

KWAZULU-NATAL DEPARTMENT OF HEALTH

INFRASTRUCTURE DEVELOPMENT
ENGINEERING ADVISORY SERVICE



POLICY DOCUMENT FOR THE DESIGN OF MECHANICAL INSTALLATIONS

(TO BE USED STRICTLY AS DESIGN GUIDE ONLY)

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CODES AND SPECIFICATIONS FOR MECHANICAL 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)

Any special requirements of the electricity supply authorities of the particular area or district

Energy Code of Conduct for all Government Buildings

Rev 3

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) Bedhead Ducting Specification
- s) Nurse Call Specifications
- t) Uninterrupted power supply (UPS) Specifications
- u) Information Communication Technology Infrastructure Specifications
- v) Partial Count Testing of Operating Theatres
- w) Standard Specification for Solar Water Heating (SWH)

Rev 2

Rev 3

Rev 3

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	January 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			
b)	M040101 Key to Symbols			
c)	M040102 Typical Operating Theatre Layout			
d)	M040103 Typical Layout of Medical Gas and Vacuum Outlet Points at Bed Head			
e)	M040104 Vacuum Pipe Take-off Details			
f)	M040201 Diagrammatic Layout – Medical Compressed Air Piping and Equipment			
g)	M040202 Typical Oxygen and Gas Bank Layout			
h)	M040203 Diagrammatic Layout of Vacuum Plant Pipe Work and Equipment			
i)	M040204 Typical Nitrous Oxide Gas Bank Arrangement			
j)	M040301 Medical Gas and Vacuum Isolating Valve Cabinet			
k)	M040302 Theatre Pendant Details			
l)	M040303 High Pressure Compressed Air Outlets			
m)	M040305 Anaesthetic Scavenging System for Operating Theatres			
n)	M040401 Concrete Base for Air Compressors and Vacuum Pumps			
o)	M040403 Gas Evaporator Enclosure Details			
p)	M040404 Details of Gas Cylinder Connections			
q)	M040501 Wiring Diagram for Vacuum and Compressed Air Plants			
r)	M040502 Typical Wiring Diagram for Medical Gas and Vacuum Warning Light Panels			
s)	M040503 Typical Warning Light Panel Layout			
t)	M040504 Alternate Compressor and Vacuum Plant Wiring Detail			
u)	M040505 Wiring Diagram for Anaesthetic Mask Exhaust Fan			
v)	5062H/M Cold and Freezer Room Floor & Door Entry Detail			

Rev 3

Structural

a)	Laboratory	Drawing No.	4036H/01-R4	January 2004
b)	Pharmacy	Drawing No.	5046H	October 2005
c)	Plant Room Doors	Drawing No.	3025H/02	August 2003
d)	Theatre and CSSD	Drawing No.	3039H/01-R1	February 2005
e)	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

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. Rev 1

Solar water heating, energy recovery units and heat pumps shall be considered in the design stage for all new facilities and the renovation of existing facilities. Investigation into the quality of electrical and water supply needs to be evaluated. Rev 4

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

All equipment is to comply with the National Electricity Regulator (NER) voltage specifications – 10% <230/400 volts > 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

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 preferably 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

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

All stainless steel fittings, fixtures and equipment shall be fixed with stainless steel bolts, screws etc.

Rev 1

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 closer

Rev 1

Where 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
- 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 (two electronic and three hard copies) of the entire project shall be included in the as built documentation, which is required at practical completion. Original statutory documents are to be provided in a separate folder.

Rev 5

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.

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.

Rev 1

AS BUILT DOCUMENTATION REQUIREMENTS

ALL DRAWINGS REQUIRED IN AUTOCAD (DWG) FORMAT ON CD

PROJECT =

AS BUILT DRAWINGS (DESCRIPTION)		REQUIRED		SUPPLIED	
		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, VENTILATION, GAS LINES, ELEVATORS,(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				
COMPLIANCE CERTIFICATES (DESCRIPTION)					
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)				
MANUALS					
17	OPERATING MANUALS PERTAINING TO ALL NEW EQUIPMENT				
18	POST GUARANTEE MAINTENANCE SCHEDULE				

VENTILATION AND AIR-CONDITIONING

VENTILATION

All rooms shall be ventilated and lit in accordance with and as required by the National Building Regulations, unless otherwise specified. Building to be designed for optimum natural ventilation and lighting.

Artificial Ventilation

The following minimum air changes and fresh air requirements shall apply where artificial ventilation is required and supplied.

Ventilation in Ablutions and Toilets

Ablutions

Single ablation facilities serving private wards or staff do not require extract ventilation, provided there are openable windows.

Extract ventilation shall be provided by either ceiling extract grilles connected to an in-line ducted fan with outside discharge air grilles by means of galvanised mild steel or PVC tubular ducting or Odour extraction system similar to "Fresh Flow" or "Toilet Friend".

