Scottish Health Technical Memorandum 2015

(Part 2 of 3)

Design considerations

Bedhead services

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NHSScotland, P&EFEx, June 2001

Contents

1. Scope

1.1 Healthcare premises (HCP) will achieve maximum efficiency when patients receive quality treatment appropriate to their needs with the minimum length of stay. To this end the services provided at the point of nursing, that is, at the bedhead, should be tailored to meet not only the short-term requirements but also the longer-term.

NOTE: The importance of achieving correct maintenance service for complex equipment cannot be over stressed. Unless the management has complete confidence in the ability of the engineering staff to carry out adequate repairs and preventative maintenance, those functions should be assigned to the manufacturer, supplier or other qualified and competent agent.

1.2 The guidance in this SHTM applies primarily to new healthcare premises and major refurbishment work; however, the principles also apply to alterations and extensions to existing installations. It covers bedhead services, and in particular patient-to-nurse call systems. The various types of installation to be considered are described.

1.3 The degree of sophistication will vary greatly over the range between low-dependency areas such as geriatric assessment, and high dependency such as intensive care wards.

1.4 The degree of engineering necessary to provide the nominated services will be influenced by the building structure. Supporting equipment in lightweight walling consisting of composite partitioning will require a totally different approach to established solid walling with possible deep window recesses.

1.5 As electronic systems become more sophisticated, the importance of electromagnetic compatibility (EMC) needs to be recognised. This includes the potential problems with electrostatic discharges (ESD) derived from the high static voltages that can be generated at the bedside.

NOTE: Refer to SHTM 2014; Abatement of electrical interface.

2. Definitions

2.1 **Injury** – death or personal injury from electric shock, electrical burn, electrical explosion or arcing, or from fire/explosion initiated by electrical energy or misuse/faults with medical gas supplies.

2.2 **System (electrical)** – 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.

2.3 **System (communication)** – a system designed to provide transfer of information between two or more locations, either by direct wiring or by other means. The system will embrace the necessary control units and power supplies.

2.4 **System (medical gas pipeline)** – a system designed to provide medical gases, medical compressed air and vacuum, derived from plantroom, compound and/or manifold rooms and including all associated peripheral equipment such as regulators, area valves, alarm and control systems.

2.5 **Low voltage (LV)** – the existence of a potential difference (rms value for a.c.) normally 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.

NOTE: This definition for low voltage incorporates the extra low voltage (ELV) range as defined in BS 7671: 1992 Requirements for Electrical Installations (the IEE Wiring Regulations).

NOTE: Bedhead services systems should have one side of the d.c. voltage earthed at the power/control unit only. It is recommended that the remainder of the system wiring be free from any earth connection. A reduced potential difference of 30 volts peak between points is recommended for hand-held call units.

2.6 **Protective extra low voltage (PELV)** – An extra-low voltage system that is not electrically separated from earth, but otherwise meets all the requirements for safety extra low voltage (SELV). The installation requirements for PELV systems are specified in BS 7671: 1992 Requirements for Electrical Installations (the IEE Wiring Regulations).

2.7 **Essential circuits** – circuits of the essential services electrical supply so arranged that they can be supplied separately from the remainder of the electrical installation.

2.8 **Bedhead services** – facilities provided for patients and/or staff to enable the performance of medical and surgical functions and entertainment. They comprise a fixed installation behind, to the side of or above the bed, and can also embrace other areas of the ward. They can consist of low voltage electrical supplies, extra low voltage communication systems, entertainment, monitoring facilities and medical gas outlets.

2.9 **Light emitting diode (LED)** – a robust solid-state indicator lamp with indefinite life ideal for low-powered visual display and signalling use.

2.10 **Electromagnetic compatibility** – capability of electronic equipment or systems to be operated with a defined margin of safety, in the intended operational environment, at designed levels of efficiency, without degradation due to interference.

2.11 **Monitored call circuit** – the call system will register a call if the hand unit connector to the bedhead or wall-mounted panel is withdrawn or an open circuit cable fault occurs.

2.12 **Simplex** – a speech system where the nurse station unit has a push-to-speak switch, which is held down while speaking and released for listening. The operation at the bedhead is "hands-free".

2.13 **Duplex** – a speech system which is "hands-free" at both ends, that is, at both the nurse station and the bedhead.

