Scottish Health Technical Memorandum 2011

(Part 1 of 4)

Overview and management responsibilities

Emergency electrical services

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Contents

1. Scope

General

1.1 Health care 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.

1.2 Interruptions in electrical power supplies to equipment can seriously disrupt the delivery of health care with serious consequences for patient well-being. Health care and social services premises must therefore ensure that they can continue to provide electrical power to essential services in the event of prolonged or short disruption to supplies.

Emergency electrical services

1.3 Emergency electrical services form an integral part of the health care and social services premises supply network in meeting both safety and functional requirements. They can be in the form of batteries, uninterrupted power supply (UPS) systems, or stand-by generators.

1.4 The provision of emergency electrical services in health care and social services premises is a management responsibility at both new and existing sites. This guidance is equally applicable to premises which offer acute health care services under the Registered Establishments (Scotland) Act 1998.

2. Management responsibilities

Statutory requirements

2.1 It is the responsibility of general managers/chief executives to ensure that their premises comply with all statutes.

2.2 Managers (owners or occupiers) of health care, social services premises and premises registered under Registered Establishments (Scotland) Act 1998 have an overriding general duty of care under the Health and Safety at Work etc Act 1974.

2.3 Essential supplies and manufactured equipment must comply with the following legislation in total or in part as applicable:

a. Electricity Act 1989;
b. Electricity Supply Regulations 1988 (as amended 1994);
c. Electricity at Work Regulations 1989;
d. Health and Safety at Work Act 1974;
e. Clean Air Act 1993;
f. Health and Safety Executive Document “Occupational Exposure Limits” (OEL), “Annual Guidance Note EH/40” (This document is updated annually);
g. Control of Substances Hazardous to Health Regulations (COSHH) 1999;
h. Energy Act 1983;
i. Health and Safety (Safety Signs and Signals) Regulations 1996;
j. G59/1: Recommendations for Embedded Generator Plant connected to Regional Electricity Company Supplies (Electricity Association);
k. Report ET 113 (1989) Protection of private generating sets up to 5MW for operation in parallel with Electricity Boards’ distribution networks (Electricity Association).

Other obligations

2.4 Managers have broader obligations to ensure that essential electrical supply services are maintained in the form of both generated and no-break supplies during any short or long term interruptions in the normal supply.

Functional requirements

2.5 As a guide to managers, the following table gives a brief indication of the duty imposed on various emergency/non-emergency electrical supplies that are encountered within health care and social services premises. These examples are not exhaustive.

Type of supply	Typical response time	Safety category	
		Statutory	Functional
Uninterruptible power supply (UPS)	No break		Computers
Batteries	Less than 0.5 sec	Escape route lighting, fire alarms	Theatre lights
Emergency Generator (Reciprocating engine)	15 sec		Clinical and diagnostic areas
Generator (non-emergency, for example, gas turbine used for combined heat and power)	Over 15 sec (for example, 3+ minutes)		Non-clinical areas

2.6 The essential characteristics of emergency standby generating sets are that they should be self contained, have their own fuel supply and be able to run independently of any other system.

2.7 Managers should ensure that all emergency generating sets are designed and rated to provide continuous full-load running for prolonged periods (minimum 200 hours). Their rating should be sufficient to provide power for essential functions. To fulfil the function of “Emergency” stand-by, an adequate supply of fuel, for example diesel, must be stored on site. Storage is required for continuous operation of the generator for a **minimum** of 200 hours, as dictated by location and fuel delivery constraints. As and when required, adequate emergency stand-by must be available at all times. This will dictate the number of sets installed to cover down time for planned maintenance. If only one generating set is provided, management has to schedule their reliance on emergency cover during the period of planned maintenance of this set.

2.8 It is recommended that managers of all health care and social services premises make emergency arrangements for generators of suitable power to be obtained elsewhere at short notice to supplement existing sources. Suitably rated switchgear that can be safely connected to temporary emergency generators should be identified within the essential services system of the health care and social services premises.