Rev 1

Extract grilles may be of the PVC type with adjustable disc valves or white powder coated or anodised aluminium type with adjustable dampers.

Where two or more ablation areas may be ventilated by one extract system such extract fan shall be connected to an isolator within 1.5 metres from the extract fan.

Toilets

All multiple toilets shall be provided with ventilation systems, which will serve as an extract ventilation system.

Single toilet facilities serving private wards or staff do not require extract ventilation, provided there are openable windows.

AIR CONDITIONING

Operating Theatre Air-Conditioning Policy: ISO 14644-1: Class 5 - 8

NOTE: The following policy shall be adopted for all new operating theatres and also wherever possible in theatre upgrading work.

Where separate package air-conditioning condenser units are provided for each theatre then one theatre may be connected to the essential electrical supply provided there is spare capacity on the emergency generating set. Rev 4

Operating Theatre Design Conditions

- a) Constant volume systems shall be employed at a positive pressure (15% excess air) with respect to any adjoining rooms.
- b) Temperature range shall be 18°C to 24°C and relative humidity 45% to 60%. Separate temperature controls in each theatre to be provided. No on and off switching of air handling plant to be done from within the theatres.
- c) 20% - 30% fresh air (see operating theatre schedule FSOT 08/2003)
- d) Delivery of the conditioned air shall be by downward movement from the ceiling to four exhaust outlets located at low level on opposite walls/corners.
- e) All ductwork beyond the Hepa filter housing shall be in solid ducting to the air terminal. The final connection to the terminal where alignment necessitates a maximum of 300mm of flexible ducting, of the wire mould type, may be employed. At the end of the duct branch a "Lobster Back" (Galvanised sheet metal bend) shall be employed followed by the flexible joint, i.e. of the wire mould ducting type.
- f) New operating theatres and where possible, theatre upgrades, shall be provided with mezzanine floors to necessitate ease of access to plant, filter housings and ductwork. Filter housings shall be positioned such to provide easy access to filter media for servicing and visual inspection purposes.
- g) No internal air duct insulation is permitted.
- h) No humidifiers are to be installed. Rev 5
- i) Condensate water discharge shall go to sewer.

TYPES OF AIR-CONDITIONING SYSTEMS

Two types of air-conditioning systems shall be adopted.

The air-handling unit is to be supplied from the emergency electrical supply and the chillers from the normal electrical supply.

Dedicated Air-Handling Unit

A detailed name plate shall be included on the air handling units with design air volume, fan speed, cooling / heating capacity, filter data and heating capacity. Rev 5

Each operating theatre shall be air-conditioned by a dedicated air-handling unit, or individual package unit. A separate air-handling unit shall serve other areas in the theatre suite. This is the preferred system.

Blended Fresh Air and Re-circulation Air Type System

- a) This system utilises one central air-handling unit with a variable speed drive for a number of operating theatres. 100% outside air is drawn into the A.H.U, filtered and cooled and

delivered via sheet metal ducting to constant volume and variable volume boxes within the system.

- b) The constant volume boxes shall feed the operating theatres, scrub rooms, pack rooms and foyers.
- c) The variable volume boxes feed the change rooms and storerooms.
- d) Each theatre constant volume-mixing box shall supply a constant volume of conditioned air to an inline re-circulation fan that also extracts air from each individual theatre. (Note: Prior to the recycled air entry into the mixing box it shall be filtered by means of a primary filter, this is to remove cotton lint from the return air thus protection of the Hepa filters is optimised.)
- e) Scrub Rooms, Pack Rooms and Foyers shall utilise the same air supply as the theatres up to the constant volume boxes, but here the constant volume box supplies air to one or more constant volume diffuser, with room air being exhausted by an adjacent independent exhaust system.
- f) In the Change Rooms and Store Rooms air shall be exhausted via independent exhaust systems.

OTHER AREAS

Types of Air-Conditioners

Ceiling mounted fan coil units are not permitted any Health facilities.

Rev 5

The following are the preferred types of air-conditioning systems:

Administration Areas	Unitary (individual) systems where possible
Patient treatment areas	Each area shall, where practical, have its own packaged air-cooled condensing unit in its own service area, or plant room on an outside wall and be easily serviceable by being placed in a plant room or outside at ground level.
Wards	Where directed by the Department of Health shall be Unitary (individual) systems where possible.

The units in all areas shall be the reverse cycle (heat pump) type.

Energy Management control of these systems is preferred.

Any other system shall be substantiated and approved.

Air Handling Units

A detailed name plate shall be included on the air handling units with design air volume, fan speed, cooling capacity, filter data and heating capacity.

Rev 5

Air-handling units shall be provided with electronic variable speed with direct drives to maintain design airflow for all filter conditions.

