

# KWAZULU-NATAL DEPARTMENT OF HEALTH

INFRASTRUCTURE DEVELOPMENT  
ENGINEERING ADVISORY SERVICE



## POLICY DOCUMENT FOR THE DESIGN OF ELECTRICAL INSTALLATIONS

(TO BE USED STRICTLY AS A DESIGN GUIDE ONLY)

**IMPLEMENTATION DATE: JANUARY 2006**  
**REVISION No. 1 - JANUARY 2007**  
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## **CODES AND SPECIFICATIONS FOR ELECTRICAL INSTALLATIONS**

The complete installation shall conform to the following:

The South African National Standards Wiring Code - SANS 10142-1:2006.

Occupational Health and Safety Act and Regulations (85 of 1993).

Energy Code of Conduct for all Government Buildings

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The Local Authority Fire Regulations.

ICASA Regulations.

National Building Regulations and the SABS 0400:1990 Code of Practice for the Application of the National Building Regulations.

R158 where applicable

The Province of KwaZulu-Natal Standard Specifications for:

- a) General Electrical Specifications.
- b) Air-conditioning and Ventilation Installations.
- c) Standard Policy and Norms for Air-conditioning.
- d) Fire Fighting Installations and Equipment.
- e) Hot and cold water for building services.
- f) Industrial kitchen equipment.
- g) Industrial laundry equipment.
- h) Steam boiler installations.
- i) Steam and Condensate Reticulation Services.
- j) Refrigeration Services.
- k) Standby Generators.
- l) Water Treatment for Mechanical Installations.
- m) Standard Specification and drawings for Medical Gas and Vacuum Services.
- n) Standard Specification for Steam Sterilizers.
- o) Standard Specification for Instrument Washer/Disinfector.
- p) Operating Theatre Light Specifications (Combination, Main and Satellite).
- q) Medical Inspection Light Specification.
- r) Bed head Ducting Specification.
- s) Nurse Call Specifications.
- t) Uninterrupted power supply (UPS) Specifications.
- u) Information Communication Technology Infrastructure Specifications Manual
- v) Standard Specification for Solar Water Heating (SWH)

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## Standard Drawings

Rev1

The standard drawings listed below form part of this policy document and must be read in conjunction with it: -

### Electrical

a)	Theatre Layout (E&M) Rev 6	Drawing No.	3039H/02.1E	December 2008
b)	Clinic Delivery Room UPS	Drawing No.	7006H-01E	January 2007
c)	Typical Bed head ducting	Drawing No.	7008H	January 2007
d)	ICU Fixed Ceiling Pendant	Drawing No.	7009H	January 2007
e)	ICU Articulated Ceiling Pendant	Drawing No.	8004H	January 2008

### Mechanical

- a) 7007H/M M(X)DR TB Ward – AS to give drawings

### Structural

f)	Laboratory	Drawing No.	4036H/01-R4	January 2004
g)	Pharmacy	Drawing No.	5046H	October 2005
h)	Plant Room Doors	Drawing No.	3025H/02	August 2003
i)	Theatre and CSSD	Drawing No.	3039H/01-R3	December 2008
j)	X-Ray Suite	Drawing No.	5031H	February 2006

### General Information

The electrical reticulation system at all health institutions shall comply with the standards and specifications of the Local Supply Authority or Eskom as the case may be. Rev 1

The notified maximum demand shall be calculated by the Consulting Electrical Engineer and shall be submitted at report stage.

Specific applicable notified maximum demands shall be applied for from the relevant supply authorities irrespective of transformer capacity.

All design criteria for distribution of the electrical systems shall conform to the following estimated sizes of supply and shall be confirmed by calculation.

Clinics:	Small	-	50 kVA
	Medium	-	50 kVA
	Large	-	100 kVA
	Extra Large	-	100 kVA

Community Health Centres: - 300 to 500 kVA

District Hospitals: – 1000 kVA

Regional Hospitals: – Consult with Department of Health

Tertiary Hospitals: – Consult with Department of Health

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The electrical reticulation system for Hospitals, Community Health Centres and Clinics shall be separate essential (Generator Supply) and non-essential (Normal Supply). Where the older type Clinic has only a single electrical distribution system then backup power to the maternity section shall be by means of an Uninterrupted Power Supply (UPS). Refer to Drawing No. 7006H-01E. Drop-out contactor systems are not permitted in new designs. Rev 1

All UPS units must have rotary type bypass systems, which must bypass both the input and output of the UPS, remote alarms and be protected by curve 1 circuit breakers. Rev 3  
All UPS units shall have a separate battery cabinet. Rev 3

Sequential delayed soft starting shall be installed on all heavy electrical driven equipment, e.g. medical gas plants, lifts, air-handling units.

Efficient energy management shall be encouraged with timer load control on non-critical plant, i.e. air-conditioning in general areas, space heating and hot water generating systems and the use of energy efficient lighting equipment.  
Residences shall have load control relays for geyser control.

All equipment shall comply with the National Electricity Regulator (NER) voltage specifications – 230/400 volts  $\pm$  10%. All major equipment shall be protected by means of voltage window comparators which shall include single phase protection, phase rotation protection and under/over voltage protection, i.e.

- a) Air-conditioning plant
- b) Boiler plant
- c) Hot water generating plant
- d) Kitchen equipment
- e) Laundry equipment
- f) Medical gas plant
- g) Refrigeration plant
- h) Stand-by electrical generators
- i) Sterilization plant
- j) Water and sewer plant
- k) X-Ray Equipment Distribution Board

Rev 2

Medium Voltage Equipment: Switchgear shall be SF6 gas or vacuum technology.

Main and major Medium and Low Voltage Panels and associated switchgear and equipment shall be subjected to infrared testing prior to commissioning. Rev 1

Integral earthing mechanism shall be provided on switchgear.

Earth and overload fault relay protection shall be provided and settings shall be confirmed in writing with the Local Supply Authority.

Paper insulated, lead sheath, copper conductor, steel wire armour cable shall be used on all medium voltage reticulations.