Operational management

2.9 Managers should ensure that an operational plan is in place for each site under their control. This should comprise:

a. a list and description of the main emergency plant and electrical equipment;

b. identification of qualified personnel with adequate training (see paragraph 2.10 “Designated staff functions”);

c. instructions to start, operate, control and shut down the emergency generating plant and associated switching devices;

d. a schedule of possible emergency incidents, with remedial operational procedures, which may cause a loss of normal electrical supplies;

e. contingency plans for alternative generating plant (see paragraph 2.5). It is recommended that an emergency exercise, independently adjudicated, should be arranged twice a year;

f. a routine of staff training should be implemented for the basic operational procedures required during an emergency.

Designated staff functions

2.10 Only trained authorised and competent persons should be appointed by management to control the operation of emergency equipment.

2.11 **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.

2.12 **Designated person** – an individual who has overall authority and responsibility for the premises containing the High/Low Voltage Electricity System within the premises, and with 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.

2.13 **Duty holder** – the person on whom the Electricity at Work Regulations 1989 impose a duty in connection with safety.

2.14 **Employer** – any person or body who:

a. employs one or more individuals under a contract of employment or apprenticeship;

b. provides training under the schemes to which the Health and Safety (Training for Employment) Regulations 1990 (Statutory Instrument No 1380) apply.

2.15 **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 electrical supply and distribution systems of that organisation to ensure compliance with the Electricity at Work Regulations and to assess the suitability and appointment of candidates in writing to be Authorised Persons. (See SHTM 2021.)

2.16 **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 the 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 and to assess the suitability and appointment of candidates in writing to be Authorised Persons. (See SHTM 2020.)

2.17 **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 SHTM 2021 and SHTM 2020.)

2.18 **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 SHTM 2021 and SHTM 2020.)

Definitions

2.19 **Injury** – death or personal injury from electrical shock, electrical burn, electrical explosion or arcing, or from fire/explosion initiated by electrical energy.

2.20 **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.

2.21 **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.

2.22 **Generator set** – an engine-driven synchronous AC 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.

2.23 **Emergency lighting** – BS 5266 Part 1:

a. a maintained lighting system is one in which all emergency lighting lamps are in operation at all material times;

b. a non-maintained lighting system is one in which all emergency lighting lamps are in operation only when the supply to the normal lighting fails;

c. a slave luminaire is one that is supplied from a central emergency power source and does not have its own internal secondary supply;

d. a sustained luminaire contains two lamp systems, one energised from the normal supply and the other from a central battery supply in an emergency;

e. escape lighting is that part of the emergency lighting system which provided to ensure that escape routes are illuminated at all material times;

f. rest mode is defined in European Standards (when the building is completely evacuated) whereby the emergency lighting may be switched off either manually or from a central point when the normal supply is switched off.

2.24 **Emergency supply** – any form of electrical supply which is intended to be available in the event of a failure in the normal supply.

2.25 **Essential service electrical supply** – the supply from an engine-driven AC 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 health care and personal social services premises are maintained in service.

2.26 **No-break supply** – a circuit continuously energised whether or not the normal supply is available.

2.27 **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.

3. Functional overview

Normal electricity supplies

3.1 The Public electricity supply companies have traditionally regarded hospitals and other health care and social services premises as priority users and given precedence to maintaining their supplies. However, failures will inevitably occur and experience indicates that the risk of failure is higher in rural districts, where there is wider use of overhead line distribution. The Public electricity supply company should be consulted to assess the extent to which the normal supply may be at risk from interruptions from various causes.

3.2 Large premises with over 300kW demand should be supplied by a high voltage feed (for example 11,000V) at three-phase to a sub-station located within the health care and social services premises. Smaller premises are normally supplied by a 415V, three-phase feed. High voltage supplies are more reliable.

3.3 Having two separate high voltage three-phase supply feeders is an additional safeguard for larger premises and is desirable. Whether this is possible largely depends on the local distribution system. The Public electricity supply company will advise.