Air handling units shall have separate electrical distribution boards (Essential and Non-essential).

Condensate drip trays shall be stainless steel and so installed to prevent the build-up of condensate.

Rev 4

All compartment doors on the air handling unit shall be clearly labelled.

Rev 2

Primary filters shall be situated at the fresh air intake opening of the air-handling unit.

Secondary filters shall be situated after the supply air fan in a blow through configuration where clean air supplied to the Hepa filters will be optimised.

PVC drop stop eliminators in 304 stainless steel frames shall be employed, if fin spacing is less than 10 fins per inch, after the cooling coils in areas with high humidity levels. This includes all coastal areas for off coil temperatures of 10° and less.

Copper to copper coils shall be employed and the coil supporting frames shall be Grade 304 stainless steel

Rev 4

Condensate drains are to be installed in the floor slab and directed to a sewer connection.

Rev 5

Filtration

Air filtration shall be as specified in accordance with the Department of Health's "Filtration and Air Flow Requirements for Operating Theatres".

High efficiency particulate air (Hepa) filters shall be utilised and be situated at the supply air terminals/diffusers before the air enters the theatre or as close to the air terminals as possible. These filters shall be accessible from the Service Areas.

Hepa Filters shall be side or top entry fitted to seal in the direction of airflow against a neoprene gasket, and shall be secured by mechanical means to ensure no air bypass.

Primary and secondary filters shall be secured by means of no less than four (4) holding 304 stainless steel clips.

Secondary and Hepa filters housings shall be fitted with Magnahelic manometers marked with the filter's operating parameters.

Validation of Operating Theatres

Each Operating Theatre shall be validated on completion to ensure compliance with Filtration and Air Flow Requirements for Operating Theatres by means of a particle count and air flow measurement. Particle count shall be undertaken prior to first delivery and prior to final delivery.

The Particle Count shall conform to I.S.O 14644 – 1 (Clean-room Classification Standard) and the Standard Specification Partical Count Testing of Operating Theatres.

Rev 3

Validation Certification shall be displayed at the operating theatre entrance.

Airborne Particulate Cleanliness Classes

CLASS	Number of Particles per Cubic Meter by Micrometer Size					
	0.1 um	0.2 um	0.3 um	0.5 um	1 um	5 um
ISO 5	100,000	23,700	10,200	3,520	832	29
ISO 6	1,000,000	237,000	102,000	35,200	8,320	293
ISO 7				352,000	83,200	2,930
ISO 8				3,520,000	832,000	29,300

The report shall contain the following details:

- | | |
|---|--|
| i) Date & Time of test | ii) Location of test |
| iii) Number of test points | iv) Particle readings |
| v) Airflow readings | vi) Test results in a numerical and graphical format |
| vii) Test Certificate confirming compliance | |

FILTRATION

Filters for Ducted Air-Conditioning Systems

Refer to KwaZulu-Natal standard specifications.

- i) Pleated Primaries
- ii) Secondary Pocket Filters (35% – 85%)
- iii) High Efficiency Secondary 95%
- iv) High Efficiency Particulate Air Filter (HEPA)

FILTRATION AND AIR FLOW REQUIREMENTS FOR OPERATING THEATRE APPLICATIONS

	Theatre	Primary	Secondary	Tertiary	Laminar Flow	Particle Count	Minimum Fresh Air Changes Per Hour	Minimum Total Air Changes Per Hour
	Description	Pleated	Pocket/Bag or Box	Hepa High Volume		Class		
		Efficiency	Efficiency	Efficiency		ISO		
		20%	95%	99,97 – 99.9999%		14644-1		
1	Casualty/Minor Stitch	X	X			8	5	25
2	Maternity/Caesarean	X	X			8	5	25
3	General Surgery	X	X			7	5	25
4	Gynaecology	X	X			7	5	25
5	Ophthalmology	X	X			7	5	25
6	Urology	X	X			7	5	25
7	Endoscopy	X	X			7	5	25
8	Plastic Surgery	X	X	X		6	5	25
9	Bone Surgery/Orthopaedic	X	X	X	X	5	5	25
10	Heart Surgery	X	X	X	X	5	5	25
11	Vascular	X	X	X	X	5	5	25
12	Neuro Surgery	X	X	X	X	5	5	25
13	Transplantations	X	X	X	X	5	5	25

NOTE: It is the Department's policy to provide 70% return air provided the return air originates from the theatre concerned. Ideally each theatre should have its own air-handling unit.

Minimum velocity in general theatres shall be a minimum of 0.2m per second at 1m above floor level and in laminar flow theatres the velocity shall be a minimum of 0.35m per second and a maximum of 0.55m per second at 1m above floor level.