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No back-up transformers shall be provided.

It is preferable to have two independent supplies from the Local Supply Authority connected through a bus coupler, which shall be under the control of the Local Authority. The two independent supplies shall not form part of the Local Supply Authority's ring system.

Electronic metering shall be provided on all bulk supplies when it is not provided by the Local Supply Authority.

Laminated framed schematic diagrams showing all sub-stations, switchgear and indicating normal open position of ring circuits is to be installed in each sub-station

Services shall to be exposed wherever practicable in order to facilitate repair and maintenance work.

All general plant room doors shall be galvanised and as per Drawing Number 3025H/02 and fitted with a standard HA 1 padlock. Standard air conditioning plant room doors shall be as per Drawing Number 8003H/01. Rev 2

Plant rooms shall preferable be located at ground level for single story buildings or on the same level in multilevel buildings. Rev 1

All equipment within the plant rooms shall have at least one metre clear working space all round to facilitate ease of maintenance. Rev 1

The designer shall provide all proposed plant room layout drawings which shall include all major plant and equipment, ducting layout, distribution boards etc. Rev 2

The responsibility of coordinating the layout of the plant rooms shall be that of the designer. Rev 2

Electrical installations shall carry a 12-month guarantee and maintenance period from the date of first delivery.

Preference shall be given to South African manufactured products. Rev 1

Where reference is made to "other approved" items this shall mean approval prior to tender closure. Rev 1

Where conduit chasing and openings are required in concrete slabs and columns approval and a method statement must be obtained from a suitably qualified structural engineer. Rev 3

## **OPERATION AND MAINTENANCE MANUALS**

The contractor shall hand over, at the completion of the works one original and two copies of the necessary operating and maintenance requirements for all plant and equipment supplied and installed by him or her as part of the works. Each copy of the operating and maintenance manual shall be separately bound in an acceptable manner, and shall contain the following data where applicable. These documents are to be handed to the Project Leader responsible for the project and the Project Leader shall ensure that these documents are handed to a Department of Health Head Office official.

- a) Scope of Work
- b) Operating Instructions

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- c) Normal Operation
- d) Safety Measures
- e) Fault Finding Guide
- f) Equipment Information
- g) Schedule of Information
- h) List of Spares and Agents
- i) Design Data
- j) As Commissioned Data
- k) Maintenance Requirements
- l) KZN Department of Health Service Schedules
- m) Manufacturers Service Recommendations
- n) Manufactures Literature
- o) Equipment Brochures
- p) Proprietary Drawings, Exploded Views and Wiring Diagrams
- q) As Built Drawings
- r) Electrical Drawings
- s) System Layouts and Schematics
- t) Training Certificates

### **As Built Drawings**

Complete sets of drawings (one electronic and three hard copies) of the entire project shall be included in the as built documentation. The set shall include:

- a) Architectural drawings and details.
- b) Electrical wiring diagrams indicating all cable sizes, current ratings, fuses, control units, site cable reticulation and schematic wiring diagrams applicable to the works.
- c) Mechanical drawings and schematics showing all equipment, connections to the equipment and service runs installed by the Contractor, and isolating valves, etc.
- d) Exploded views of all equipment showing each component part adequately identified and numbered.
- e) The electronic records (on disk) are to be handed to the Department of Health Head Office official at first delivery.
- f) Laminated and framed copies of operating procedures, wiring diagrams, zone diagrams and plant schematics as applicable are to be fixed to the wall in a well illuminated and accessible area.

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## **Equipment Schedules**

A complete schedule of all plant and equipment forming part of the WORKS shall be included in the manual. The schedule shall include, but shall not be restricted to the following data:

- a) Equipment type and model
- b) Equipment identity number/serial number
- c) Date of manufacture, testing installation and commissioning
- d) Country of manufacture
- e) Manufacturers name and contact address
- f) Any other information required by the Department

## **Maintenance Requirements**

The manufacturer's recommendation with regard to the routine servicing and maintenance of all equipment shall be included in the manual. This data shall include the recommended service interval and the estimated hours required for each type of service, for each item of equipment, together with a list of agents/contractors authorised to carry out service/maintenance.

For identified systems, plant and equipment, a proposed maintenance schedule shall be provided by the specialist for a period of thirty six (36) months after final delivery

Rev 2

## **Operating Instructions and Training**

A complete description of all operating procedures and safety measures shall be included in the manual. A basic "Fault Finding Guide" shall also be included.

Training shall be given to staff operating machinery and plant together with maintenance personnel.

Training certificates shall be signed by all staff that has received training.

The following table below shall be used by the Project Leader and Principal Agent as a check list for the submission of all "As built" documents.

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**AS BUILT DOCUMENTATION REQUIREMENTS**

**PROJECT =**

<b>AS BUILT DRAWINGS (DESCRIPTION)</b>		<b>REQUIRED</b>		<b>SUPPLIED</b>	
		Yes	No	Yes	No
1	ARCHITECTURAL - PLANS, DETAILS etc				
2	ELECTRICAL - RETICULATIONS, TELEPHONES, NURSE CALL SYSTEMS, ALARMS, BMS AND ELEVATORS etc.				
3	MECHANICAL - AIR CONDITIONING, GAS LINES, (LAYOUTS AND SIZES)				
4	STRUCTURAL, - REINFORCING SCHEDULES				
5	CIVIL (STORMWATER AND SEWER) - EARTHWORKS, SITE SERVICES RETICULATIONS, ROAD MARKINGS etc.				
6	EQUIPMENT SCHEDULE				
7	COMPUTERISED PROGRAMMES - CD's				
<b>COMPLIANCE CERTIFICATES (DESCRIPTION)</b>					
8	PRESSURE TESTING -				
	1) MEDICAL GAS				
	2) STEAM LINES				
	3) CHILLED WATER				
	4) CONDENSER WATER				
	5) WATER MAINS				
	6) HOT & COLD WATER RETICULATION				
	7) COMPRESSED AIR LINES				
	8) VESSELS UNDER PRESSURE				
	9) SEWER RETICULATION				
	10) PLUMBER				
	11) STABILITY CERTIFICATES				
9	ELECTRICAL - MASTER or INSTALLATION ELECTRICIAN				
10	SOIL POISONING / COMPACTION				
11	LOCAL FIRE DEPARTMENT CLEARANCE				
12	ROOF TRUSSES - TRI &TR2				
13	FIRE DETECTION - SPRINKLER SYSTEMS, FIRE EXTINGUISHER AND HOSE REELS				
14	LIGHTNING AND EARTHING				
15	CONCRETE CRUSHING TEST				
16	GUARANTEE'S ( NEW AND UPGRADED EQUIPMENT )				
<b>MANUALS</b>					
17	OPERATING MANUALS PERTAINING TO ALL NEW EQUIPMENT				
18	POST GUARANTEE 36 MONTH MAINTENANCE SCHEDULE				