3. List of figures

Figure 1: Basic Call System

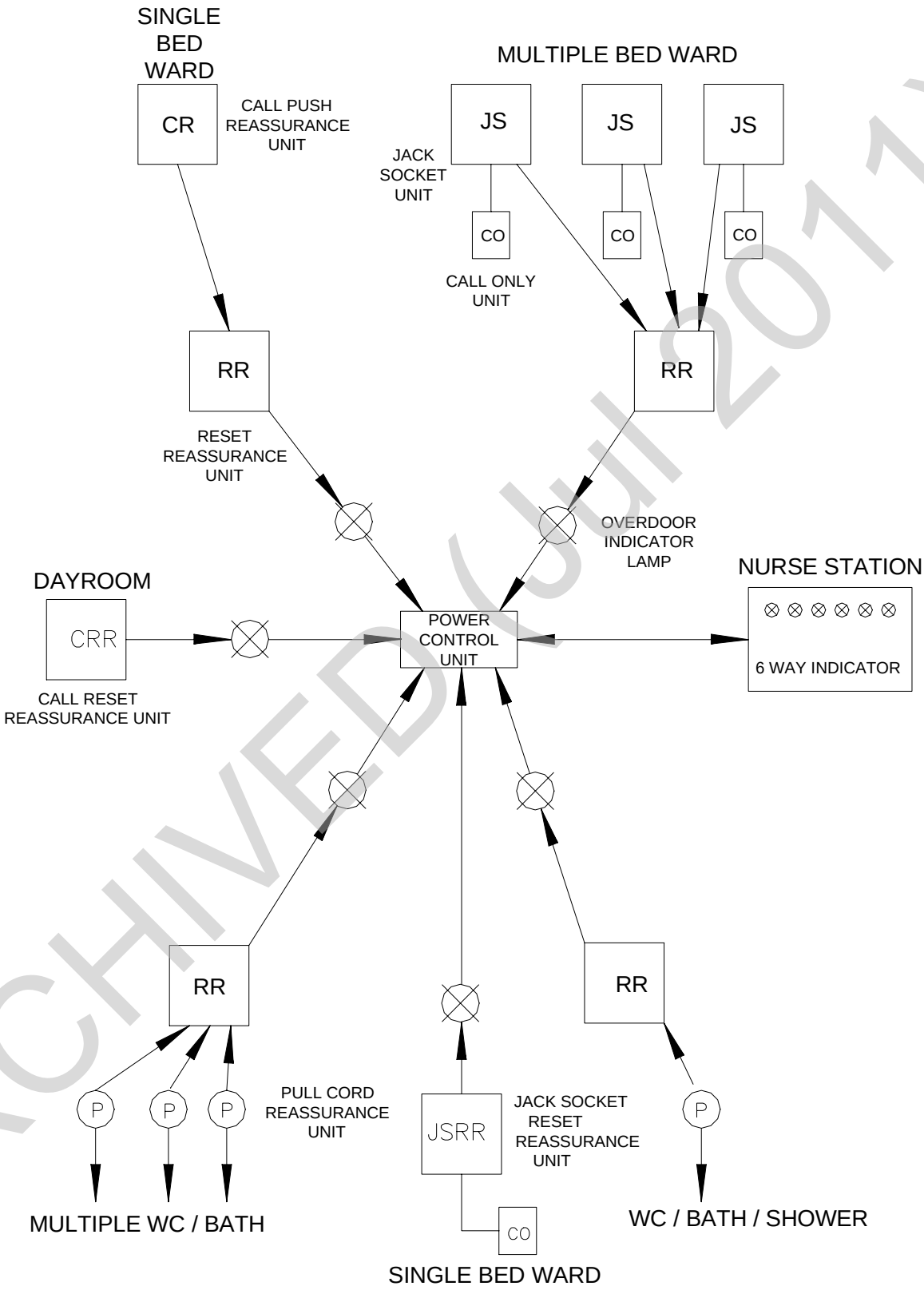


Figure 2: Basic call system with bedhead units

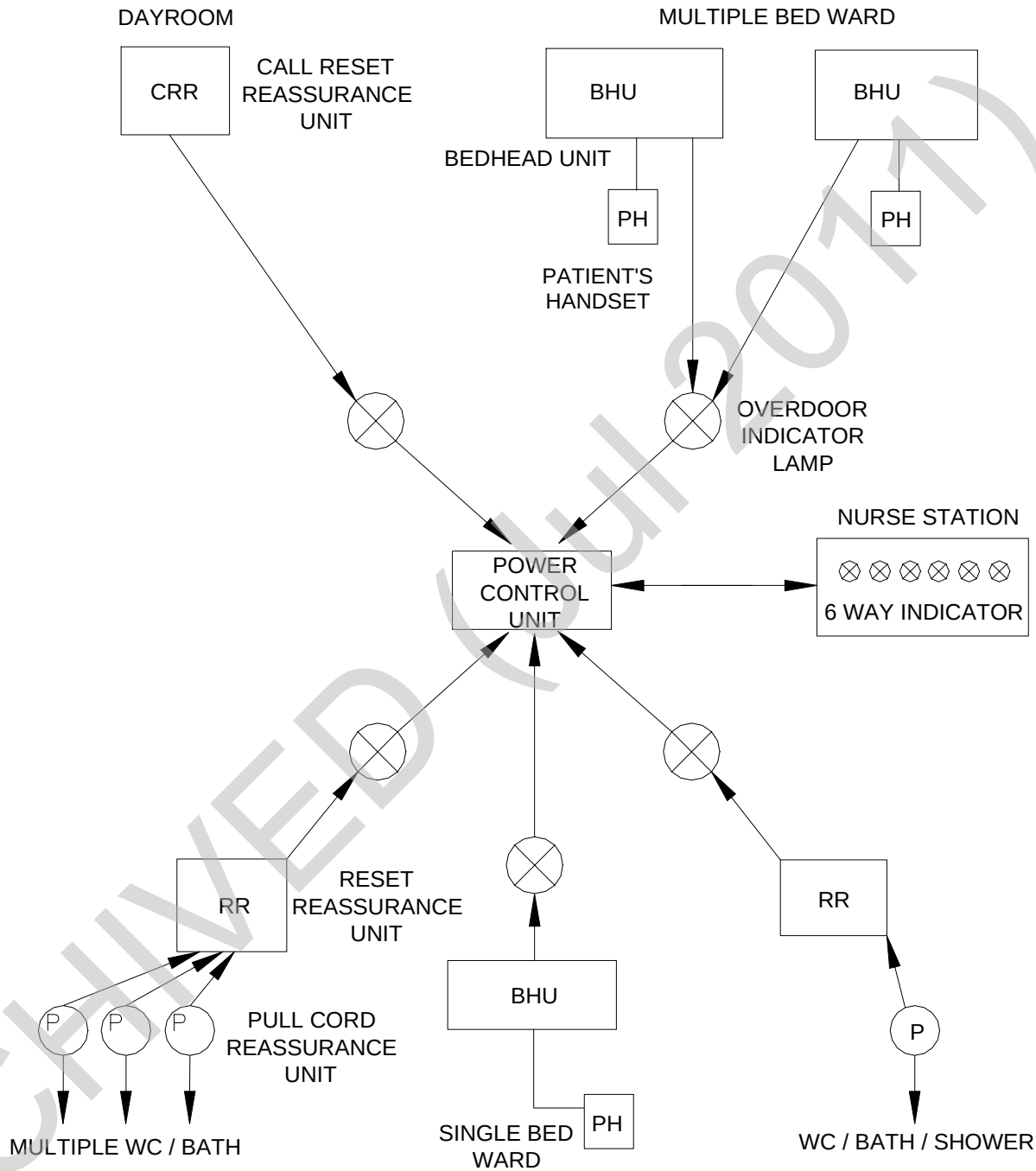


Figure 3: Arrangement of overdoor & group lamps

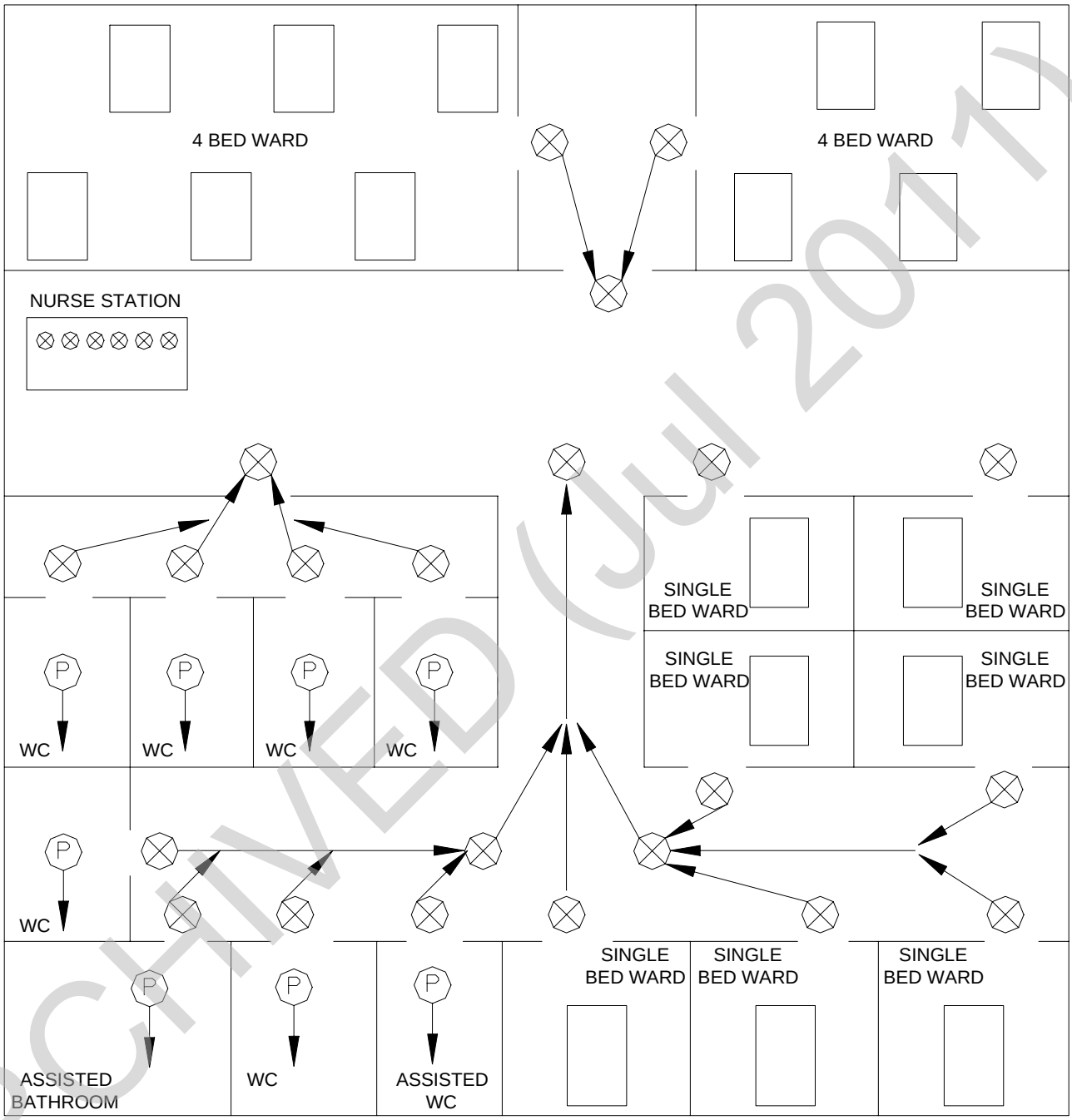
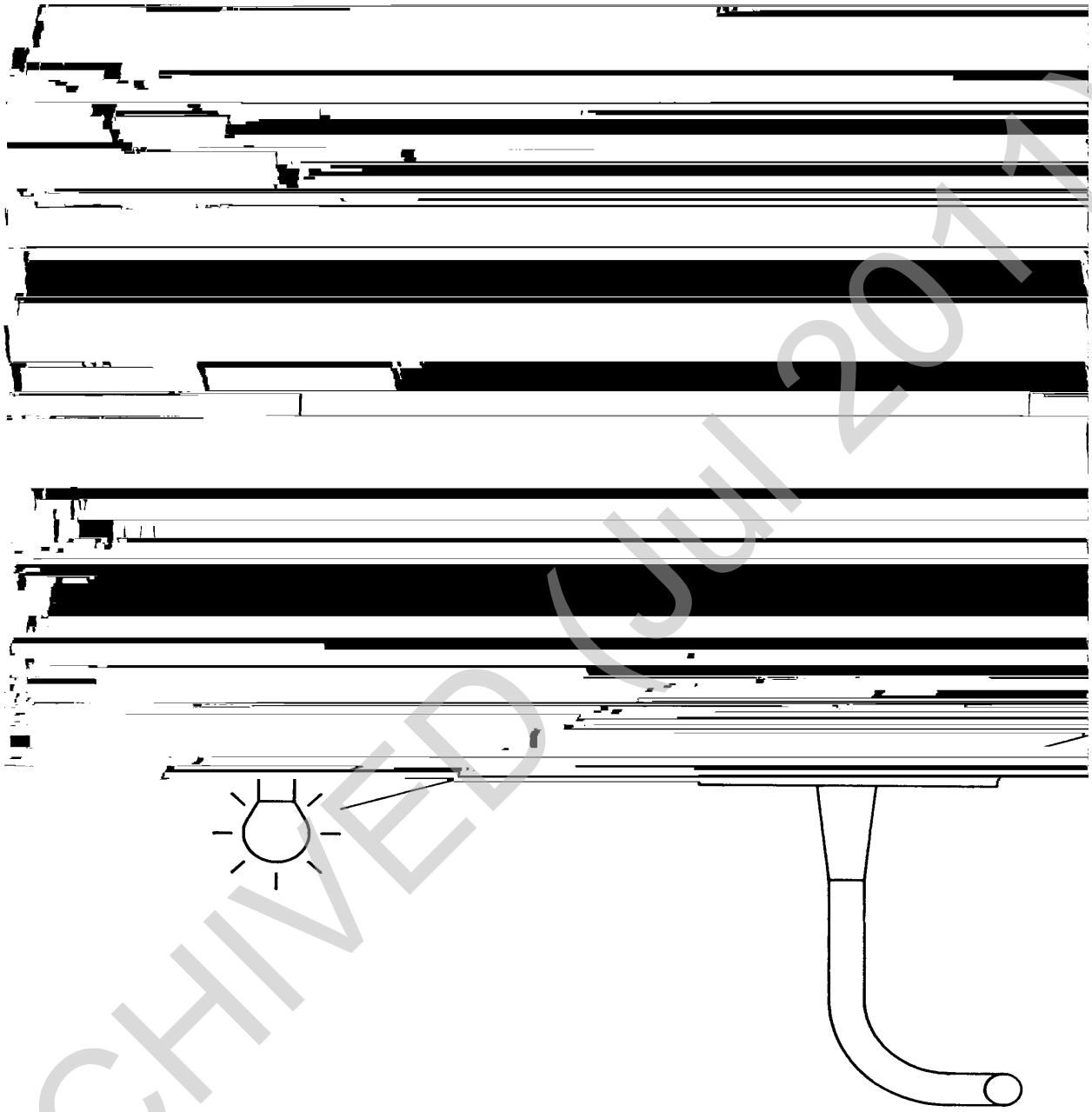


Figure 4: Typical layout of patient handset with examples of symbols



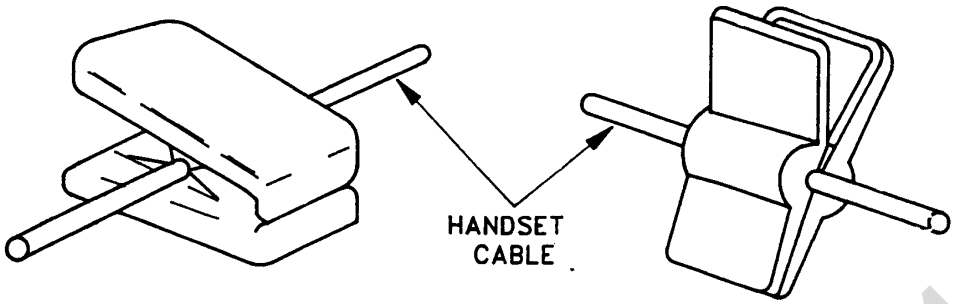


Figure 5: Typical attachment clips

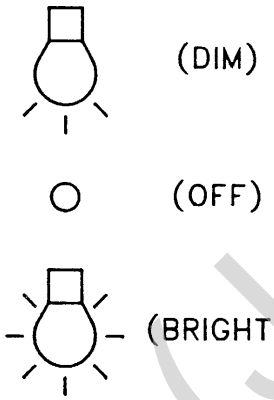


Figure 6: Example of symbols for bedlight control on bedhead panel

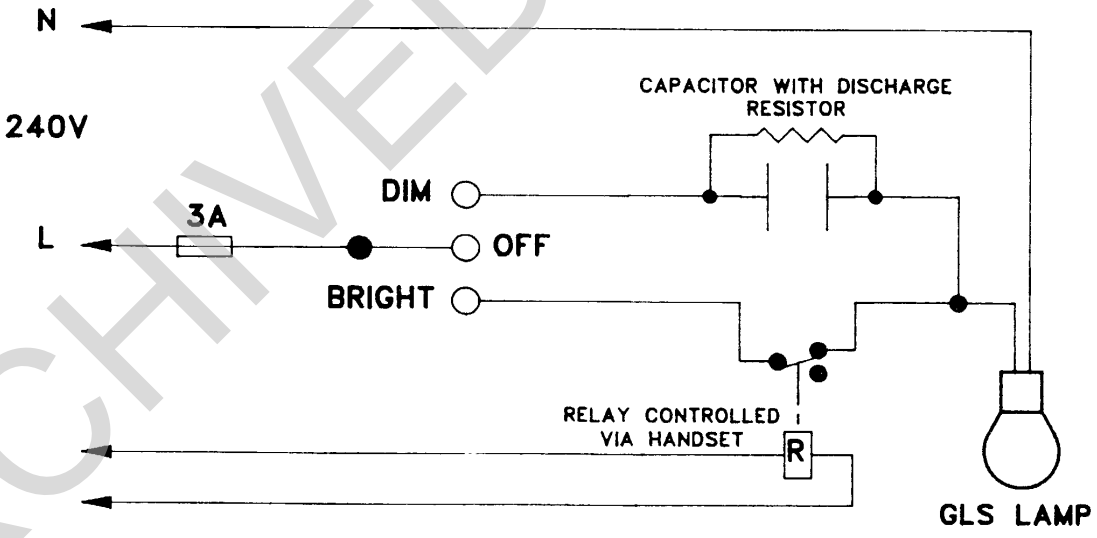


Figure 7: Bedlight dimming circuit for GLS lamps

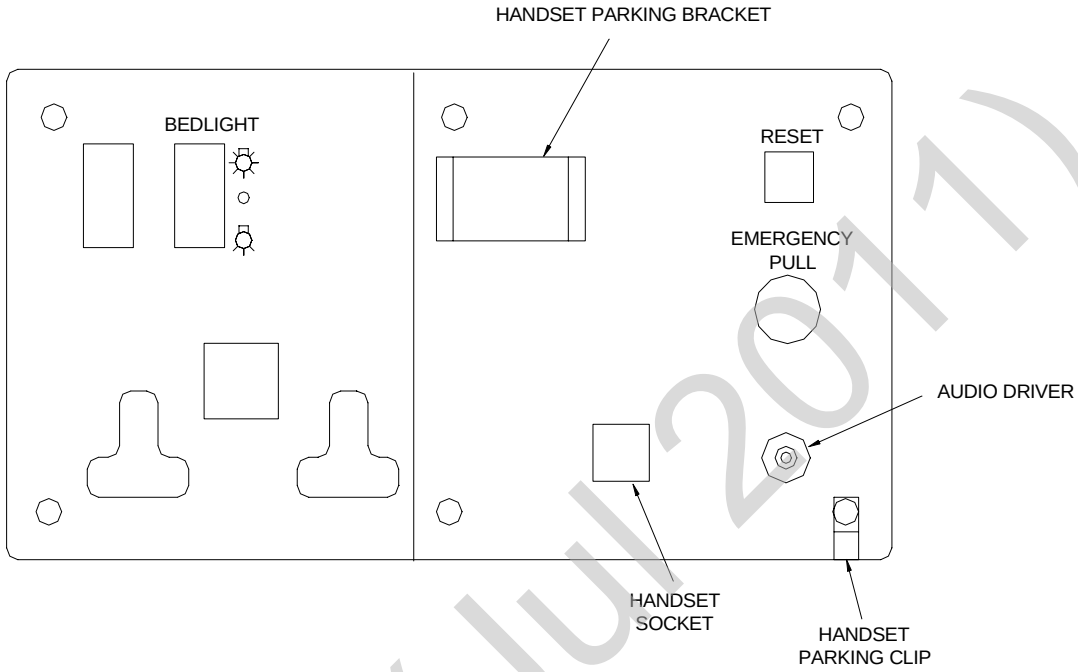


Figure 8: Typical layout of bedhead services panel

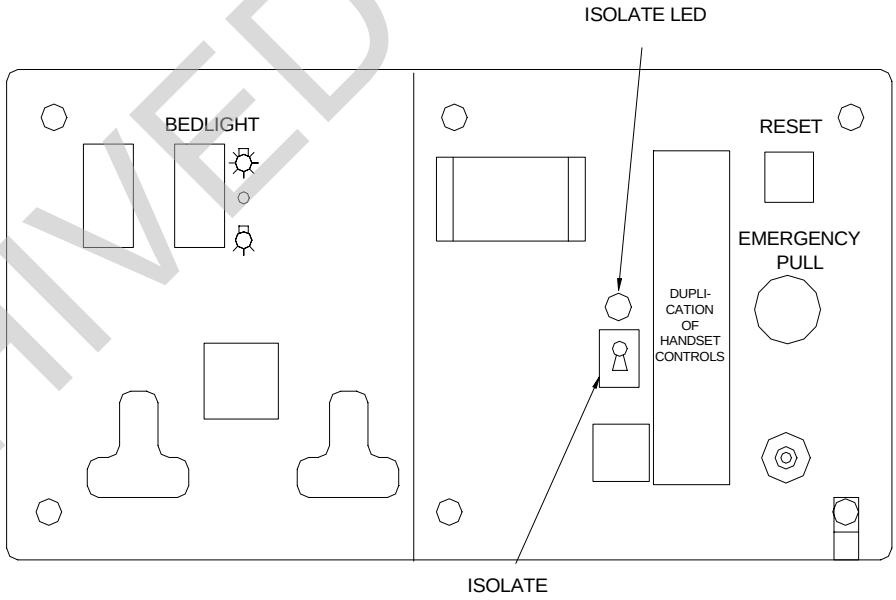


Figure 9: Typical layout of bedhead services panel with additional facilities of an isolation switch and dual control