3.4 The electrical installation within the health care and social services premises should be designed to limit interruptions in the supply due to internal faults as far as reasonably practicable. This is further detailed in SHTM 2011 Part 2; *Emergency electrical services*, 'Design considerations'.

The choice of segregated or unified systems

3.5 The rapid increase in demand for health care and social services premises offering advanced surgical and medical care has led to a proportionally increased demand for essential electrical services. When planning for new installations the option of segregated non-essential and essential electrical systems or a unified electrical system should be evaluated.

3.6 The provision of two segregated systems, each of smaller power capacity, must be balanced against having one larger unified power system in terms of economics and reliability in emergencies (see SHTM 2011 Part 2; *Emergency electrical services*, 'Design considerations').

3.7 Even when two segregated systems are provided it is desirable to incorporate emergency coupling between them. This allows the emergency generator to be connected to both systems if necessary, for example during a prolonged loss of power some non-essential services may become

"essential" – such as catering and laundry. Also, with the coupling it is possible to provide a larger test load when required.

3.8 Where additional essential supply facilities are being added to existing installations the choice of distribution will depend on local conditions and the location of the existing essential supply relative to the electrical load centre in the health care and social services premises.

Selection of emergency supply equipment

3.9 Reliability in service is of prime importance for equipment used in essential supplies. Goods and services subject to the assessment and inspectorate services based on BS 5750 (ISO 9000) – 'Quality Systems', and BS 9000 – 'Electronic Components of Assessed Quality', or those equipment which carry the "CE" mark should be encouraged and supported.

3.10 The likely maximum demand from essential loads should be carefully analysed to ensure that the plant capacity is sufficient to supply the required loads in the event of a prolonged interruption to normal supplies.

3.11 Compliance of all electrical equipment with the appropriate British Standards or IEC, ISO harmonised or European Standards should be specified where they are applicable. Where no accepted standard or independent certification is offered, care should be taken with the manufacturer's specification to ensure that equipment will be satisfactory and reliable for the service required. IEC and ISO standards, by agreement, are harmonised and adopted by those EEC and EFTA countries represented on the European Committee for Electrotechnical Standardisation (CENELEC).

Uninterruptible power supplies

3.12 The considerable increase in sophistication and computerisation of equipment for specialised treatment and monitoring of patients has led to a greater demand for continuous and reliable power supplies. An alternating current (AC) "no break supply" that is continuous and unaffected by external circumstances can be provided by an uninterruptible power supply (UPS).

Combined heat and power systems

3.13 The basis of combined heat and power (CHP) systems is to obtain greater energy utilisation from the fuel used in an engine-driven generator set. The overall electrical efficiency of these sets is not usually more than 30%. However, a CHP system using a similar generator could achieve an overall electrical and thermal efficiency of up to 90% by utilising the previously wasted heat.

3.14 For greater benefit, the engine should run as continuously as possible at full load. It follows that for CHP to operate at maximum efficiency the engine must run at a high load factor with a simultaneous requirement for the heat output. To achieve this continuous running, additional generating plant may be required for essential emergency supply support during breakdown or maintenance.

3.15 Special arrangements must be made with the Public electricity supply company if it is intended to export any surplus electrical power.

4. Management summary

4.1 Emergency power supplies should be periodically reassessed by the management and improved where necessary to ensure that they remain adequate to maintain essential clinical and surgical life-support facilities.

4.2 Where new health care and social services premises are built in separate phases the emergency power supply for the whole premises should, as far as possible, be planned and evaluated at the initial design stage. This will enable the total emergency power supply requirement to be assessed in the planning stages and appropriate areas of accommodation allocated. The required AC generator sets should be installed early in each phase to make the maximum amount of emergency power available as early as possible and so that staff training can be carried out.