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## **LIGHTING**

### **Interior Lighting**

Minimum average values in accordance with the SANS 10114 Code of Practice for Interior Lighting Part 1: Artificial Lighting.

All interior lighting levels shall be verified by means of an appropriately scaled light meter, witnessed and documented by the Consultant. Rev 1

Luminaries for specific projects must ensure uniformity and standardisation in wattage capacity.. All fluorescent luminaries shall have electronic ballasts and incandescent lighting must be confined to x-ray rooms only. Rev 3

Luminaries in suspended ceilings shall be supported from the roof trusses on all four corners. Rev 3

Lighting above bed spaces in ICU's and Neonatal ICU's shall be made dimmable to enhance patient comfort. Rev 1

ICU	400 lux at whole bed area for observation - dimmable 5 000 lux for local examination luminary
High Care and all patient treatment areas	300 lux at whole bed area for observation 5 000 lux for local examination luminary
Recovery	400 lux at whole trolley area
Maternity/delivery room Procedure Room	400 lux 10 000 lux for local examination luminary
Stitch / Procedure Room	Minimum of 50 000 lux at operation table level
Emergency unit/resuscitation	400 lux 5 000 lux for local examination luminary
Tertiary/Regional Hospitals Operating Theatres: Operating room/luminary	Minimum of 160 000 lux at operation table level via OT main light and a minimum of 160 000 lux for the satellite. 400 lux for general lighting. <span style="float: right;">Rev 2</span>
District Hospital Operating room/luminary	Minimum of 115 000 lux at operation table level via OT main light and a minimum of 50 000 lux for the satellite. 400 lux for general lighting.
Maternity Theatres / Procedure / Stitch Rooms / Casualty / Trauma Rooms.	Minimum of 50 000 lux at operation table level. 400 lux for general lighting. <span style="float: right;">Rev 2</span>
General Wards – passageways, patient waiting areas	160 lux at whole bed area for observation

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Kitchens Stores	200 lux
Laundries	200 lux
Plant Rooms and Workshops	400 lux
Boiler Houses	Coal and ash handling – 100 lux Boiler rooms – 160 lux
Lifts	Car interior – 160 lux Motor room – 500 lux
Ablution areas	160 lux
Laboratories	400 lux
Radiology	400 lux for patient preparation Dimmable incandescent lighting for patient treatment. <span style="float: right;">Rev 2</span>
Area lighting	50 lux
Pharmacy	400 lux
Lecture rooms	400 lux
Service Ducts and Roof Voids	100 lux

## Types of Luminaries

Rev 1

Patient treatment areas (normal):	Prismatic diffused fluorescent fittings.
Seclusion Wards :	Vandal proof fitting
Consulting Medical Examination Lights:	12/24 volt 50w with 4000hr Dichroic reflector lamp
Offices:	Diffused or Low brightness fluorescent fittings.
Passages:	Diffused fluorescent fittings.
Walkways:	2PL9 Round Bulkhead or diffused fluorescent fittings.
Ablutions:	2PL9 Round Bulkhead diffused fluorescent fittings.
Wet areas:	Splash proof IP65 rated 2 x 58w fluorescent fittings.
Plant Rooms:	Splash proof IP65 rated 2 x 58w fluorescent fittings.
Store Rooms:	Diffused fluorescent fittings.
Chemical Stores:	Flame proof fittings.
Staff houses and Nursing Homes	Battery backup fluorescent fittings <span style="float: right;">Rev 2</span>
Illuminated Exit Signs	2 x PL9 lamps with 1 HOUR emergency control gear. <span style="float: right;">Rev 2</span>

Refer to the Province of KwaZulu-Natal Standard Specification for General Electrical Installations for further information.

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## **SPACE HEATING**

In colder climate areas the preferred heating system shall be a ducted heating system.

In hot climate areas no heating shall be provided, but ceiling fans shall be installed where no air-conditioning is provided.

### **Nurseries and Children's Wards**

Where no air-conditioning or central ventilation type systems with electric heating has been provided, the only heaters which shall be permitted in nurseries and children's wards, are wall-mounted fibre cement stainless steel encased convection panel type heaters rated at 500 watts maximum.

Where central ventilation type systems are installed, electric heater banks shall be installed in the air-handling unit to provide the required space heating. In this case no individual electrical space heaters per room/area shall be accepted. Space heating shall then be controlled on the supply air temperature of between 22°C - 24°C, which shall control the heater banks. Once the outside ambient temperature reaches a preset level, the heater banks shall be totally switched off and the air-handling unit shall function normally as a ventilation unit supplying unconditioned air.

### **Other Areas in Health Care Facilities**

Where no air-conditioning or central ventilation type systems with electric heating has been provided, the only heaters which shall be permitted shall be electrical fan heaters or the wall mounted fibre cement stainless steel encased convection panel type heaters rated at 500 watts maximum. This case shall only apply where ambient temperatures require the provisioning of space heating.