Figure 10: Power supplies (typical)

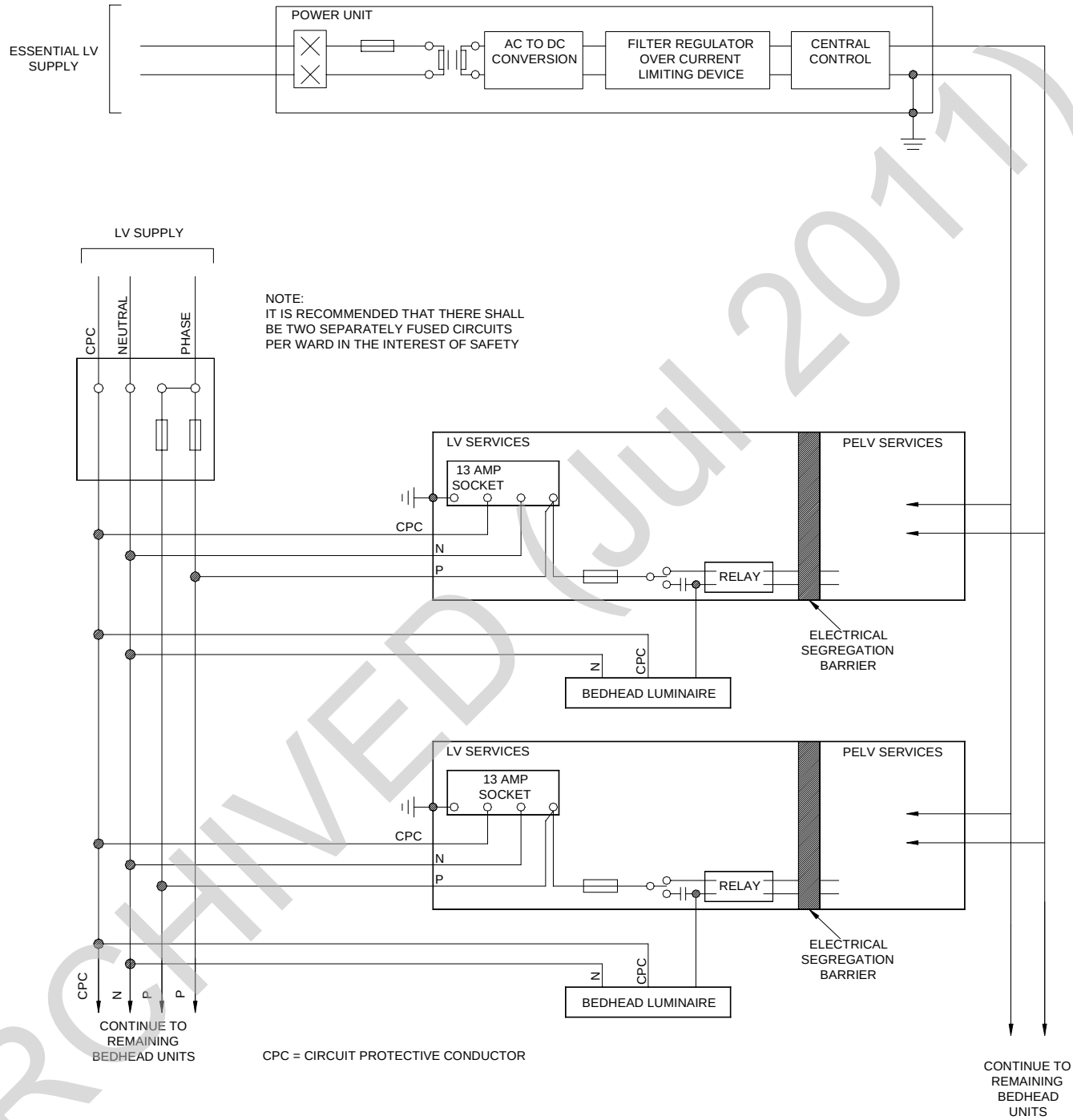


Figure 11: Typical layout of patient handset with speech

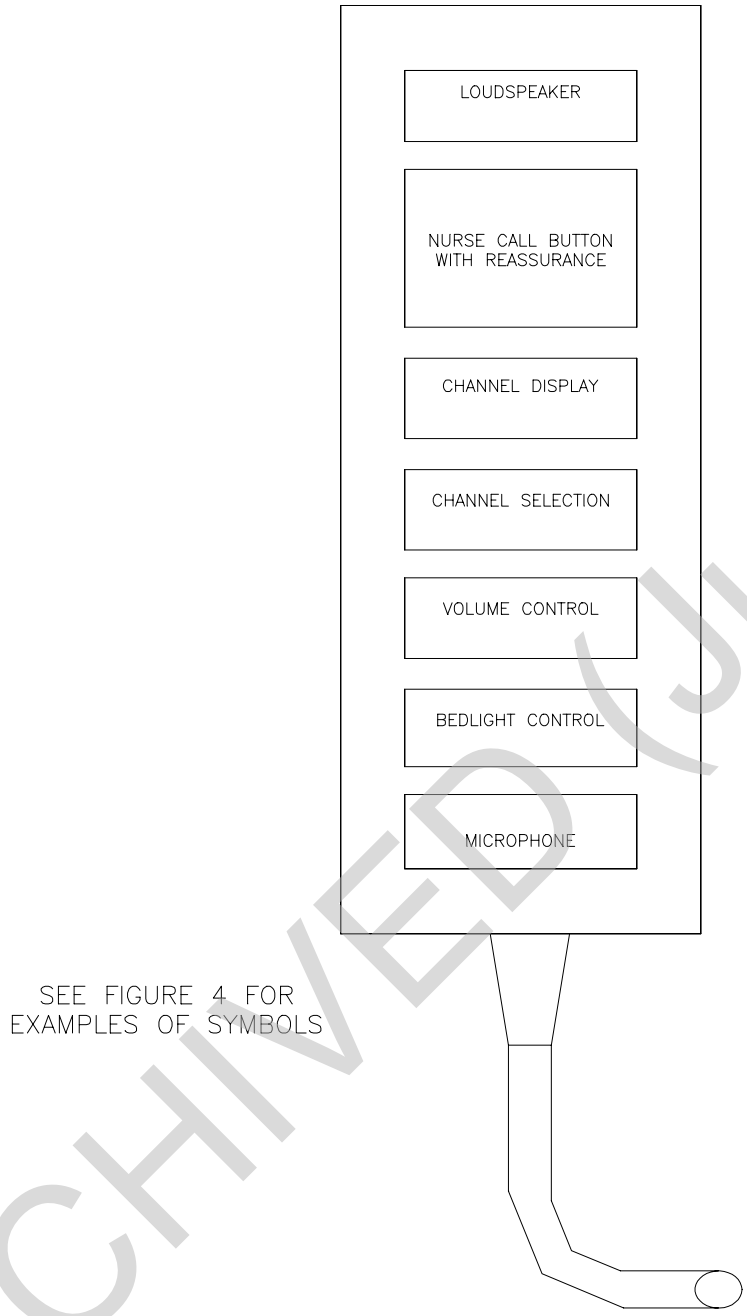


Figure 12: Typical multiplexed audio entertainment distribution system

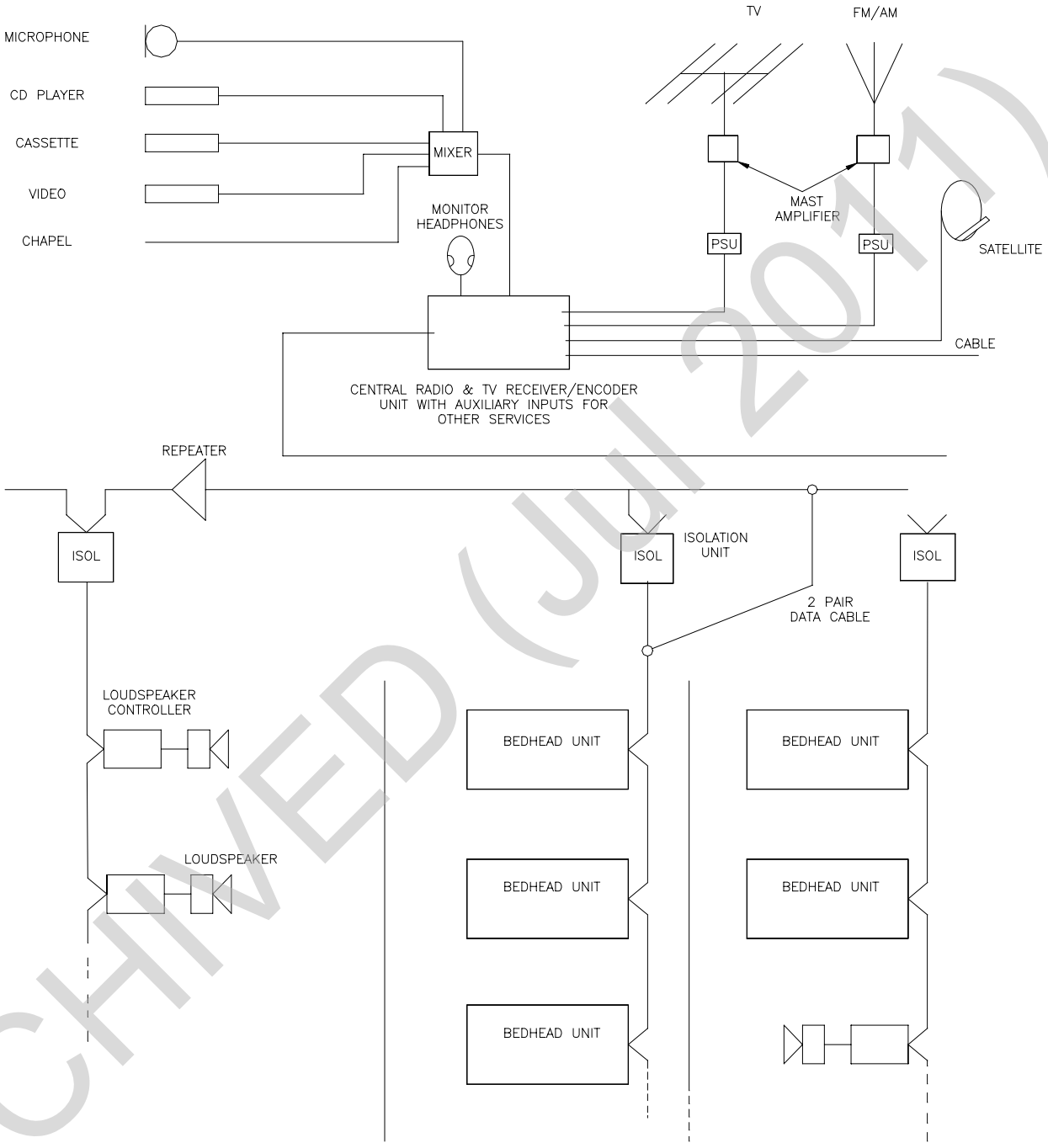


Figure 13: Typical arrangement for a trunking system

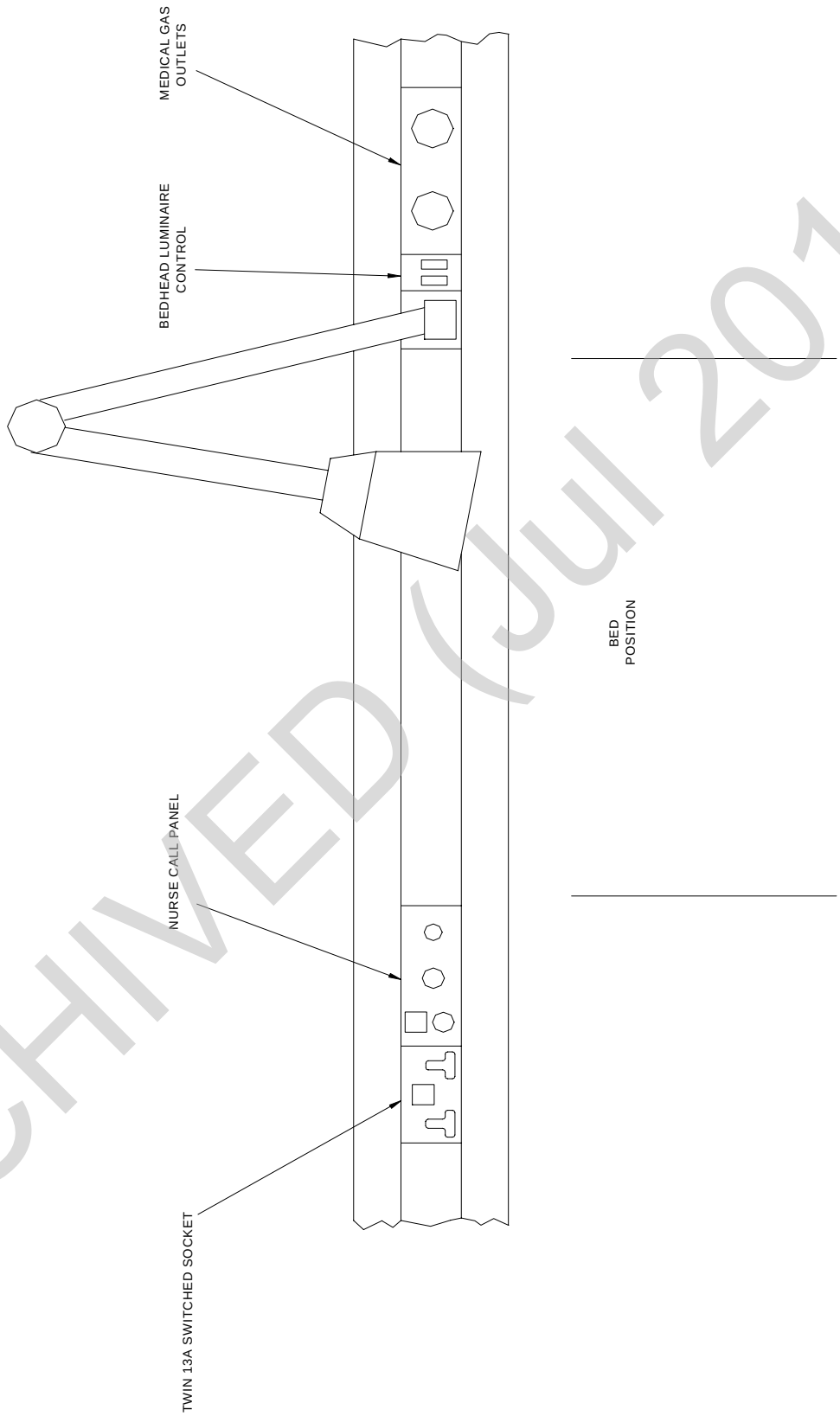
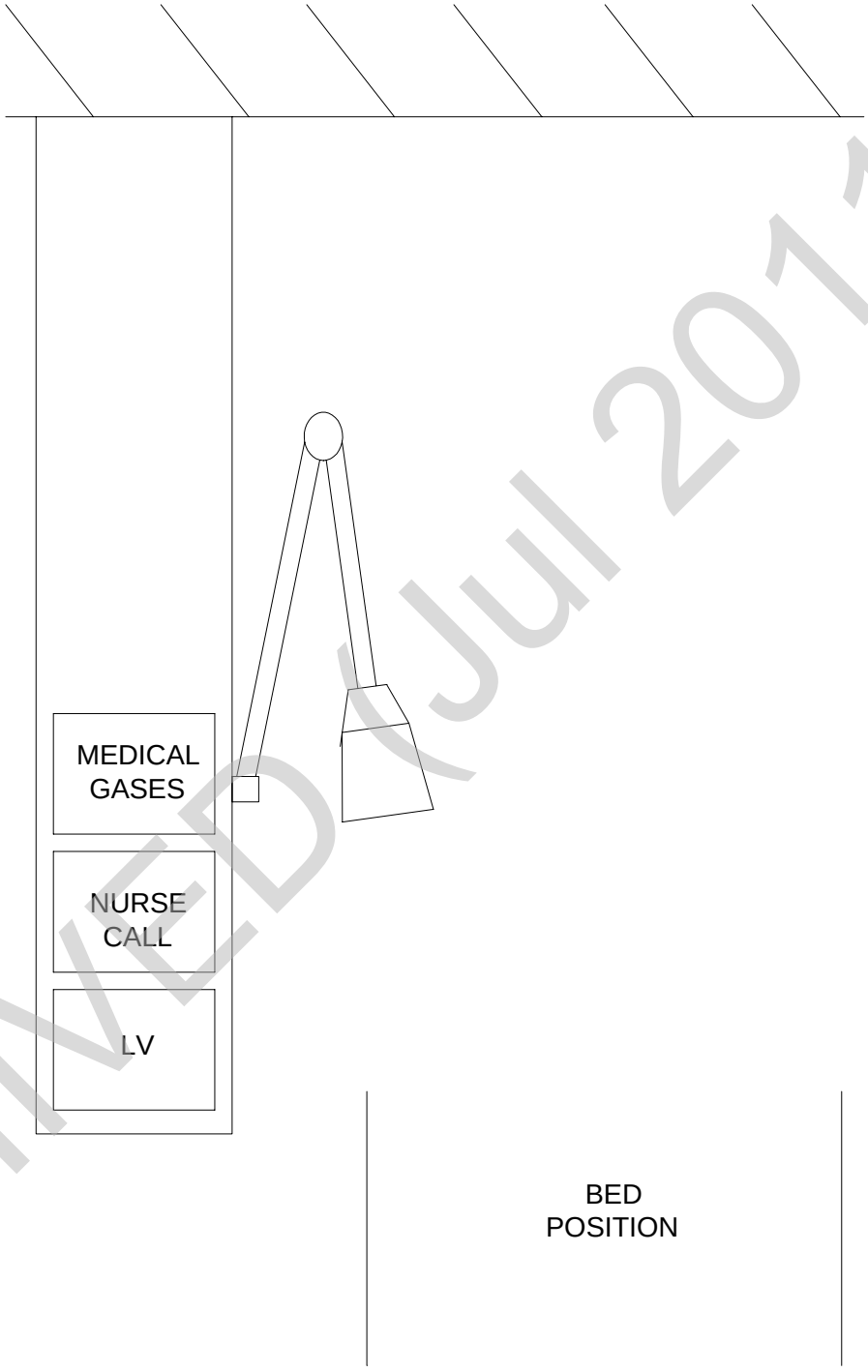


Figure 14: Typical arrangement for a vertical unit



4. Communications – patient-to-nurse (non-speech)

General

4.1 The modern tendency to house patients in rooms or bays with a small number of beds within the greater ward complex, increases the need to provide some means whereby a patient can call for attention.

4.2 In some cases the means of making a call may be inappropriate for some groups of patients; for example, the elderly may be confused, children and psychiatric patients may misuse the system. To ensure maximum flexibility of use, however, it is recommended that at least a basic call system is installed but it is made inoperative (or the means of call is temporarily removed) for such groups.

Basic call system

4.3 A basic call system might comprise the following elements:

a. a means for the patient to make a call;
b. a device for latching or maintaining the call until it is cancelled;
c. a means of resetting the call;
d. a lamp to reassure the patient that the call has been made;
e. a lamp at the staff base or nurse station to indicate that a call has been made;
f. a lamp or lamps along the route between nurse station and calling point to guide staff to the source of the call;
g. an audible tone until the call is cancelled;
h. a power supply and control unit.

Examples of basic call systems are shown in Figures 1 and 2.

Visual signals

4.4 A patient call will be initiated by operating a push button on the handset, a wall-mounted push button in areas such as dayrooms, treatment rooms etc, or by pull cord switches in toilets, bathrooms, showers etc.

4.5 Combined within, or in close proximity to, the calling devices in paragraph 4.4, a reassurance lamp should illuminate steadily within sight of the patient.

NOTE: Where a call push and a reset push are combined together on a single panel, the lamp within the reset push can serve as the reassurance lamp.

4.6 Combined within the local reset push, a lamp should illuminate steadily.

4.7 A lamp outside and above the door of the ward/cubicle should illuminate steadily. Where no door exists such as in an open bay, a lamp should be positioned in an alternative position such as in the corridor ceiling.

4.8 Where the calling location is not adjacent to the main corridor and is, for example, served by a side corridor or passageway, the lamp should be duplicated as often as necessary so that a follow-the-light procedure can apply.

4.9 A lamp should illuminate steadily at the nurse station or staff base.

4.10 A lamp should illuminate steadily, when required, in areas such as Sister's office, kitchen, utility rooms.

4.11 All of the above lamps should remain in the steady state until the related call is cancelled at the associated reset unit. It should not be possible to cancel the call at any other position.

4.12 Where groups of calling points occur, as in multi-bed wards and toilet/ bathroom suites, it is usual to provide a single over door lamp to indicate any of the calls collectively. This arrangement would continue with any duplicated corridor repeater lamps and also at the nurse station (see Figure 3).

4.13 The existence of a call should not prevent any other call from being made. The resetting of a call should not cancel or affect any other call that is in force. An exception is where a toilet/bathroom suite is controlled by a common reset unit.

Audible signals

4.14 An audible signal should be provided at the nurse station in the form of a tone with a fixed frequency, typically in the range 500 to 800 Hz. For a patient call, the tone should sound 1 second on, 9 seconds off until all calls are cancelled. A switch on the nurse station panel should be provided to reduce the volume at night. There should be no means of switching off the tone altogether.