4.3 Within this general guideline, the aim should be to keep electrical installations as simple as practicable.

4.4 When facilities do not currently meet the standards recommended in this Memorandum, management should bear in mind the following high priority objectives:

a. the protection of life-saving and life-support services such as those found in operating suites, delivery rooms, special care baby units, intensive therapy units and high dependency units where patient monitoring equipment, ventilators, defibrillators, renal dialysis machines, etc, are used;

b. the provision of light, heat and, if necessary, ventilation in patient areas;

c. essential supporting services;

d. safe evacuation of the building in an emergency.

4.5 The operational management to ensure generator availability is discussed in SHTM 2011; *Emergency electrical services*, 'Operational management'. Recommended procedures will ensure plant reliability and availability even though these tests will cause some minor disruption to hospital services. Simulation of loss of mains supply should be initiated once per month. This would allow staff, particularly in the ITU, to practise their emergency procedures.

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				
	Building (Scotland) Act	HMSO	1959	
	Clean Air Act	HMSO	1993	
	Control of Pollution Act	HMSO	1974	
	Electricity Act	HMSO	1989	
	Energy Act	HMSO	1983	
	Environment Protection Act	HMSO	1990	
	Registered Establishments (Scotland) Act	HMSO	1998	
	Water (Scotland) Act	HMSO	1980	
	Health and Safety at Work etc Act	HMSO	1974	
SI 3146	The Active Implantable Medical Devices Regulations	HMSO	1992	
SI 2179 & 187	The Building Standards (Scotland) Regulations (as amended)	HMSO	1990	
	The Building Standards (Scotland) Regulations: Technical Standards Guidance	HMSO	1998	
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 2451	Gas Safety (Installation and Use) Regulations	HMSO	1998	

Publication ID	*Title*	*Publisher*	*Date*	*Notes*
SI 917	Health & Safety (First Aid) Regulations	HMSO	1981	
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 3017	The Medical Devices Regulations	HMSO	1994	
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)	Stationary Office	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 3004	Workplace (Health, Safety and Welfare) Regulations	HMSO	1992	
British Standards				
BS 88	**Cartridge fuses for voltages up to and including 1000V AC and 1500V DC** **Part 1:** General Requirements	BSI Standards	1982	
BS 89	**Direct acting indicating electrical measuring instruments and their accessories** **Parts 1 to 9**	BSI Standards	1977	
BS 89	**Direct acting indicating electrical measuring instruments and their accessories** **Parts 1 to 9**	BSI Standards	1997	

Publication ID	*Title*	*Publisher*	*Date*	*Notes*
BS 171	**Power transformers**	BSI Standards	1970	
BS 417	**Galvanised mild steel cisterns and covers, tanks and cylinders (metric units)** **Part 2**	BSI Standards	1987	
BS 764	**Automatic change-over contactors for emergency lighting systems**	BSI Standards	1954 (1985) (1990)	
BS 799	**Oil storage tanks** **Part 5**	BSI Standards	1987	
BS 822	**Terminal markings for rotating electrical machinery** **Part 6**	BSI Standards	1964 (1988)	
BS 1361	**Cartridge fuses for AC circuits in domestic and similar premises** **Part 1**	BSI Standards	1971 (1986) AMD (1991)	
BS 1362	**General purpose fuse links for domestic and similar purposes (plugs)**	BSI Standards	1973 (1986) AMD (1991	
BS 1363	**13A fused plugs and switched and unswitched socket-outlets and boxes**	BSI Standards	AMD (1997)	
BS 1650	**Capacitors for connection to power frequency systems**	BSI Standards	1971 AMD (1991)	
BS 1710	**Identification of pipelines and services**	BSI Standards	1984	
BS 2754	**Memorandum. Construction of electrical equipment for protection against electric shock**	BSI Standards	1976	
BS 2771	**Electrical equipment of industrial machines**	BSI Standards	1986	
BS 2869	**Fuel oil for engines and burners for non-marine use**	BSI Standards	1988	
BS 3535	**Safety isolating transformers for industrial and domestic purposes**	BSI Standards	1962 (1987)	
BS 3535-1	**Safety isolating transformers for industrial and domestic purposes EN 60742** **Part 1**	BSI Standards	1996	