Where central ventilation type systems are installed, electric heater banks shall be installed in the air-handling unit to provide the required space heating. In this case no individual electrical space heaters per room/area shall be accepted. Space heating shall then be controlled on the supply air temperature of between 22°C- 24°C, which shall control the heater banks. Once the outside ambient temperature reaches a preset level, the heater banks shall be totally switched off and the air-handling unit shall function normally as a ventilation unit supplying unconditioned air. This case shall only apply where ambient temperatures require the provisioning of space heating.

**NORMAL (NON-ESSENTIAL) AND EMERGENCY (ESSENTIAL) ELECTRICAL SERVICES**

Normal, emergency and UPS, where applicable, electrical power shall be provided via separate distribution boards.

If a kitchen's primary energy source is electricity, certain appliances shall be fed off the emergency power source. These shall be determined for each institution and shall not compromise the generator capacity.

Rev 1

**Power Supply** shall be as follows:

- Normal / Non-essential = from Supply Authority
- Emergency / Essential = from Emergency stand-by generating plant
- UPS = all UPS are supplied from Essential supply

LOCATION	NON-ESSENTIAL POWER	ESSENTIAL POWER	UNINTERUPPTED POWER SUPPLY (UPS)
<b><u>Major / Main Operating Theatres:</u></b>			
Main and Satellite OT Lights -----	-----	-----	100%
Earth Monitoring -----	-----	-----	100%
Socket Outlets -----	-----	-----	100%
Peripheral Lighting -----	-----	-----	100%
Exit Signs -----	-----	-----	100%
<b><u>Stitch / Procedure Room:</u></b>			
Main and Satellite OT Lights -----	-----	100%	
Socket Outlets -----	-----	100%	
Peripheral Lighting -----	-----	100%	
Exit Signs -----	-----	100%	
<b><u>General areas in OT suites:</u></b>			
Lighting -----	-----	100%	Minimum of 1 self-maintained light
Socket Outlets -----	-----	100%	
<b><u>Casualty / Trauma Department:</u></b>			
Socket Outlets -----	-----	Min. 8 Socket Outlets per bed / 2 circuits per bed <span style="float: right;">Rev 2</span>	
Lighting including exit signs -----	-----	100%	Minimum of 1 self-maintained light
<b><u>Out-patients Department:</u></b>			
Lighting -----	-----	100%	
Socket Outlets -----	100% General Areas	100% Patient Treatment	

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LOCATION	NON-ESSENTIAL POWER	ESSENTIAL POWER	UNINTERUPPTED POWER SUPPLY (UPS)
<b><u>ICU's and Neonatal ICU's:</u></b>			
Earth monitoring system -----	-----	Min. 8 Socket Outlets per bed / 2 circuits per bed Rev 2	Min. 8 Socket Outlets for Life Support per bed / 2 circuits per bed Rev 2
Lighting -----	-----	100%	Min. of 1 self-maintained light
Socket Outlets -----	100% General Areas	100% Patient Treatment	
<b><u>HCU's</u></b>			
Lighting -----	-----	Min. 4 Socket Outlets per bed 100%	Min. 1 self-maintained light
Socket Outlets -----	100% General Areas	100% Patient Treatment	
<b><u>X-Ray Department:</u></b>			
3 Phase X-Ray units			
Mobile units – Power -----	100%		
Lighting -----	-----	100%	
Socket Outlets -----	100% General Areas	100%	
<b><u>Wards</u></b>			
Bed head Trunking -----	-----	100% Patient Treatment	
Lighting -----	-----	100%	
Socket Outlets -----	100% General Areas	100% Patient Treatment	
<b><u>Boiler House (Steam)</u></b>		100%	
<b><u>Laboratory</u></b>		100%	
<b><u>Mortuary</u></b>		100%	
<b><u>Pharmacy</u></b>		100%	
<b><u>Plant Rooms</u></b>		100%	
<b><u>Medical equipment stores</u></b>			
Socket outlets -----	-----	Min 8 Socket Outlets / 2 circuits	
<b><u>Medical waste stores</u></b>			
Socket outlets -----	-----	100% One socket outlet per store	
<b><u>Laundries</u></b>			
Laundry Equipment -----	100%		
Lighting -----	-----	100%	
Socket outlets -----	100%		

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LOCATION	NON-ESSENTIAL POWER	ESSENTIAL POWER	UNINTERUPPTED POWER SUPPLY (UPS)
<b>Kitchens</b> Kitchen Equipment ----- Lighting ----- Socket outlets -----	70% ----- 100%	30% 100%	Rev 3
<b>Nurses Homes</b> Kitchen Equipment ----- Lighting ----- Socket outlets -----	100% ----- 100% 5amp MCB	100%	Rev 3
<b>EQUIPMENT</b> Unitary Air-conditioning ----- Air handling units ----- Chiller plant ----- Heating and Cooling -----	100% ----- 100% 100%	100%	
<b>Alarms:</b> Fire ----- Medical Gases ----- Nurse Call ----- Burglar/Intruder -----	----- ----- ----- -----	----- 100% 100% 100%	100% (If not on self-contained battery backup)  Self-maintained
Cold Rooms		100%	
<b>Communication Services:</b> PABX ----- Public Address ----- IT Server Rooms ----- Access Control / CCTV -----	----- ----- ----- -----	----- 100% 100% for AC and Lighting 100%	100%  100% for data switches Self-maintained Rev 3
Hot Water Systems	100%		
Hydro-boils	100%		
Lifts	Other Lifts (if more than one)	Minimum 1 lift	

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LOCATION	NON-ESSENTIAL POWER	ESSENTIAL POWER	UNINTERUPPTED POWER SUPPLY (UPS)
<b>Pumps:</b>			
Generator Fuel -----	-----	100%	
Water -----	-----	100%	
Sewage -----	-----	100%	
Sumps -----	-----	100%	
Space Heating	100%		
Ventilation	100%		
Fixed X-Ray Machines -----	100%		
Mobile X-Ray Machines -----	-----	100%	
X-Ray Viewers -----	-----	100%	
Street/Area Lighting	-----	100%	

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## COLOUR CODING

Normal / Non-essential Supply: White  
 Emergency / Essential Supply: Signal Red (**SANS 1091 Code A11**)  
 UPS Supply: Blue (**SANS 1091 Code F01**)

All cover plates shall be PVC and white in colour with 3mm engraved lettering indicating distribution board and circuit number.