NOTE: Additional remote line audible tone units may be required in utility rooms.

4.15 The tone sound should be reproduced at strategic positions throughout the ward to alert staff generally. These sounders should also be quietened at night, controlled by the switch at the nurse station.

4.16 The tone sound should be reproduced, when required, in areas such as Sister's office, kitchen and utility rooms; in these cases it may be preferable to have no reduction of volume at night. The Sister's office unit may need to incorporate an on/off switch.

Toilet/bathroom call

4.17 It may be a requirement that a greater priority is given to a patient call made from a toilet area or bathroom than any other patient call. In this event the overdoor lights should remain steady and the sounder should have a different tone/repetition rate to distinguish it from a normal patient call and an emergency call (see paragraphs 4.14 and 5.5).

5. Communications – staff-to-staff (emergency)

Emergency switch

5.1 With the possible exception of low dependency areas, it is necessary to give nursing staff the ability to call for assistance should the need arise while attending to a patient. A switch for this purpose should be incorporated in the bedhead services panel and in any other area where assistance may be required. Areas which have no other form of communication may require this facility, for example treatment rooms. The switch will operate with a pull on/ push off action to prevent inadvertent operation. It should be coloured red and labelled "Emergency Pull".

Visual signals

5.2 Operation of the staff emergency switch at any bed or other location where fitted, will cause the sequence of lamps as described in paragraphs 4.5 to 4.12 to illuminate in a flashing mode (whether a normal call is in force or not) until the emergency switch is returned to normal. The flash rate will be 0.5 seconds on / 0.5 seconds off.

5.3 Where a group lamp is positioned to indicate calls from more than one source, the raising of an emergency call from one section should not be masked by a steady illumination from another section which has a normal call in operation.

5.4 Operation of the emergency switch should cause the system to operate in one of the following ways:

a. it should override any patient calls on the system when the emergency call is made, storing these until the emergency call is cancelled, when they are reinstated automatically;

b. it should not affect any patient or emergency calls from any other point that are in force or need to be made during the emergency. Group lamps should operate as described in paragraph 5.3.

Audible signals

5.5 Use of an emergency switch should cause all the tone sounders of the system to operate in phase with the flashing lamps. Frequencies typically used are:

a. a dual tone operation: 0.5 seconds at 1000 Hz and 0.5 seconds at 500 Hz;

b. a single tone on/off operation: 0.5 seconds at 800 Hz and 0.5 seconds off.

5.6 If the quiet (or mute) setting of the control switch at the nurse station has been selected, this will be overridden.

6. Patient's calling devices

General

6.1 Whatever form it may take, the device a patient will use to make a call should be easy to operate even with arthritic hands. The push button should be easily recognised by its colour (orange) and by a nurse symbol indelibly engraved/printed on or alongside the device wherever practical. Examples of typical nurse symbols are shown in Figure 4. Switches used for calling devices should have a tactile feel.

Panel-mounted push button

6.2 The push button should be large and easily recognisable. Associated with the push button either integrally or alongside, a reassurance lamp in the form of a filament lamp (typically 1 watt) or light emitting diode (LED) with an amber or red lens should be fitted.

6.3 This form of calling device is not particularly suitable for patients in bed unless the unit is mounted within easy reach, for example on the side of a fixed locker. It is suitable for areas frequented by ambulant patients such as a dayroom or rehabilitation centre.

