEx	1999	CD-ROM
SFPN 5	Commercial enterprises on hospital premises	P&EFEx	1999	CD-ROM
SFPN 6	Arson prevention and control in NHS healthcare premises	P&EFEx	1999	CD-ROM
SFPN 7	Fire precautions in patient hotels	P&EFEx	1999	CD-ROM



Publication ID	Title	Publisher	Date	Notes
SFPN 10	Laboratories on hospital premises	P&EEx	1999	CD-ROM
UK Health Technical Guidance				
MES	Model Engineering Specifications	NHS Estates	1997	As required
Concode	Contracts and commissions for the NHS estate – contract procedures	HMSO	1994	
C41	National health service model engineering specifications: Common services electrical low and extra low voltage	NHS Estates	1997	
C42	National health service model engineering specifications: A Electric traction lifts B Hydraulic C Service lifts	NHS Estates	1997	
C45	National health service model engineering specifications: Electrical sub-station equipment extensions (high voltage)	NHS Estates	1997	
Miscellaneous				
	Electricity Association (EA) standards and engineering recommendations:			
35-1	Distribution transformers (from 16 kVA to 1,000kVA)	EA	1985	
41-26	Distribution switchgear. Ratings up to 36 kV	EA	1991	
C89.1	Termination on polymeric insulation cables rated at 12 kV and 36 kV	EA	1986	
G59	Connection of private generating plant at the electricity supply system	EA	1985	
ET113	Guidance for the protection of private generating sets up to 5 MW, in parallel with the Public electricity supply company distribution network	EA	1989	
G5/3	Limits for harmonics in the UK electricity supply system	Electricity Research Association	1976	
ERA 69-30	Part 3, Sustained current ratings for pvc-insulated cables. Part 5, sustained current ratings for cables with thermosetting insulation			
C62.41	ANSI/IEEE Surge voltages in low voltage a.c. power circuits		1980	
EH 40	HSE Occupational Exposure limits	HSE	Annual	
HS(G)41	Petrol filling stations – Construction and operation	HSE	1990	



Publication ID	Title	Publisher	Date	Notes
HS(G)47	Avoiding danger from overhead electrical lines	HSE		
GS6 (rev)	Avoidance of danger from overhead electrical lines	HSE		
HS(G)141	Electrical safety on construction sites	HSE		
HS(G)85	Electrical at work – safe working practices	HSE		
GS38 (rev)	Electrical test equipment for use by electricians	HSE		
GS50	Electrical safety at places of entertainment	HSE		
PM29 (rev)	Electrical hazards from steam/water pressure cleaners etc.	HSE	1995	
PM38	Selection and use of headlamps	HSE	1992	
HS(G)25	Memorandum of guidance on the Electricity at Work Regulations 1989	HSE		
	Code of practice for in-service inspection and testing of electrical equipment	HSE		
Paper No. 6	Waste Management Paper No. 6 – Polychlorinated Biphenyl (PCB) Wastes	HMSO		

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