## COLOUR CODING OF LIGHT SWITCHES

POWER SOURCE	COVER PLATE COLOUR	SWITCH COLOUR	LABEL TYPE	CONTENTS ON LABEL	LETTER SIZE
NORMAL	White	White	Black letters on white Ivorene label or Black engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the switch as per example. DBA /L1	3 mm
ESSENTIAL	White	Red	White letters on red Ivorene label or Red engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the switch as per example. DBAE/L1	3 mm
UPS	White	Blue	White letters on blue Ivorene label or Blue engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the switch as per example. DBAU/ L1	3 mm

**Note: All light switches fed from a circuit connected to an Earth Fault Monitor Supply shall be equipped with double pole switches.**

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## COLOUR CODING OF SOCKET OUTLETS

POWER SOURCE	COVER PLATE COLOUR	SWITCH COLOUR	LABEL TYPE	CONTENTS ON LABEL	LETTER SIZE	EARTH PIN	FEMALE SOCKET
NORMAL	White	White	Black letters on white Ivorene label or Black engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the socket outlet as per example DBA/ P1/1 Each socket outlet on a circuit shall be labelled.	3 mm	Round	White
ESSENTIAL	White	Red	White letters on red Ivorene label or Red engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the socket outlet as per example DBAE/ P1/1 Each socket outlet on a circuit shall be labelled.	3 mm	Round	White
UPS	White	Blue	White letters on blue Ivorene label or Blue engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the socket outlet as per example DBAU/ P1/1 Each socket outlet on a circuit shall be labelled. Note: All socket outlets on UPS supply to be labelled as follows: LIFE SUPPORT ONLY	3 mm	Round	White
DEDICATED This socket outlet shall be used for computer equipment only and shall not be on earth leakage units.	Red	Red	Black letters on white Ivorene label or Black engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the socket outlet as per example DBA/ PD1/1 Each socket outlet on a circuit shall be labelled.	3 mm	Chamfered	Red

**Note: All socket outlet switches fed from a circuit connected to an Earth Fault Monitor Supply shall be equipped with double pole switches.**

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## COLOUR CODING OF ISOLATORS AT EQUIPMENT

POWER SOURCE	COVER PLATE COLOUR	SWITCH COLOUR	LABEL TYPE	CONTENTS ON LABEL	LETTER SIZE	COMMENTS
NORMAL	White	White	Black letters on white Ivorene label or Black Engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the isolator as per example DBA/ S1	3 mm	
ESSENTIAL	White	Red	White letters on red Ivorene label or Red engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the isolator as per example DBAE/ S1	3 mm	Where red switches are not obtainable the illuminated type red switch may be used or a white switch may be used but the switch shall be tagged with a non removable red sticker.
UPS	White	Blue	White letters on blue Ivorene label or Blue Engraved letters on cover plate. Ivorene label glued with super glue or pop riveted to cover plate.	Distribution Board Number and Circuit number feeding the isolator as per example DBAU/ S1	3 mm	Where blue switches are not obtainable the illuminated type blue switch may be used or a white switch may be used but the switch shall be tagged with a non removable blue sticker.

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**DISTRIBUTION BOARDS, KIOSKS AND LOW TENSION SWITCHBOARDS**

<b>POWER SOURCE</b>	<b>COLOUR OF DISTRIBUTION BOARD, KIOSK, LOW TENSION SWITCHBOARDS</b>	<b>COLOUR OF FACE PLATE</b>	<b>LABEL TYPE</b>	<b>CONTENTS ON EXTERNAL LABEL</b>	<b>CONTENTS OF INTERNAL LABEL ON FACE PLATE</b>	<b>LETTER SIZE</b>	<b>LABELLING OF CABLES</b>
NORMAL	<p><b>Distribution Boards in buildings</b> White or Beige</p> <p><b>Outdoor Kiosks, and Low Tension Switchboards</b> Electric Orange</p>	<p><b>Distribution Boards in buildings</b> White or Beige</p> <p><b>Outdoor Kiosks, and Low Tension Switchboards</b> Electric Orange</p>	Black engraved letters on white Ivorene label. Ivorene label super-glued or pop riveted to face plate or frame.	Distribution Board Number as per example DB A	Distribution Board Number, Indication of Feeder Source, Size of Feeder Cable, Fault Level Rating of Distribution board, Phase rotation direction	<p>Label of Distribution Board : 6 mm</p> <p>Label on Face Plate: 3 mm</p>	All incoming and outgoing cables shall be labelled with Ivorene labels indicating the size of the cable.
ESSENTIAL	<p><b>Distribution Boards in buildings</b> White or Beige</p> <p><b>Outdoor Kiosks, and Low Tension Switchboards</b> Electric Orange</p>	<p><b>Distribution Boards in buildings</b> Red</p> <p><b>Outdoor Kiosks, and Low Tension Switchboards</b> Red</p>	White engraved letters on red Ivorene label. Ivorene label super-glued or pop riveted to face plate or frame.	Distribution Board Number as per example DB AE	Distribution Board Number, Indication of Feeder Source, Size of Feeder Cable, Fault Level Rating of Distribution board, Phase rotation direction	<p>Label of Distribution Board : 6 mm</p> <p>Label on Face Plate: 3 mm</p>	All incoming and outgoing cables shall be labelled with Ivorene labels indicating the size of the cable.
UPS	<p><b>Distribution Boards in buildings</b> White or Beige</p> <p><b>Outdoor Kiosks, and Low Tension Switchboards</b> Electric Orange</p>	<p><b>Distribution Boards in buildings</b> Blue</p> <p><b>Outdoor Kiosks, and Low Tension Switchboards</b> Blue</p>	White engraved letters on blue Ivorene label. Ivorene label super-glued or pop riveted to face plate or frame.	Distribution Board Number as per example DBAU	Distribution Board Number, Indication of Feeder Source, Size of Feeder Cable, Fault Level Rating of Distribution board, Phase rotation direction	<p>Label of Distribution Board : 6 mm</p> <p>Label on Face Plate: 3 mm</p>	All incoming and outgoing cables shall be labelled with Ivorene labels indicating the size of the cable.