NOTE: Wherever practical, the patient's calling device should be coloured orange to aid recognition.

Call only unit

6.4 The push button should be large and easily recognisable. Associated with the push button either integrally or alongside, a reassurance lamp in the form of an LED with amber or red lens should be fitted.

6.5 The push button should be permanently illuminated to a level sufficient to allow easy location in the dark, but should not be so bright as to be confused with the reassurance lamp. The lamps should not be of a filament type due to their relatively fragile nature.

6.6 The unit should be ergonomically designed, with a flexible lightweight cable typically 2 metres in length. The means of attachment at both ends of the cable should be in the form of an effective strain relief device. The plug should be of a pattern that will disengage from the wall socket when strain is applied to the cable without damage to either plug, socket or cable. Where the same plug and socket is used for a call only unit as an alternative to a patient handset, the circuitry of the call only unit should be compatible with that of the handset so that the socket can be used for either.

6.7 Some means of attaching the call only unit securely to the bedclothes or patient's clothes should be available, but such means should not tear the clothing if sufficient force is applied to effect disengagement. Typical clips are shown in Figure 5.

6.8 Within the call only unit or its cable the recommended potential should not exceed 30 volts peak between any two points including earth. The nurse call circuit should be monitored so that a break in the cable or withdrawal of the plug will initiate a call.

6.9 A parking clip or bracket should be provided to allow the unit to be stored on the wall or locker unit when not in use (see paragraph 8.29 for further details).

6.10 In order to avoid false calls due to switch bounce if the unit is knocked or falls to the floor, the nurse call function should not be sensitive to a switch operation of less than 5 milliseconds.

Pull cord unit

6.11 In showers, bathrooms and toilets, the patient calling device is normally a ceiling-mounted pull cord unit. It is important that the pull cord is easily recognised as the calling device and cannot be confused with a light switch. The cord should be coloured orange, as should the "acorn", the latter being indelibly marked with the nurse symbol (Figure 4). The pull cord unit should incorporate a reassurance lamp with an amber lens. The switch should have a momentary action.

NOTE: When, in a wet area, a ceiling-mounted pull cord unit may be inappropriate (examples - psychiatric bathroom or hydrotherapy pool), a wall-mounting push button with an IP rating of 66 is acceptable.

Other call units

6.12 Where bedlight control is required in addition to the call facility, a switch marked with the bright bulb symbol (see Figure 4) should be added to the call unit described in paragraphs 6.4 to 6.10.

6.13 A pneumatically operated call unit can be used for patients who are unable to use their hands. The unit comprises an air bulb and connecting tube, terminating in an air velocity operated switch mounted integrally with a 2 pole 6 mm jack plug.

7. Patient's handset

General

7.1 It is not practical to expect bedded patients to operate controls positioned on a wall-mounted panel, and the use of hand-held units is very commonplace. Where control of entertainment channels and bedlight are required in addition to patient call, a multifunction handset is required. A typical handset is shown in Figure 4.

7.2 Patients' handsets will be subject to misuse. Those which are poorly designed will be susceptible to any rough handling, thereby creating a continuing maintenance cost.

Sterilization

7.3 Traditional handsets have suffered considerably from ingress of food, drink and body fluids, giving rise to breakdown and potential contamination. The modern multifunction handset should have a rating of IP 67 to BS EN 60529: Specification for degrees of protection provided by enclosure (IP code) 1992 to enable dip sterilization. Alternatively, the unit should have a disposable sleeve which can be sterilized or replaced as and when required.

NOTE: Manufacturers must state which sterilizing materials can be used on their handsets, and the recommended method of sterilizing.

Electrostatic voltages

7.4 The handset should not be affected by the high electrostatic voltages generated in the hospital environment; see paragraphs 26.4 and 26.5 for the test details.

Call push

7.5 The patient call push button should be coloured orange and marked with the nurse symbol. It should be the largest button on the unit and the switch should have a tactile feel. In order to avoid false calls due to switch bounce when the handset is dropped or knocked, the call function should not be sensitive to a switch operation of less than 5 milliseconds.

7.6 For ease of location at night, the call push button should be permanently illuminated, but not so brightly that it could be confused with the reassurance lamp.

NOTE: Lamps fitted within patients' handsets should be of the robust LED type rather than the more fragile filament type.

Reassurance lamp

7.7 A reassurance lamp in the form of an LED with amber or red lens should be positioned adjacent to the call push.

Programme controls

7.8 There is an increasing move to distribute entertainment to patients using digital techniques via data cable which means that the number of channels can be far more than when conventional wiring is used. Simple programme selection is essential and this can be achieved with one or two push buttons for sequential stepping of channel numbers. Likewise, the control of volume should be with two similar push buttons. The channel number selected should be displayed by a seven-segment LED indicator. All controls should be clearly marked with their function (see Figure 4).

NOTE: Historically, the recommended number of programmes supplied to patients has been four or six, mainly limited by the amount of cabling required. The use of digital transmission techniques means that the number of programmes can be greatly increased.

Bedlight control switch

7.9 Patients should be given the facility to switch their bedlight on or off. A push button on the handset should effect control via a relay in the bedhead panel, see paragraph 8.21. The button should be marked with a lamp symbol as shown in Figure 4.

Attachment clip

7.10 Some form of clip should be provided on the handset or the cable to allow attachment to the patient's clothes or bedclothes. It should be so designed that any undue force will allow the clip to disengage without tearing the material. For examples see Figure 5.

Cable

7.11 The handset cable should be lightweight and flexible with no more than six conductors. At both ends the cable should be anchored positively. The cable should be typically 2 metres in length.

Plug

7.12 The handset plug should be of a pattern that will disengage from the wall socket when strain is applied to the cable. The plug and socket should be suitable for the light current levels used by the digital electronics in modern multifunction handsets. One type of plug that has been used successfully is the BT Type 420 4 pole jack plug.

Monitored call circuit

7.13 The nurse call circuit should be monitored so that a break in the cable or withdrawal of the plug will initiate a call.

NOTE: If all handset facilities are multiplexed, the call function should be self-checking to ensure that the integrity of the link to the bedhead panel is not impaired.

Parking bracket

7.14 The handset should be designed to fit a parking bracket - see paragraph 8.29.

Ergonomic design

7.15 The handset should be ergonomically designed, robust and of lightweight construction. The rear of the unit should incorporate an anti-slip surface to prevent the handset from being dragged onto the floor by the weight of the cable when placed on a standard over-bed table or locker.

Supply voltage

7.16 It is recommended that the circuit of the handset should not contain a voltage of more than 30V peak between any two points including earth.

8. Bedhead unit

Positioning

8.1 A panel mounted on the wall and to the side of the bed is a convenient means of providing the electrical services that will be required by both patients and staff. .

NOTE: For trunking-mounted bedhead services and vertical units see paragraphs 21.8-21.14.

8.2 The tendency is for nursing to be carried out on the patient's right-hand side; the panel should therefore be positioned on that side.

8.3 In some cases, treatment is required on the patient's left. The panel should not be obscured when the bed and furniture are moved to allow treatment from that side.

8.4 Raising, lowering or tilting of the bed should not obscure or damage the panel nor any component plugged into or attached to it.

8.5 The mounting of services to a moveable locker with a flexible connection to the wall is not recommended.

8.6 Where tall fixed lockers are installed, it may be deemed preferable to mount all or some of the electrical services in the side of the locker facing the patient; this is likely, however, to complicate the cabling installation.

Construction

8.7 Separate panels should be used for low voltage (LV) and protective extra-low voltage (PELV) services. This allows access to the PELV section for servicing without having to isolate the LV circuits. A typical bedhead panel is shown in Figure 8.

8.8 Segregation between LV and PELV should be in the form of a barrier to fulfil the requirements of BS 7671:1992 (the IEE Wiring Regulations).

Mounting box

8.9 The backbox should typically be a standard sheet steel adaptable box. Typical dimensions are 300 mm wide x 150 mm high x 50 mm or 75 mm deep, depending upon internal requirements and site mounting arrangements.

NOTE: Where possible, for reasons of neatness and cleanliness, bedhead panels should be flush-mounted. When it is necessary to surface-mount the unit, the box should be of neat appearance with sealed corners to prevent ingress of dust and insects.

8.10 The finish of the box should be to BS 4568:Part 1:1970 Class 2 medium protection, for example stove enamel.

8.11 Within the LV compartment an earthing terminal should be provided to give efficient and reliable electrical connection to the box.

Panels

8.12 The panels should be manufactured from stainless steel (minimum 1.5 mm thickness) or other metal of adequate stiffness, suitably protected against corrosion and having non-reflective surfaces. They should overlap the flush boxes by approximately 12 mm.

8.13 The two panels should be fixed with not fewer than six screws, preferably with a mushroom or pan head. Where the two panels meet there should be some means to ensure alignment of both front surfaces and also the top and bottom edges.

8.14 The front surfaces of the panels should show no fixing device used to attach components to the panels, nor should there be any obvious blemishes resulting from such fixings.

8.15 All exposed surfaces should have an ingress protection rating of at least IP 20.

Controls

8.16 The controls on bedhead services panels should be easy to use. They should be marked by adequately sized engraving or silk screen printing in an indelible manner; the colour of the marking should be in bold contrast to the panel colour.

LV section components

Twin 13A switched socket-outlet

8.17 A twin 13A switched socket-outlet complying with BS 1363 should be fitted. In some nursing areas it is necessary to supply these sockets at all beds or alternate beds from the essential supply. For easy recognition, such sockets should ideally have red switch dollies; alternatively, a letter "E" coloured red should be marked on the panel in close proximity to the socket. The LV

power circuit wiring should be taken directly into the socket connections and not via an intermediate connector within the unit.

Bedlight control switch

8.18 A bedlight control switch should be fitted complying with BS 3676:1989/BS EN 60669-1: 2000; this switch should be a flush two-way three-position rocker type to give "Dim-Off-Bright" control. The panel should be marked with the word "Bedlight" and to the side, the symbols as indicated in Figure 6.

Bedlight fuse unit

8.19 A bedlight fuse unit should be fitted. Power for the reading lamp will be derived from the 13A socket wiring via a flush-mounting fuse carrier suitable for use on a 32A ring main and incorporating a 3A fuse to BS 1362:1973 (1992) replaceable from the front of the panel. The panel should be marked with the word "Bedlight".

NOTE: When the bedlight switch and fuse are mounted close together, the single word "Bedlight" can be used to embrace both components.

Dimming capacitor

8.20 It is commonplace for the bedlight to use a 60 watt GLS lamp, and a convenient means of achieving dimming to a satisfactory level is to switch in series with the lamp a 2.2 µF capacitor rated at 250V a.c. rms. A discharge resistor, typically 1 Mohm, should be connected across the capacitor. Some manufacturers have the resistor built into the capacitor. See Figure 7.

NOTE: In cases where the bedlight takes the form of a ceiling-mounted spotlight rather than an adjustable arm type of fitting, and the lamp used is 100 watts, the dimming capacitor value will be 3.0 µF rated at 250V a.c. rms.

Bedlight relay

8.21 The relay provides the means to switch the LV bedlight circuit on and off from the patient's handset via the PELV control section of the bedhead panel while the bedlight control switch is in the "bright" position.

8.22 The relay should be mounted in the LV section of the bedhead unit and adjacent to the segregation barrier. The PELV connection to the relay should pass through a grommeted hole in the barrier. The relay should be capable of withstanding a high voltage test of 3500V a.c. rms between the LV and PELV conductive parts. The relay should be either a mechanically latched type or a magnetic impulse type with continuously rated coil/coils. Contacts should be rated at 250V a.c. rms, l0A minimum.

PELV section components

Reset switch/indicator lamp

8.23 For resetting the patient call this switch should have a flat-topped translucent orange or amber lens and a lamp typically rated at 28V 1.1 watts. The lamp should be easily replaceable from the front. The panel should be marked "Reset" above the switch.

Socket for handset

8.24 The socket should be suitable for receiving the plugs fitted to both the patient's handset and call only unit.

8.25 The circuit connections to the socket should ensure that any short circuits developed in the handset or call only unit or their associated leads cannot result in damage to any other component. If such short circuits are capable of causing the nurse call system to malfunction, such effects must be localised to ensure that the integrity of other parts of the system is maintained.

NOTE: Where it may be necessary to deprive a patient of a handset or call only unit due to misuse, a dummy plug should be available, insertion of which will enable the call (which is automatically raised with no plug present) to be cancelled see paragraph 7.13.

8.26 If the 4 pole BT type 84A socket is used, circuit connections should ensure that:

a. if a telephone is plugged into the bedhead unit, no damage will result to either;

b. if a handset or call only unit is plugged into a socket of a telephone system, no damage will result to either.

Audio sound driver

8.27 A popular type of headset provided for patients is the "stethoscope" type. The acoustic tube to the headset should mate firmly with a spigot attached to the panel-mounted driver unit. The audio power generated at the sound driver should be typically 25 mW.