Publication ID	*Title*	*Publisher*	*Date*	*Notes*
BS 3938	**Current transformers**	BSI Standards	1973 (1982)	
BS 3941	**Voltage transformers**	BSI Standards	1975 (1982)	
BS 3951	**Freight containers**	BSI Standards	1969 (1977)	
BS 4196	**Sound power levels of noise sources Parts 0 – 8**	BSI Standards	1981 (1986)	
BS 4343	**Industrial plugs, socket-outlets and couplers for AC and DC supplies**	BSI Standards	1968	
BS 4417	**Specification for semi-conductor rectifier equipments**	BSI Standards	1969 (1981)	
BS 4752	**Circuit breakers Part 1**	BSI Standards	1977	
BS 4533-102.22	**Luminaires. Particular requirements. Specification for luminaires for emergency lighting. (EN 60598-2-22: 1990)**	BSI Standards	1990	
BS 4999	**Terminal markings for rotating electrical machinery Part 108**	BSI Standards	1987	
BS 4999-0	**General requirements for rotating electrical machines Part 0**	BSI Standards	1987	
BS 5000	**Rotating electrical machines of particular types or for particular applications: Index Parts 1 – 99**	BSI Standards		
BS 5000-3	**Generators to be driven by reciprocating internal combustion engines Part 3**	BSI Standards	1980 (1985) AMD 1988	
BS 5266	**Code of practice for the emergency lighting of premises Parts 1 – 3**	BSI Standards	1988	
BS 5304	**Code of practice for safeguarding machinery**	BSI Standards	1988	
BS 5378	**Safety signs and colours**	BSI Standards	1980	
BS 5410-3	**Code of practice for oil firing. Installations for furnaces, kilns, ovens and other industrial purposes**	BSI Standards	1976	

Publication ID	*Title*	*Publisher*	*Date*	*Notes*
BS 5424	**Contactors up to and including 1,000V AC and 1,200V DC Part 1**	BSI Standards	1977	
BS 5499-1	**Fire safety signs, notices and graphic symbols. Specification**	BSI Standards	1990	
BS 5514-1	**Reciprocating internal combustion engines. Performance. Standard reference conditions, declarations of power, fuel and lubricating oil consumptions and test methods. (ISO 3046-1: 1995)**	BSI Standards	1996	
BS 5514-4	**Reciprocating internal combustion engines. Performance. Speed governing. (ISO 3046-4:1997)**	BSI Standards	1997	
BS 5514	**Reciprocating internal combustion engine performance, etc Parts 1/6**	BSI Standards	1996	
BS 5992-1	**Electrical relays. Specification for contact performance of electrical relays.**	BSI Standards	1980	
BS 6132	**Code of practice for safe operation of alkaline cells**	BSI Standards	1983	
BS 6133	**Code of practice for safe operation of lead-acid cells**	BSI Standards	1995	
BS 6231	**PVC insulated cables for switchgear and control gear wiring**	BSI Standards	1981 1998	
BS 6260	**Open nickel-cadmium prismatic recharchable single cells**	BSI Standards	1982 1988	
BS 6290	**Lead-acid stationary cells and batteries**	BSI Standards	1982 1988	
BS 6327	**Fire protection of reciprocating internal combustion engines**	BSI Standards	1982	
BS 6346	**PVC insulated cables for electricity supply up to and including 3300V between phases**	BSI Standards	1989 1997	
BS 6387	**Specification for performance requirements for cables required to maintain circuit integrity under fire conditions**	BSI Standard	1983	
BS 7625	**Voltage transformers**	BSI Standards	1993	
BS 7671	**Requirements for electrical installations. IEE Wiring Regulations**	HMSO	1992	Sixteenth edition