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## **OPERATING THEATRES**

All new and upgrading of operating theatres shall conform to the latest revision of the Main Theatre Typical Layout Drawing. Rev 1 Rev 2

Each operating theatre shall have its own individual suitably sized UPS situated in a separate air conditioned room.

Where the mirroring of operating theatres occurs during the design stage, the position of the ceiling mounted pendent shall not alter. It shall remain at the head and to the right of the operating table when viewed from the foot of the table. Rev 1

Tertiary and Regional Hospital operating theatres shall each be equipped with 2 x theatre lights with a minimum lighting level of 160 000 lux each. Rev 2

District Hospital operating theatres shall each be equipped with a main light of 115 000 lux minimum and a satellite light of 50 00 lux minimum Rev 2

Maternity Theatres shall be equipped with a medical light of 50 000 lux minimum and shall be mounted at the foot of the bed. Rev 2

Procedure / Stitch Rooms shall be equipped with a medical light of 50 000 lux minimum. Rev 2

Each bed in a Casualty / Trauma Unit shall be equipped with a medical light of 50 000 lux minimum. Rev 2

### **Uninterrupted Power Supplies (UPS)**

Each Operating Theatre and ICU shall be equipped with a UPS with a minimum rating of 5 kVA at 230-volts and shall be housed in an air-conditioned environment in close proximity to the Earth Fault Monitoring Sub-Distribution Board. Rev 2

All UPS units must have rotary type bypass systems, which must bypass both the input and output of the UPS, remote alarms and be protected by curve 1 circuit breakers. Rev 3

All UPS units shall have a separate battery cabinet. Rev 3

### **Earth Monitoring Systems**

Power supply to switched socket outlets and switches in ICU's, Operating Theatres shall be on an earth monitoring system. Double pole switches on socket outlets and switches shall be used for supply points in these areas. Refer to standard theatre layout drawing.

All Earth Monitoring Systems shall comply with and be certified in terms of SANS 10142-1 Section 7. Rev 1

All circuits shall be enclosed in PVC conduits and there shall be separate circuits for IT and TN-S systems. Rev 1

The colour coding of wiring on the secondary side of the isolating transformer shall be in accordance with SANS 10142-1 Regulation 6.3.3.2 item a.1 and a.3. Rev 1

The Earth Monitoring Distribution Board shall be located as close as possible to the Earth Monitoring distribution system. The remote alarm panel shall be located inside the theatre and in the case of an ICU it shall be located at the Nurse station. Rev 1

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## **BEDHEAD DUCTING**

Rev 1

All bed head ducting shall be supplied from the essential electrical distribution system.

The Electrical Consulting Engineer shall allow in his/her design documentation for the incorporation of medical gas points in the bedhead ducting including all pipe work and connections where applicable, this work shall be done by the bedhead ducting supplier at the factory.

Prior to manufacture of bedhead ducting all drawings shall be approved by both the mechanical and electrical engineers.

Rev 3

The final connection to the bedhead ducting from the main medical pipe system shall be done by the medical gas specialist.

All Health Institutions shall be provided with surface mounted bedhead ducting or pendent type (Where applicable) and shall incorporate the following:

### **General requirements for all wards.**

The following items shall be taken into account in the particular specification of the project:

- a) All Socket Outlets, Switches and Isolators shall be of the same make and model
- b) No Chamfered earth pins shall be permitted
- c) All switch toggles shall identify the type of electrical supply, i.e. white – normal, red – essential, blue - UPS
- d) Circuits shall be engraved on base 3mm lettering indicating circuit number and DB
- e) All light fittings shall be the prismatic diffused type and shall have electronic ballasts.
- f) Lamp colour – cool white.
- g) Wiring – every 1m distance (wire wrapping)
- h) Supply vertical riser with ceiling trim and connection box 100mm through ceiling.
- i) End of units shall be installed with 50mm distance from either side of wall.
- j) Medical gas outlet points shall be identified and colour-coded using labels with 3mm lettering.
- k) Medical Gas shall be installed by bedhead manufacturer in terms of the KwaZulu-Natal Standard Specifications and Drawings for Medical Gas and Vacuum Services.
- l) Heyer/Afrox gas service outlets with shut off / non-return valve are required.
- m) Medical Rails – General Wards 500mm in length behind beds, all other wards full length

### **Specific Requirements for all wards:**

#### **General Wards:**

- a) Each bedhead duct run shall be provided with one earth leakage isolator with the necessary circuit breakers for the respective circuits and shall be clearly and unambiguously labelled.
- b) All nightlights and main up lights shall be switched per bedhead duct from entrance door.

Rev 2

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- c) 58-watt Main up light per bed (Switched from entrance door). Rev 2
- d) 18-watt Reading light per bed (Switched from bed head duct). Rev 2
- e) 5-watt Nightlight per bed (Switched from entrance door). Rev 2
- f) Two switched socket outlets per bed on separate circuits with a maximum of eight (8) socket outlets per circuit. Rev 2
- g) Medical gas outlet points (Oxygen and Vacuum – 1 set per two beds).
- h) One nurse / emergency call point per bed.

Ceiling lighting shall be avoided wherever practicable.