NOTE: The sound quality and comfort of "stethoscope" type headsets is considered adequate for general ward use. They are relatively inexpensive, sterilizable and durable. Alternatively, a lightweight electromagnetic headset can give improved sound quality. For these, a jack socket will be required on the panel.

Staff emergency switch

8.28 The emergency switch should operate with a pull-on/push-off action. It should be coloured red and the panel above the switch should be marked "Emergency Pull". See paragraph 5.1.

Parking brackets

8.29 Suitable means of parking the loose accessories at the bed, that is, handset or call only unit and headset, should be provided on the bedhead panel and additionally, when required, on the locker. Requirements are as follows:

a. it should be clear which device the bracket is provided for, this being marked with an appropriate symbol;

b. when parked on the locker, the handset or call only unit should be easy to operate by the patient;

c. when parked on the locker the handset or call only unit should be easily placed into or removed from its bracket by a frail patient lying supine or prone and whose arm is at full stretch;

d. the positioning of the parking bracket on the bedhead panel should be such that the handset or call only unit or their cables do not obstruct other components or access to other components on the bedhead panel;

e. the brackets should hold their devices positively so that they do not become accidentally dislodged by such knocks and pulls as may be expected in normal service. The handset or extended call push should nevertheless disengage from its bracket if abnormal forces are applied to the device or its cables, and such disengagement must cause no damage to any part;

f. to reduce the risk of injury or breakage, the bracket material should be tough and deformable and not project more than 20 mm. Edges and corners should be rounded.

PELV section - options

General

8.30 For the standard sized bedhead panel, the number of additional facilities that can be accommodated will be limited. The additional facilities of an isolation switch and dual control are described below. It may be necessary for the dual control version to use a deeper box or a larger plate. A typical layout is shown in Figure 9.

Isolation switch

8.31 The isolation switch will provide a convenient means of isolating the PELV section of a bedhead panel and any attachments to:

a. help locate a faulty bedhead panel where several panels are being affected by the fault;

b. take the faulty bedhead panel out of service until maintenance can be arranged.

NOTE: The more sophisticated type of call system may incorporate automatic fault reporting features.

8.32 The isolating switch should be a multi-pole switch operated by a key (key withdrawable) or a tool. An LED indicator with red lens should be positioned adjacent to the switch to show when the bedhead is isolated.

8.33 It should be possible to isolate any number of bedhead panels in any combination.

Dual control

8.34 Duplication on the panel of the channel selection and volume controls featured on the multifunction handset will make entertainment facilities available (with operation by staff if necessary) to patients who are without a handset or unable to use one.

NOTE: Another feature of dual controls can be the duplication on the panel of the nurse call button and bedlight control switch in addition to the handset.

9. Other call system units

Reset unit

9.1 For areas not requiring a bedhead unit, patient-made calls need to be retained by means of a latch-on device; this is likely to be an electronic module located within a reset unit. The module should be plug-in and easily replaced. The function of the reset unit is to unlatch the electronic module and effect cancellation of the call. A reassurance lamp, typically 1 watt with an orange or amber lens, should be incorporated within the switch used for resetting. The switch will be clearly labelled "Reset". Where appropriate, for example in a dayroom, the reset unit can also incorporate a call push and/or an emergency switch.

9.2 A reset unit may be used to reset calls from a single calling location or multiple calling locations such as a suite of bathrooms/toilets or a multi-bed ward. The number of multiple calling points controlled by a single reset unit should be limited to no more than four.

9.3 Where the reset unit is independently mounted from the call/push, it should be located so that the patient does not operate it unintentionally.

Overdoor/corridor lamps

9.4 Situated at the entrance to calling locations, the overdoor lamp will indicate to staff responding to a call, the source of that call. For areas such as bedded bays, the lamp should be mounted in the corridor ceiling at the entrance to the bay. Where the calling points are situated along side passages, the overdoor lamp will need to be repeated at the main corridor and at other intermediate places en route if necessary. The overdoor lamp should contain a lamp of at least 2.5 watts rating with a translucent lens.

NOTE: The material of lamp lenses should be adequately rated so that no deterioration takes place with extended illumination periods. Polycarbonate is a satisfactory material.

Nurse station unit (staff base)

9.5 The nurse station or staff base is the administrative and communication centre of the ward. All patient calls will need to be indicated here either with a single group lamp, an individual lamp for each calling point, a combination of both, or by use of other forms of display, for example liquid crystal displays (LCD) or computer visual display units (VDU). One group lamp could be used for the toilets/bathrooms and an individual lamp for each bed call. The lamps may be in the form of high brightness light emitting diodes (LEDs), filament lamps typically 1 watt rated, or other means of display, for example VDUs or LCDs.

9.6 Along with the visual indication of a call, there should be a tone sound (see paragraphs 4.14 and 5.5).

9.7 In areas where the nurse station is responsible for, and local to, a small number of beds only, for example ITU, there may be no need for lamp indication at the nurse station; location of the call can be ascertained from the reassurance lamp at the bed. However, there should always be a tone sound.

9.8 A switch should be provided to attenuate the volume of sound at night. There should be no "OFF" position.

Power/control units

9.9 This unit will be ideally located if mounted centrally within the ward area in an electrical duct or cupboard. Power will be derived from a single phase LV essential supply via a switched fused connection unit nearby (see Figure 10).

9.10 The power/control unit should provide an adequate means of terminating incoming cables. Terminals should be well labelled and of sufficient capacity to accommodate the specified size and quantity of cables and the maximum operational circuit currents.

NOTE: Refer to SHTM 2011; Emergency electrical services.

With call systems being powered from the LV essential supply, a power failure is not likely to exceed 15 seconds so the need for a battery/charger equipment to sustain the call system during the power loss is generally considered unnecessary. Should the user, however, wish to:

prevent a patient call being lost; and

enable a patient call to be established during the rare and short-lived occurrence of a power failure,

a battery/charger equipment will need to be incorporated. Such a decision should take cognisance of the extra costs involved both initially and for subsequent maintenance.

(a) and (b) above do not apply to emergency calls.

Some modern call systems will be self-sustaining during short-term power loss.

9.11 The power unit will provide the protective extra-low voltage (PELV) to power the call system, one terminal of the ELV being connected to the protective conductor. Mains transformers should be of Class II construction and comply with BS 3535:Part 1:1990. Switch mode power supplies should comply with BS EN 60950:1992 (this standard is still current but further reference should be made to BS EN 60950: 2000). A typical nominal voltage used is 24 volts d.c. With 25 per cent of calling points being energised simultaneously the voltage on any part of the supply should not be less than that specified by the manufacturer to ensure correct operation of the system. The d.c. output should be stabilised and overload protected against any short or partial short circuits that may cause damage to the cabling or power source.

9.12 The power/control unit may contain the control circuits as necessary. Electronic modules should ideally be plug-in to aid maintenance.

9.13 The power/control unit should be housed in a substantial steel enclosure with an ingress protection rating of at least IP2O. A double pole on/off switch should be incorporated to isolate the mains, clearly labelled with its function. The enclosure should be marked externally with the manufacturer's name, address and the telephone number to be used for service. Consideration can also be given to polycarbonate enclosures meeting the same requirements.

10. Transfer of calls

General

10.1 Where staff at a particular nurse station take on the responsibility for the adjacent ward or wards at certain times, for example during the night, it is advisable to incorporate a transfer system whereby any calls from the adjacent ward or wards are annunciated at the duty station.

Transfer switch

10.2 The nurse station at a ward to be transferred will incorporate a switch the operation of which will divert a common signal from any call in the ward to the duty station. A lamp alongside, or incorporated within the switch, will indicate "transfer selected".

Visual signals

10.3 The duty station panel will be equipped with a lamp, LCD or VDU, to indicate that transfer from the "other" ward has been selected. Any calls received from the "other" ward will illuminate a separate lamp (steady for normal calls, flashing for emergency calls) to indicate "Call from Ward ...", or use an LCD or VDU to define the origin of the call.

Audible signals

10.4 Transferred calls, both normal and emergency, should sound the tones appropriately in both the transferred ward and the "duty" ward.

11. Speech system

General

11.1 The addition of a speech facility to a nurse call system can save nursing time. It has the advantage that nursing staff at the staff base can ascertain the needs of the patient prior to attending the bed. It eliminates some visits altogether, yet still gives reassurance to the patient.

Nurse station unit (staff base)

11.2 The staff base panel should be fitted with a suitable loudspeaker/microphone arrangement. Identification of the source of the call may be by indicator lamps, liquid crystal displays (LCD) or computer visual display units (VDU). Selection of the speech channel will be by either keyboard or selector switch.

NOTE: It is recommended that nurse station panels with speech be provided with a telephone type handset in addition, or as an alternative, to the loudspeaker/microphone, for privacy reasons.

Operation

11.3 Selection of the speech channel should enable the nurse to speak to the patient. The patient should not be able to speak to the staff base until a patient call has been established.

11.4 Where the speech system is used to audibly monitor the patient, the patient should be aware that the monitoring is taking place. It should be noted that monitoring of this nature could restrict operation of the remainder of the speech system.

11.5 If the speech system is simplex rather than duplex, the nurse station panel will be fitted with a "push-to-speak" switch.

11.6 It should be possible with a speech system to cancel patient calls from the staff base, but only after communication has been established. Cancelling of emergency calls should not be possible.

Bedhead services unit

11.7 The provision of a speech facility as part of the bedhead services for a patient may take one of the following forms:

a. wall-mounting loudspeaker/microphone. This arrangement is satisfactory in single or twin-bedded wards;

b. a loudspeaker/microphone incorporated within the patient's handset. This arrangement is more user-friendly, being similar to ordinary telephone use. The loudspeaker and microphone should be mounted separately within the handset in positions similar to a telephone handset, see Figure 11. The design features of the non-speech handset should be retained, see Chapter 7.

NOTE: Where audible monitoring of patients is a requirement, the wall mounting loudspeaker/microphone arrangement will be the most effective. Monitoring will only be practical in single-bed wards and will normally form part of a separate system.

11.8 It should be possible to insert a speech handset into a non-speech bedhead panel or a non-speech handset into a speech bedhead panel and maintain the use of the basic call system. This will allow maximum flexibility in establishments where both speech and non-speech systems with handsets are in use.

NOTE: A separate telephone used for patient-to-nurse speech is not recommended. It will increase the possibility of confusion, especially where a normal telephone facility is also provided.

Security of communication

11.9 Where a patient/nurse speech system is a requirement and there will be periods when the staff base is unattended, it is necessary to ensure that communication following a call will be established without delay. This can be achieved by:

a. the nurse responding to the door/corridor indicators and tones and reporting directly to the bed as in a non-speech system;

b. the nurse, on leaving the staff base, picking up a paging receiver; this will direct them to the source of any call made;

c. the nurse responding to the tones or paging receiver and making use of "slave" staff bases placed in strategic positions.

Transfer of speech

11.10 Where speech systems incorporate transfer facilities it will be necessary for the duty nurse to be able to converse with patients in the transferred ward from the duty station. This means that either individual lamps and speech channel selector switches will be duplicated on the duty station panel, or an LCD/VDU will be used to define the origin of the call and assist the selection of speech. Calls from non-speech locations can still be indicated with a single common lamp.

12. Nurse presence system

General

12.1 With the greater use of small side wards and recessed bay areas in the modern hospital, the installation of a nurse presence system will allow easier location of staff.

Nurse presence switch

12.2 Each room and bedded bay can be provided with a switch for the nurse to operate as they enter and leave the location. In single rooms, the switch can be part of the bedhead services installation, but more usually it is placed at the entrance of each area so fitted.

NOTE: It may be possible to install a presence system which will respond automatically to the entry and exit of a nurse. A device can be attached to the nurse's person which will activate a wall-mounted unit; this will initiate the necessary indications at the staff base etc.

Visual signals

12.3 Operation of the switch will illuminate a lamp adjacent to or integral with the switch; additionally, either lamps, LCDs or VDUs will give indication of the whereabouts of the nurse. If required, indication may also be provided in the sister's office to show the location of staff.

Additional tone sounders

12.4 It may be appropriate to install a tone sounder in each area which has a presence switch. The switch when operated will connect the tone sounder so that any patient or emergency call will be heard by the nurse in that location.

NOTE: The success of a nurse presence system will depend on the discipline exercised in operating the switches for each and every visit.

Speech system

12.5 A nurse presence system lends itself to the addition of a staff-to-staff speech system (intercom). By knowing where nurses are located, the staff base can initiate a speech call to whichever nurse needs to be contacted.

Mimic indicator

12.6 For a large and complex ward layout it may be appropriate to provide at the staff base a mimic indicator engraved with a plan of the ward. Patient call lamps and nurse presence lamps can be positioned on the plan to give a clear picture of call and nurse locations; normally, indication would be to room level.

13. Cardiac alarm

General

13.1 If a cardiac alarm system is required it should be initiated by a special switch installed at the bed position. The switch should be boldly marked "Cardiac Alarm". The cardiac call should register at a permanently staffed centre such as the switchboard from where the cardiac response team can be alerted and directed by telephone pocket pager or other means.