Publication ID	*Title*	*Publisher*	*Date*	*Notes*
BS 7676	**Current transformers**	BSI Standards	1993	
BS EN 60076	**Power transformers**	BSI Standards	1976	
BS EN 60146	**Specification for semi-conductor rectifier equipments**	BSI Standards	1981	
BS EN 60269	**Cartridge fuses for voltages up to and including 1000V AC and 1500V DC – General requirements** **Part 1**	BSI Standards		
BS EN 60309	**Metric units industrial plugs, socket-outlets and couplers for AC and DC supplies** **Part 2**	BSI Standards		
BS EN 60309-2	**Plugs, socket-outlets and couplers for industrial purposes. Dimensional interchangeability requirements for pin and contact-tube accessories**	BSI Standards	1992	
BS EN 60622	**Sealed nickel-cadmium prismatic rechargeable single cells**	BSI Standards	1996	
BS EN 60623	**Open nickel-cadmium prismatic rechargeable single cells**	BSI Standards	1982 1988	
BS EN 60896	**Lead-acid stationary cells and batteries** **Part 1**	BSI Standards	1982 1988	
BS EN 60947	**Circuit breakers** **Part 2**	BSI Standards		
BS EN 60947	**Contactors up to and including 1,000V AC and 1,200V DC** **Part 1**	BSI Standards	1998	
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 ISO 668	**Freight containers**	BSI Standards	1996	
EN 60204	**Electrical equipment of industrial machines IEC204 PT1 ZED 81** **Part 1**	BSI Standards	1993	
ISO 3046	**Reciprocating Internal combustion engine performance** **Parts 1/6**	BSI Standards		
ISO 8528	*To replace ISO 3046 after harmonisation*			

Publication ID	*Title*	*Publisher*	*Date*	*Notes*
Scottish Health Technical Guidance				
SHTM 2007	Electrical services supply and distribution	P&EFEx	2001	CD-ROM
SHTM 2011	Emergency electrical services	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 2022	Medical gas pipeline systems	P&EFEx	2001	CD-ROM
SHTM 2023	Access and accommodation for engineering services	P&EFEx	2001	CD-ROM
SHTM 2035	Mains signalling	P&EFEx	2001	CD-ROM
SHTM 2045	Acoustics	P&EFEx	2001	CD-ROM
SHPN 1	Health service building in Scotland	HMSO	1991	
SHPN 2	Hospital briefing and operational policy	HMSO	1993	
SHTN 1	Post commissioning documentation for health buildings in Scotland	HMSO	1993	
SHTN 4	General Purposes Estates and Functions Model Safety Permit-to-Work Systems	EEF	1997	
	NHS in Scotland – PROCODE	P&EFEx	2001	Version 1.1
NHS in Scotland Firecode				
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
SFPN 10	Laboratories on hospital premises	P&EFEx	1999	CD-ROM

Publication ID	Title	Publisher	Date	Notes
UK Health Technical Guidance				
EH 40	HSE Occupational Exposure limits	HSE	Annual	
MES	Model Engineering Specifications	NHS Estates	1997	As required
MES C44	Diesel Engine Driven Automatic Stand-by Generator Sets	NHS Estates		
	Code of practice for reducing the exposure of employed persons to noise	HSE		
ETR No. 113	Notes of guidance for the protection of private generating sets up to 5MW for operation in parallel with the Electricity Board's Distribution Network	Electricity Assn.	1989	
Miscellaneous References				
G 59	Recommendations for the connection of private generating plant to the Electricity Board's Distribution Systems	Electricity Assn.	1985	
G 5/3	Limits for Harmonics in the UK Electricity Supply System	Electricity Assn.	1976	
	Regulations for Electrical Installations (16th edition) Institution of Electrical Engineers (IEE)			
	Lighting guide for hospitals and health care buildings Chartered Institution of Building Services Engineers			
LG 9	Lighting for communal and residential buildings Chartered Institution of Building Service Engineers		1997	
IM/17	Code of practice for gas engines. British Gas			
(ANSI/UL) 1008	Automatic Transfer Switches. American National Standards Institute/Underwriters Laboratory		1983	
IEC 947-6-l	Low voltage switch gear: Automatic Transfer Switches			
HN (76) 126	Noise control			