The following items shall be taken into account in the particular specification of the project:

- a) Installation height of bed head ducting shall be 1500mm to centre of unit. Rev 2

### **Adult Intensive Care Units (ICU's)**

- a) Ceiling lights (Two per bed and dimmable fluorescent – Switched from pendent and nurse station) Rev 2
- b) Peripheral lighting (Dimmable fluorescent- Switched from nurse station). Rev 2
- c) Ceiling mounted Consulting Medical Examination light 12/24 volt – one per bed. Rev 2
- d) One articulated pendent per bed and shall incorporate the following: Rev 2
  - Eight (8) switched socket outlets (Minimum of 2 circuits per bed with a maximum of eight (8) socket outlets per circuit) – IT earth monitoring system via UPS on Essential supply. Rev 2
  - Eight (8) switched socket outlets (Minimum of 2 circuits per bed with a maximum of eight (8) socket outlets per circuit) – IT earth monitoring system on Essential supply. Rev 2
  - Medical gas outlet points (Oxygen, Vacuum and Low Pressure Air – two sets per pendent.
  - Two way light switch.
  - Four equipment mounting poles – complete with medical rails -Refer to Drawing No 7009H. Rev 2

The following items shall be taken into account in the particular specification of the project:

- a) Labelling above switched socket outlets on pendent shall read the following:
  - UPS Supply – Patient Life Support Only

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- Essential Supply – Patient General Use Only
- b) The pendent shall be located at the head and to the left of the bed.
  - c) Installation height 1800mm to underneath of pendent measured from final floor level.

### **Neonatal Intensive Care Units (NICU's)**

- a) Ceiling lights (One per bed and dimmable fluorescent - Switched from bed head ducting).
- b) Passage lights (Dimmable fluorescent - Switched from nurse station).
- c) Bed head ducting shall incorporate the following:
  - Eight switched socket outlets per bed (Minimum of 2 circuits per bed with a maximum eight (8) socket outlets per circuit) – IT earth monitoring system via UPS on Essential supply.
  - Eight switched socket outlets per bed (Minimum of 2 circuits per bed with a maximum of eight (8) socket outlets per circuit) – IT earth monitoring system on Essential supply.
  - Medical gas outlet points (Oxygen, Vacuum and Low Pressure Air – two sets per bed).

The following items shall be taken into account in the particular specification of the project:

- a) Labelling above switched socket outlets on pendent shall read the following:
  - UPS Supply – Patient Life support only.
  - Essential Supply – Patient General use only
- b) Installation height 1000mm to centre of bed head ducting.

Rev 2

### **Casualty/ Trauma Wards**

- a) Twelve (12) switched socket outlets per bed - six (6) on UPS and six (6) on Emergency supply. (Minimum of 2 circuits per bed with a maximum of eight (8) socket outlets per circuit)
- b) Medical gas outlet points (Oxygen and Vacuum – 1 set per bed)
- c) One nurse / emergency call point per bed.
- d) Ceiling mounted medical light - 24 volt 80 watt 50 000 lux @ 1 metre.

Rev 2

Rev2

General ceiling lighting shall be supplied.

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The following items shall be taken into account in the particular specification of the project:

- a) Installation height of over bedhead ducting shall be 1900mm to underneath of unit.

#### **High Care Wards:**

- a) 58-watt Main up light per bed (Switched from entrance door). Rev2
- b) 18-watt Reading light per bed (Switched from bed head duct). Rev2
- c) 5-watt Nightlight per bed (Switched from entrance door). Rev2
- d) Eight switched socket outlets per bed. (Minimum of 2 circuits per bed with a maximum of eight (8) socket outlets per circuit) Rev 3
- e) Medical gas outlet points (Oxygen and Vacuum – 1 set per bed).
- f) One nurse / emergency call point per bed.

Ceiling lighting shall be avoided wherever practicable.

The following items shall be taken into account in the particular specification of the project:

- a) Installation height of bed head ducting shall be 1500mm to centre of unit. Rev 2

#### **Maternity Delivery Rooms**

- a) Four (4) switched socket outlets per bed – **one set per bed + set for infant.** (Minimum of 2 circuits per bed with a maximum of eight (8) socket outlets per circuit) Rev 2
- b) Medical gas outlet points :-  
Oxygen and Vacuum – **one set per bed**  
Oxygen, vacuum and medical air low pressure - **one set for infant)** Rev 3
- c) One nurse / emergency call point per bed.
- d) Ceiling mounted medical light - 24 volt 80 watt 50 000 lux @ 1 metre.

General ceiling lighting shall be supplied.

The following items shall be taken into account in the particular specification of the project:

- a) Installation height of bed head ducting shall be 1500mm to centre of unit. Rev 2

## **HOT WATER SYSTEMS**

Consideration shall be given to the installation of approved solar panel water heating systems which shall form part of the Eskom initiative to reduce power consumption. This system shall be incorporated into the design of electrically operated water heating systems at all health institutions. Rev 2

Solar water heaters shall be installed by ESKOM approved installers only. Rev 3

Only thermo-syphon type solar water heating systems shall be installed in systems with a storage capacity of 350 litres or less. Rev 3

As far as is practical, hot water systems are to be decentralised, i.e. point of use.

Hot water supply design figure – 35 litres per patient per day.

Domestic type installations may be supplied from standard, i.e. up to 250 litres, 4kW geysers, but larger systems are to consist of electric in-line heater(s) coupled to storage tank(s). These storage tanks are not to exceed 2,500L capacity per unit.

The in-line heaters are to be fitted with timer controls to enable load shedding.

For electrical driven systems refer to the Provincial Standard Specification for Hot and Cold Water for Building Services for further details.

For steam driven: Steam and Condensate Reticulation

### **General**

Point of use application shall be the design criteria.

No calorifier storage for patient and staff areas shall not exceed 60<sup>0</sup>C.

Hot water temperature for paediatric wards shall not exceed 40<sup>0</sup>C at the point of use. The use of thermostatically controlled mixing valves on the hot water line is recommended near the point of consumption. (Group these points together from one mixing valve).

Kitchen and Laundry calorifiers shall not exceed 80<sup>0</sup>C.

All pressure/temperature gauges shall be marked.

All reticulation piping on hot or cold water services to be of copper class 2 and installed on external walls wherever possible, if installed in walls, only labour bends are permitted.

Drain valves to be situated at the lowest level for both the storage vessel and the inline heater and to be easily accessible and to discharge to drain.

All safety valves shall discharge outside the plant room and in a safe position so as not to cause injury or damage to persons or buildings.