Operation

13.2 Operation of the cardiac alarm switch should also initiate the local call system with the accompanying lamps and sounders. The lamps and sounder operation should either be as described for the emergency call (see paragraphs 5.2 to 5.5), or alternatively a separate sounder operation may be used to discriminate the type of call. In the latter case the cardiac call will override any emergency call on the system, which will be stored and reinstated when the cardiac call is cancelled.

13.3 Cancellation of a cardiac alarm will be achieved by returning the alarm switch to normal. Typical switches would be:

a. pull-on/push-off switch similar to the emergency switch (see paragraph 5.1) with a knob colour other than red or orange;

b. latching push button with hinged cover.

14. Intruder alarm

General

14.1 An intruder alarm is sometimes required to alert staff to an unauthorised person in the ward area. The alarm should be operated by a concealed switch at the staff base, and possibly an additional switch at the far end of the ward/corridor.

Operation

14.2 Operation of the intruder alarm switch should activate the local call system. The lamps and sounder operation should either be as described for the emergency call (see paragraphs 5.2 to 5.5), or alternatively a separate sounder/lamp operation may be required to discriminate the alarm. In the latter case both emergency calls and intruder alarm will be able to operate simultaneously.

14.3 Additional alarm signals may be required at other locations, for example adjacent ward, hospital switchboard, porters' room, security room.

15. Attack alarm

General

15.1 In areas such as accident and emergency departments and also psychiatric wards, staff can become subject to attack and it may be appropriate to install a personnel attack alarm system.

Transmitter

15.2 A transmitting device suitable for wearing on a belt or in a breast pocket can be issued to staff. Activation of the device should be by the operation of a switch, or by sharp impact, or by either.

Receiver

15.3 It is essential that the location of the attack is reported and this can be achieved by suitably-placed receiver units wired back to a central indicator situated at a permanently staffed position.

Operation

15.4 An attack alarm system should be designed to be as reliable as possible. Consideration should be given to systems using ultrasonics and/or infrared and/or radio. Where radio signals are used these should be strictly managed and controlled to ensure that the limiting parameters such as signal strength and range as laid down by the manufacturer are not exceeded.

NOTE: A multiple mode system might use an infrared signal to report the attack location information and simultaneously a radio signal to raise a general alarm. A failure of one of these signals due to any environmental difficulties will not prevent a response to the alarm.

15.5 The body-worn alarm-raising transmitter units can be supplemented by wall-mounting push buttons where additional protection is needed.

16. Pocket pagers

General

16.1 Where a nurse may need to move out of earshot of the call tones and still need to respond to a call, a pocket pager can be provided to sound the alarm. The staff base unit will be linked to a transmitter to initiate the signal, the frequency of which should be exclusive to the particular ward.

NOTE: More information is given in Model Engineering Specification C48 Radio Paging Systems.

16.2 A more sophisticated arrangement would be to utilise the type of pocket pager which will indicate also the position from where the call has been made.

Priority of calls

16.3 It is necessary that the pager signals differentiate between types of call and that higher priority calls take precedence. The types of call in order of importance are: cardiac alarm, staff emergency call, patient call.

17. Flexible nursing

General

17.1 The pattern of a hospital floor layout may be such as to make practical a flexible nursing arrangement embracing two or more ward areas. Where the degree of patient dependency or bed occupancy varies greatly or regularly, it may be advantageous to have the ability to increase or decrease the number of beds covered by the relative nurse stations. It is probable that computer VDUs will be required to manipulate this information on the system.

18. Centralised nursing

General

18.1 Consideration may be given to controlling all nurse-call systems throughout the healthcare establishment from one central point. The potentially large amount of information to be handled, for example:

a. patients' calls, speech and non-speech;

b. staff calls (emergency);

c. nurse presence locations;

d. transferred wards information

would necessitate the use of a visual display unit at the central console linked to VDUs at each nurse station, the whole forming a computerised, software-based network incorporating the necessary speech links between patients and staff and the central console.

18.2 Modern nurse call systems using microprocessor control can accommodate the central control approach if preferred by management. With good organisation and direction of staff from the central control station, there may be opportunities for greater efficiency and economies of staffing.

Call logger

18.3 Systems of this type may incorporate a call logger to provide management information regarding the frequency of calls and response times.

19. Entertainment

General

19.1 Provision of entertainment is important for the patients' well-being. A selection of television sound, radio and possibly other channels should be made available as a bedhead service and delivered to the patient via headphones, with channel selection and volume control at the handset or bedhead unit.

19.2 Entertainment sources may include:

a. terrestrial television;
b. satellite television;
c. radio;
d. compact disc player;
e. compact cassette player;
f. video cassette player;
g. cable services.

19.3 Larger healthcare establishments may wish to provide a central console to house equipment for the above facilities and perhaps also a hospital radio station and chapel circuit.

19.4 Technology has brought about dramatic changes in the way hospital multi-channel programme distribution takes place. Use of digital techniques means many high-quality sound channels can be generated from a compact central unit and transferred through a single 4-core data cable to all bedheads, where the signal is decoded. Other places requiring entertainment such as dayrooms or laundries can similarly be served by the same data cable.

19.5 Traditionally patients have been provided with just four or six programmes of entertainment and each of these programmes is carried on individual pairs of cables. This constitutes a considerable bulk of cable and very many connections – for example, the termination of six programmes in a bedhead panel means 12 connections in and 12 connections out. The use of a data cable therefore simplifies greatly the installation as a whole and reduces significantly the likelihood of faults developing.

NOTE: A well-designed audio entertainment system should typically have a total harmonic distortion of not more than 2% at 1 kHz. Cross-talk between channels should be no more than minus 45dB.

Television sound

19.6 Where television is provided, the means of relaying the TV sound to the patient will depend on circumstances:

a. a single-bed ward may dispense with using the headset and use the TV loudspeaker direct;

b. a multi-bed ward with a traditional system will have the sound output of the TV wired around the bed positions for headphone listening, the loudspeaker being disconnected. Where the sound output is taken from the TV a suitable isolation/matching transformer will need to be interposed between the TV and the ward circuits;

c. where TV sound channels are generated centrally, all beds in all wards should be served by this means via headsets;

d. careful consideration should be given to allowing the use of loudspeakers direct. Such an arrangement is open to misuse and potential annoyance.

NOTE: Control of the television picture wi!l be by the remote control unit provided with the TV or by the controls on the TV by patients or staff.

Digital system

19.7 The system shown in Figure 12 is a comprehensive scheme using multiplex techniques to carry considerable audio entertainment information to the patient. The amount of equipment shown here would certainly warrant a console to house it all and to provide a convenient operator workstation for the times when the "hospital radio" is active. A basic scheme should employ the central receiver/encoder and the FM/TV aerials delivering say four radio and four TV sound channels.

NOTE: This SHTM describes the multiplexed form of audio entertainment distribution in preference to the traditionally multicore direct-wired version. While the system detailed has much to offer by way of sound quality reliability and economics, the traditional system may still warrant consideration by managers for the small establishment and/or extensions to existing traditional installations.

19.8 The central receiver/encoder unit is small and compact. It receives signals from all programme sources and encodes the audio onto a screened data cable. The cable specification should be equivalent to British Telecom CW 1370; the overall diameter is approximately 4 mm and the conductors lend themselves to screwless terminations (IDT), so the installation becomes easy and economical.

19.9 Signal integrity is maintained on long lengths of cable by small repeater units which boost and condition the signal approximately every 300 metres. Where the data cable branches off into wards and other areas, an isolator is installed; this ensures that a fault developing in a particular area does not reflect back into the system. This is a significant improvement on a conventionally wired system where a short circuit on a programme pair can seriously affect the whole site.

19.10 Within the ward, the data cable will loop around all beds. The signal is decoded by the bedhead electronics and then amplified to drive the headset, control of programme selection and volume being via the handset.

19.11 In areas such as dayrooms, laundry and workshops, loudspeakers may be required to provide the entertainment. The data cable will connect into a decoder/amplifier unit complete with controls, to drive the loudspeakers. A 24 volt d.c. supply will be required and this can be taken from a nurse-call power unit where convenient.

Television mains and aerial supplies

19.12 Where television sets are installed, the 13A mains socket and aerial outlet for the TV will not normally be installed as part of the bedhead services but will be positioned at a more convenient location, for example at low level on the opposite side of the room.

19.13 The UHF video signals required for each television set will usually be derived from a common aerial installation. Signal-boosting amplifiers and attenuators should be employed to ensure adequate signal strength and balance at each aerial outlet.

20. Integrated services

General

20.1 The use of a data cable to carry information to and from the bedhead opens up the possibility of using the data cable for other facilities.

20.2 The latest developments in bedhead services communication use a single data cable to carry nurse call, patient/nurse speech and entertainment throughout large hospital complexes.

Possible new developments

20.3 Once installed, the capacity of a data cable is potentially considerable, so expansion of facilities in the ward becomes possible with the appropriate input and output interfaces. Some features that may be developed in the future are:

a. bed status: to indicate whether the bed is occupied, vacant, in the course of preparation or out of commission;

b. patient monitoring: the output from medical apparatus can be multiplexed onto the line. This may take the form of a simple on/off medical alarm or a constant reporting of varying analogue signals to indicate a changing medical condition;

c. menu selection: the patient can select their choice of meal on a special handset;

d. patient details: name, address and all relevant personal information can be entered at the bedside;

e. medication requirements: a plug-in display unit at the bedhead can display all medical details to the nurse or doctor.

NOTE: All of these possible developments would have to be carefully evaluated with regard to their effect on other hospital systems, and any security/safety implications. Further information on Patient and Communication systems is available on the Property and Environment Forum web site www.show.scot.nhs.uk/pef.

21. Types of installation

General

21.1 As far as possible, the design of a bedhead services installation should be ergonomically sound. Facilities that are difficult to use tend to be not used or wrongly used. Good accessibility is important for both nurse and patient.

21.2 Maintenance on some parts of the bedhead services installation may have to be on a regular basis, for example medical gas terminal units. All equipment should be easily accessible for maintenance to minimise downtime and disruption. Where extra cost put into the installation initially can be seen to achieve reduced effort or time, this should be given due consideration.

NOTE: The installation of electrical and medical gas bedhead services should follow at all times the recommendations of:

a. BS 7671:1992, Requirements for Electrical Installations (the IEE Wiring Regulations);

b. SHTM 2007; *Electrical services: supply and distribution*;

c. SHTM 2022; *Medical gas pipeline systems*;

d. BS 5724: Part 1:1989 - Medical electrical equipment – General requirements for safety.

21.3 In the majority of cases, a nurse will treat the patient from the patient's right-hand side so where practical, the facilities should be positioned on that side. In some cases treatment is required from the patient's left; any movement of bed or furniture to allow this should not result in any of the bedhead services being obscured. In critical cases, provision for treatment from either or both sides is required.

21.4 Provision should be made to prevent the bed or bed attachments damaging the bedhead services equipment while the bed is being moved, raised or lowered. One method of restricting bed movement towards the wall is to provide some means of buffering fixed to wall, bed or floor.

21.5 The means of accommodating bedhead services will depend on many factors, such as the number of services, the type of services, the building structure, and whether the installation is for short-, medium- or long-term use in a new or refurbishing situation.

21.6 For new and major refurbishment and where the bedhead services requirements are basic, the installation for both LV and PELV may employ

flush boxes and conduits set into the wall structure and connected (usually) into the ceiling void at each bed position.

21.7 Where the number of bedhead services is significant, embracing for example LV, ELV, medical gases and other services, the method described in paragraph 21.6 becomes complex and expensive and the necessary inroads into the building structure that would be required could constitute an unacceptable weakening of the building fabric or, conversely, there would need to be purpose-built ducting designed into the establishment at every bed position.

Trunking

NOTE: See Figure 13 for a typical horizontal trunking arrangement.

21.8 A horizontal trunking system is a convenient method of housing bedhead services for the following reasons:

a. when surface mounted, wall chases are eliminated;

b. where walls are lightweight partitioning and/or half glazed it may be the only method of housing and supplying services to the bed;

c. all electrical and gas connections can be fed in at one point, usually at one end of the run of trunking and via a vertical length of the same trunking up to the ceiling void or down to the floor void;

d. modifications to equipment panels or changes in position along the trunking length can easily be carried out. This is particularly useful where the type of nursing may change with time;

e. accessibility for maintenance and service is convenient. The removal of panels will expose wiring and piping if necessary;

f. the length of horizontal run is unlimited within reason and could embrace the length of several wards.

NOTE: A well-designed horizontal trunking system should be able to negotiate around corners and wall projections and also "up and over" doorways in a neat manner.

21.9 The design of a trunking system should incorporate the following features:

a. access to live parts via the panels should only be possible with the aid of a tool;

b. separate front panels should be provided for each service carried within the trunking, for example ELV LV medical gas/vacuum terminals and bedhead luminaires;

c. the front panels should remain rigid under all conditions;

d. segregation between compartments and different services should be maintained throughout the trunking by use of rigid and secure barriers. Where the barriers are metal, they should be electrically bonded to earth;

e. provision should be made for each front panel to be effectively earthed to the trunking or protective conductor. Conducting accessories mounted on the front panels should be effectively electrically bonded.

NOTE: Where, in refurbishment work, the trunking is required to span such as a window recess, the manufacturer's recommendation on maximum unsupported lengths (if allowed at all) should be adhered to.

Vertical units

21.10 Where the building form is such that the use of a horizontal type of trunking is impractical, for example where doors and windows cause tortuous trunking routes, consideration can be given to a vertical unit system. See Figure 14 for a typical arrangement.

21.11 A vertical unit will be designed to serve one bed or in some instances two beds. With services entering at the top, connecting to the above-ceiling services is relatively easy so that the units can be fitted towards the end of the building programme.

NOTE: Access to a vertical unit can also be from the rear, or from below where the unit reaches to floor level.

21.12 Should the need arise, a vertical unit can be re-positioned without major building works.

NOTE: Consideration may be given to the use of vertical units that are supplied to site completely wired tubed and factory tested.

21.13 The flexibility and adaptability of a vertical system should be no less than that of a horizontal trunking system.

21.14 Where a large number of services need to be provided at the bed, a vertical unit arrangement may be the most suitable means of accommodating them.

Plastic enclosures/ducting

21.15 The use of plastic enclosures/ducting and surface cabling for bedhead services installations is not recommended. The stringent requirements of electromagnetic compatibility (EMC) legislation need to be met, and the use of metal installation components enclosing wiring and equipment will contribute significantly to this end. Where the use of plastic enclosure is unavoidable, the equipment contained therein must meet EMC requirements. One technique is to coat the interior with a metallised spray. Refer to SHTM 2014; *Abatement of electrical interference*. .

22. Low voltage (LV) supplies

13A sockets

22.1 At least one twin 13A switched socket-outlet should be installed at each bed position and it is convenient to incorporate the sockets in the same enclosure as the other bedhead services. Where more than one twin 13A socket is required, the bedhead panel will become larger and non-standard if they are combined in a single unit. An alternative is to mount the extra sockets on a separate panel to match the standard bedhead panel and install them independently but in close juxtaposition to allow easy interconnection. Where other bedhead services are also required, consideration should be given to either trunking installations or vertical units. See paragraphs 21.8 to 21.14.

NOTE: Current discussion on the introduction of a harmonised plug and socket system for Europe is likely to generate public resistance. No long-term advice can be given at this stage. It is essential that the low voltage and extra low voltage be segregated at all times. The routing of LV cables through an ELV compartment (or vice versa) is strictly forbidden (except bedlight relays, see paragraph 8.22).

22.2 Within an intensive care unit the number of socket-outlets required may be as many as 24, some of which may need to be unswitched.

22.3 Where sockets are connected to the essential supply, this should be made obvious, preferably by specifying the switch rocker to be red. In some installations it is specified that alternate beds will have their sockets connected to the essential supply.

Other sockets

22.4 30A sockets for X-ray machines have now been supplanted by standard general-purpose 13A socket-outlets, these being adequate for modern equipment. The circuits to these sockets, however, require special features on account of the transient loads. Refer to SHTM 2007; *Electrical services: supply and distribution*.

22.5 In departments where there may be an accumulation of flammable anaesthetic gases and sparking of electrical connections this may present a hazard; sparkless LV sockets with interlocked switch and special plug may be specified depending upon circumstances (safety requirements to BS 5733:1995).

NOTE: Flammable anaesthetic gases such as ether and cyclopropane are very rarely used and the use of cyclopropane is being phased out completely in the UK, ether is no longer available.

22.6 Shaver sockets should be to BS 4573:1970 for general ward use or to BS 3535:Part 1:1990 in areas where extra isolation/protection is required, for example bathrooms.

NOTE: BS 3535: Part 1 remains current for use with BS 3535-2. Further reference should be made to BS EN 60742: 1996.

23. Bedhead luminaire

General

23.1 Most bedhead services installations will make provision for a reading lamp which usually takes one of the following forms:

a. articulated adjustable arm type mounted to the bedhead services panel or to the wall above;

b. fixed arm lamp mounted at high level on the wall: may have sideways movement only;

c. ceiling-mounted downlighter;

d. linear light fitting attached to trunking.

(b) and (c) above will be particularly suited to children's and psychiatric wards.

NOTE: For recommendations with regard to bed and ward lighting consult the CIBSE Hospital and Health Care Building Lighting Guide (LG2) or BS 4533, sections 102.55 and 103.2, whichever is appropriate.

23.2 Where the reading light is specified as being integral with surface trunking, the luminaires should provide the required luminance allowing for the shielding of the patient's head and shoulders. Where such luminaires are installed in trunking along with medical gas pipeline systems, the control of glare and convenience of terminal use requires careful consideration with regard to positioning.

23.3 The mounting of fixed or free-standing luminaires on moveable lockers is discouraged.

Dimming bedhead luminaires

23.4 Where patient inspection is required at night, it is necessary to provide a small amount of light at the bed (typically 5-10 lux) and this can be achieved by dimming the reading luminaire. With a general lighting service (GLS) lamp a satisfactory dim light can be achieved by inserting in series with the lamp a 240V a.c. rated capacitor: 2.2 µF for a 60 watt lamp and 3.0 µF for a 100 watt lamp. See paragraph 8.20.

NOTE: Luminaires should only be used for the purposes for which they are designed. Unprotected lamps used for examination purposes where splashes of liquid may occur can result in lamp explosion. Examination luminaires should be to BS 4533 Section 103.2, 1986.

23.5 The use of compact fluorescent rather than GLS lamps is becoming universal. Dimming of fluorescent lamps is not so simple as with GLS; an electronic dimmer is required plus a lamp with four contacts and an external starter and gear. An alternative is to use a small GLS lamp to provide the reduced illumination, in the same fitting as the main lamp. In either case, extra wiring to the lamp is required.

Trunking-fitted luminaire

23.6 Some horizontal bedhead services trunking systems can incorporate supplementary ward lighting. Fluorescent light fittings are attached to the trunking either separately or as an integrated section of the trunking design. It is unlikely that this form of illumination is sufficient as the only ward lighting, because the height of the light source will be less than optimum.

24. Medical gas pipeline systems

General

24.1 Where medical gas pipeline systems are used, the terminal unit provided should be as indicated in the relevant Health Building Note, Activity Data Sheet, SHTM 2022; *Medical gas pipeline systems* and BS 5682:1998.

24.2 Methods of installation should be to SHTM 2022; *Medical gas pipeline systems*.

24.3 Where terminal units are integrated with other bedhead services, care must be taken to ensure adequate space for ease of use of medical equipment such as flowmeters, vacuum control units etc.

Bedhead services enclosure

24.4 Medical gas terminals mounted within bedhead services enclosures must be rigidly fixed. The panel hole through which the terminal protrudes should be as small as practical and the panel should be easily removable with the aid of a tool to allow routine maintenance on the terminal.

Bedhead services trunking/vertical unit

24.5 Where medical gas pipelines are accommodated within bedhead services trunking or vertical units, they should provide a convenient means of clipping the pipework at the recommended spacing and throughout its length in both horizontal and vertical runs.

25. Telephones

General

25.1 Where a bedside telephone is required, the socket-outlet can be incorporated within the bedhead services wall panel. The facility usually takes one of two forms:

a. an individual standard telephone socket will be fitted at each bed and wired as a separate extension to the hospital exchange. This will allow the simultaneous use of private telephones and/or mobile payphones within the ward;

b. an individual standard telephone socket will be fitted at each bed and wired in parallel to other beds in the ward on a common single circuit to the exchange. A telephone or mobile payphone can be plugged in where required, but only one at a time.

NOTE: In the interests of electromagnetic compatibility (EMC) and possible adverse interaction with ward communications, it is strongly recommended that the use of portable telephones by patients staff and visitors in sensitive hospital departments (for example ICUs, theatres etc.) is not permitted.

Isolation ward

25.2 For patients confined within an isolation ward, the provision of a telephone for the patient and people outside the ward is a convenient means of communication. Such a telephone link should comprise two identical single-button telephones plus a small power supply. Operation of the push button should sound a buzzer on both telephones. The alternative of a loudspeaker type intercom may be required if the patient is incapacitated.

26. Electromagnetic compatibility

General

26.1 The sensitivity of electronic components is such that protection against electrostatic and electromagnetic interference becomes of paramount importance.

26.2 Electromagnetic compatibility (EMC) is defined as capability of electronic equipment or systems to be operated with a defined margin of safety, in the intended operational environment, at designed levels of efficiency, without degradation due to interference.

26.3 All electrical units should meet the requirements of the EC Directive 89/336/EEC (the Electromagnetic Compatibility Regulations 1992) for both emissions and immunity. Electrostatic discharge immunity.

26.4 The presence of electrostatic discharges between dissimilar materials is well known. The use of artificial fibres in clothing and bedding materials can produce a very high static build-up.

NOTE: The static voltages at the bed area should not exceed 7kV. One method used to achieve this is to use floor coverings and bed tyres made with dissipative material.

26.5 The bedhead services units, including the handsets, should meet the electrostatic discharge tests specified in the appropriate immunity standard, that is, 4kV contact discharge, 8kV air discharge.

26.6 It is recommended that provision is made on the bedhead services panel for one earthing point to which the bedframe can be attached.

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	
	Health and Safety at Work etc Act	HMSO	1974	
	Registered Establishments (Scotland) Act	HMSO	1998	
	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 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	
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	

Publication ID	Title	Publisher	Date	Notes
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 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 1362	**Specification for general purpose fuse links for domestic and similar purpose (primarily for use in plugs)**	BSI Standards	1973	
BS 1363	**13A fuse plugs and switched and unswitched socket outlets**	BSI Standards	1984	
BS 3535	**Isolating transformers and safety isolating transformers**	BSI Standards	1990	
BS 3676	**Part 1**: Switches for household and similar fixed electrical installations. Specification for general requirements	BSI Standards	1989	
BS 4533	*Section 102.55 & section 103.2*	BSI Standards		
BS 4568	**Part 1**: Specification for steel conduit and fittings with metric threads of ISO form for electrical installation	BSI Standards	1970	
	Part 2: Specification for steel conduit and fittings with metric threads of ISO form for electrical installation		1970	
BS 4568-1	**Specification for steel conduit and fittings with metric threads of ISO for electrical installations. Steel conduit, bends and couplers**	BSI Standards	1970	

Publication ID	*Title*	*Publisher*	*Date*	*Notes*
BS 4573	**Specification for 2-pin reversible plugs and shaver sockets**	BSI Standards	1970	
BS 5682	**Specification for terminal units, hose assemblies and their connectors for use with medical gas-pipeline systems**	BSI Standards	1984 (1992)	
BS 5724	**Part 1**: Medical electrical equipment – general requirements for safety	BSI Standards	1989	
BS 5733	**Specification for general requirements for electrical accessories**	BSI Standards	1995	
BS 7671	**Requirements for electrical installations IEE wiring regulations**	BSI Standards	1992	
BS EN 60529	**Specification for degrees of protection provided by enclosures (IP code)**	BSI Standards	1993	
BS EN 60742	**Isolating transformers and safety isolating transformers. Requirements**	BSI Standards	1996	
BS EN 60950	**Specification for safety of information technology equipment, including electrical business equipment**	BSI Standards	1992	
BS EN 60950	**Safety of information technology equipment**	BSI Standards	2000	
BS EN ISO 9000	**Quality management and quality assurance standards**	BSI Standards	1994	
Scottish Health Technical Guidance				
SHTM 2005	Building management systems	P&EFEx	2001	CD-ROM
SHTM 2007	Electrical services supply and distribution	P&EFEx	2001	CD-ROM
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 2022	Medical gas pipeline systems	P&EFEx	2001	CD-ROM
SHGN	Static discharges	P&EFEx	2001	CD-ROM
SHPN 1	Health service building in Scotland	P&EFEx	2001	
SHPN 2	Hospital briefing and operational policy	P&EFEx	2001	
SHPN 48	Telecommunications	HMSO		
SHTN 1	Post commissioning documentation for health buildings in Scotland	HMSO	1993	
SHTN 4	General Purpose Estates and Functions Model Safety Permit-to-Work Systems	EEF	1997	
	NHS in Scotland – PROCODE	P&EFEx	2001	Version 1.1

Publication ID	*Title*	*Publisher*	*Date*	*Notes*
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
UK Health Technical Guidance				
HBN 27	Intensive therapy unit	NHS Estates	1992	
EH 40	HSE Occupational Exposure limits	HSE	Annual	
MES	Model Engineering Specifications	NHS Estates	1997	As required
Miscellaneous References				
LG 2	The lighting guide – hospitals and health care buildings	CIBSE		
LG 9	Lighting for communal residential buildings	CIBSE		
12/5/97	Electromagnetic compatibility of medical devices with mobile communications	EEF	1997	
5/6/97	Radio signalling nurse call systems	EEF	1997	