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## **LAUNDRIES**

Other than Central Laundries, equipment shall be kept to a minimum at all other Health Institutions to suit the application and shall not exceed the following sizes of which technical specifications are available.

Rev 1

The designer must consult institutional management with regards to onsite laundry requirements.

Rev 3

- a) Sluice Machine (9 to 25kg).
- b) Roll Ironer single roll (1900 to 2000mm)
- c) Washer Extractor (23 to 34kg)
- d) Side Loading Washing Machine (67kg)
- e) Electrically heated Tumble Drier (23 to 34kg)
- f) Single Garment Press

## **KITCHENS**

If the kitchen's primary energy source is electricity, certain appliances shall be fed off the emergency power source. These shall be determined for each institution.

Layouts shall be discussed with this Department's Electrical and Mechanical Section. The complete equipment layout, including sinks, worktops, canopies, etc. shall be the responsibility of the Electrical and Mechanical Section and the Architect shall be advised at the working drawing stage of the services and plumbing requirements.

Kitchens - clarify type of dishwasher system at design stage.

Preferred system is a central island system with extract canopy fed directly from distribution board.

The amount and size of the equipment to be installed shall be verified by calculations and shall relate to the number of meals served per sitting.

Rev 1

Technical Specifications are available for the following equipment:

- a) Steam Heated Boiling Pot
- b) Electrically Heated Boiling Pot
- c) Electric Range
- d) Tilting Frying Pan
- e) Convection/Steaming Oven
- f) Stainless Steel Worktops
- g) Stainless Steel Sinks
- h) Extract Canopy

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## **COLOUR CODING FOR PIPED SERVICES**

Colours as per the attached table “Colour Coding for piped Services” are to be used. Note that unless specified otherwise, medical gas piping is to be painted over its entire length. Relevant SANS 1091 code in brackets.

<b>CONTENTS OF PIPING</b>	<b>COLOUR (CODE)</b>
STEAM	PASTEL GREY (G54)
CONDENSATE	BRILLIANT GREEN (H10) WHITE
HOT DOMESTIC WATER	BRILLIANT GREEN (H10) CRIMSON (A03)
COLD DOMESTIC WATER	BRILLIANT GREEN (H10) CORNFLOWER (F26)
INDUSTRIAL HOT WATER (i.e. Primary Circuit, Central Heating etc.)	BRILLIANT GREEN (H10) GOLDEN YELLOW (B49)
FIRE WATER	SIGNAL RED (A11)
SEWAGE	BLACK
OXYGEN (Medical)	WHITE
NITROUS OXIDE (Medical)	ULTRAMARINE (F09)
VACUUM (Medical)	PRIMROSE (C67)
AIR (Medical) LOW PRESSURE	WHITE / BLACK
AIR (Medical) HIGH PRESSURE	WHITE / SALMON PINK (A40)
SCAVENGING SYSTEM	ORANGE <span style="float: right;">Rev 1</span>
LPG	LIGHT STONE (C37)
COMPRESSED AIR (Industrial)	ARCTIC BLUE (F28)
CONDITIONED AIR FLOW	ARCTIC BLUE (F28) WHITE
CONDITIONED AIR RETURN	ARCTIC BLUE (F28) WHITE
VENTILATION AIR FLOW	ARCTIC BLUE (F28) LIGHT STONE (C37)
VENTILATION AIR EXHAUST	ARCTIC BLUE (F28) LIGHT STONE (C37)
CHILLED WATER	BRILLIANT GREEN (H10) PEACOCK BLUE (F08)
CONDENSER WATER	BRILLIANT GREEN (H10) SALMON PINK (A40)
REFRIGERANT	LIGHT GREY (G29)
DIESEL	GOLDEN BROWN (B13) WHITE
TRANSFORMER OIL	GOLDEN BROWN (B13) CRIMSON (A03)
FUEL OIL	GOLDEN BROWN (B13) + LABEL

All piping shall be labelled as per SANS requirements including the direction of flow at maximum 3 metre intervals or at all changes of direction, Tee's and wall penetrations.

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## RECOMMENDED NOISE RATINGS INSIDE BUILDINGS

Rev 1

<u>Description</u>	Criteria for continuous noise intrusion	
	NR Curve	Approx. dB (A)
Office Buildings:		
General open offices, reception areas	40	45
Design offices	35	40
Drawing offices	40	45
Conference rooms	30	35
Executive offices	35	40
Foyers, public areas	45	50
Typing and machinist rooms, computer rooms	45	50
Hospitals:		
Hospital wards (public)	35	40
Hospital wards (private)	30	35
Intensive care wards, operating theatres	30	35
Laboratories, casualty areas	40	45
Kitchens, sterilising and service areas	45	50
Surgery, dental clinics and consulting areas	40	45
Waiting rooms and reception areas	45	50

## PROTECTION AGAINST LIGHTNING

All specified buildings shall be provided with lightning conductors, which shall be in accordance with SANS 10313:1999 and shall be capable of withstanding the tests laid down herein.

## COMMUNICATION SYSTEMS

The following systems shall be provided:

- a) Telephone PABX System including cabling and handsets
- b) Extensions to existing Telephone PABX Systems shall include cabling and terminations but excludes handsets.
- c) P.A. Systems in hospitals and Community Health Centres and other institutions where directed.
- d) Fire Detection and Protection to comply with SABS 0400:1990 – Code of Practice for The Application of the National Building Regulations
- e) The complete installation for all data equipment including data switching, cabling, ducting, conduit must be provided by an approved State Information Technology Agency (SITA) contractor.
- f) T.V. Installations ducting, conduit with galvanised draw wire and power point
- g) Nurse Call
- h) Intercom system where directed
- i) Access Control including C.C.T.V. where directed
- j) Intruder Alarm Systems in Pharmacy and other areas where directed

Rev 3

### **Public Telephones**

Provision shall be provided in waiting areas, wards and nurses' homes for public telephone outlets including conduits, cabling and termination points only.

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