FILTRATION AND AIR FLOW REQUIREMENTS FOR AREAS OTHER THAN OPERATING THEATRES
AIR-CONDITIONING: EXTERNAL DESIGN CONDITION SHALL BE BASED ON 80% OF SUMMER PEAK SEASON
HEATING: EXTERNAL DESIGN CONDITION SHALL BE BASED ON 80% OF WINTER SUMMER PEAK SEASON

	Description	Pleated	Pocket/ Bag/Box	Pocket/ Bag/Box	Pocket/ Bag/Box	Minimum Fresh Air Changes Per Hour	Minimum Total Air Changes Per Hour	Temperature (Humidity)
		Efficiency	Efficiency	Efficiency	Efficiency			°C
		20%	35%	65%	95%			
1	Administrative Sections	X				2	4	22 – 24
2	Waiting	X				2	6	N/A
3	Auditoriums	X				2	4	22 – 24
4	Autopsy	X		X		2	12	22 – 24
5	Bath Room					2	10	N/A
6	Bedpan Room					2	10	N/A
7	Blood Bank	X				2	4	22 – 24
8	Casualty	X	X			2	6	22 – 24
9	CSSD	X		X		2	4	22 – 24
10	Dark Room	X				2	10	22 – 24
11	Dining rooms/Canteens	X				2	4 - 6	24 – 26
12	General Stores	X				2	4	N/A
13	Laboratories	X		X		2	6	22 – 24
14	Labour/Delivery Room					2	4	22 - 24
15	Laundry - General					2	10	N/A
16	Lecture Halls	X				2	4	24 – 26
17	M.O.P.D	X				2	4	22 – 24

	Description	Pleated	Pocket/ Bag/Box	Pocket/ Bag/Box	Pocket/ Bag/Box	Minimum Fresh Air Changes Per Hour	Minimum Total Air Changes Per Hour	Temperature (Humidity)
18	O.P.D	X				2	4	24 – 26
19	Pharmacy Dispensing	X		X		2	4	22 – 24
20	Pharmacy Store	X	X			2	4	22 – 24
21	Specialist Clinics–E N T	X		X		2	4	24 – 26
22	Sterilizer Equipment					2	10	N/A
23	Toilet Room					2	10	N/A
24	Treatment Room	X				2	6	24 – 26
25	Units	Burns	X		X	2	15	26 – 28 (50 – 60 %)
		HCU / CCU				2	4	22 - 24
		ICU	X		X	2	6	22 – 24
		ICU Neonatal	X		X	2	6	26 – 28
26	Wards	General				2	4	24 - 26
		Isolation				2	6	
		Maternity	X			2	4	
		Medical				2	4	24 – 26
		Paediatric				2	4	
		Psychiatric				2	4	
		Orthopaedic				2	4	
		Surgical				2	4	
		TB				20	20	
27	X-Ray	General	X		X	2	6	22 – 24
		MRI/CT Scanner						As per manufacturer's requirements

NOTE: Air extraction systems in TB Wards shall be in accordance with Drawing No. 7007H-M

Rev1

- 1) This filtration only applies to areas served by air handling units or package type units and does not apply to individual units.
- 2) Other specialized areas shall be individually designed in consultation with the Department.

SPACE HEATING

TB WARDS

An open window policy for all TB Wards as an appropriate infection control measure has been adopted. No air-conditioning is permissible. In M(X)DR-TB Wards fresh air shall be mechanically induced at ceiling level in opposite directions from the centre of the room and extracted at low level at a rate of 20 air changes per hour by means of a continuous extract plenum/duct fixed to the external wall to discharge air at above head height. Heating shall be provided for temperatures below 20°C.

No filtration is required to air extract system.

Rev 3

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

In hot climate areas no heating will be provided, but ceiling fans will 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 will be permitted in nurseries and children's wards, are the fibre cement with steel frame convection panel type heaters which shall be fixed at a level high enough to be completely out of reach of children in cots and far enough away from a cot or crib so as to prevent overheating by radiation, convection or conduction.

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 will be accepted. Space heating will then be controlled on the supply air temperature of between 22°C - 24°C, which will 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 be functioning 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 will be permitted will be electrical fan heaters or the fibre cement with stainless steel frame convection panel type heaters. This case will 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 will be accepted. Space heating will then be controlled on the supply air temperature of between 22°C- 24°C, which will 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 be functioning normally as a ventilation unit supplying unconditioned air. This case will only apply where ambient temperatures require the provisioning of space heating.

REFRIGERATION

Cold Rooms and Freezer Rooms

No stacking or close configuration of condenser units shall be permitted.

Rev 5

Refer to KwaZulu-Natal Department of Health Standard Specifications for Refrigeration Services

All refrigeration plant shall be connected to the essential electrical supply.

The refrigeration design capacity for mortuaries shall be 150% with multiple units.

Rev 4

Temperatures required for freezer room -18°C to -20°C

Temperature required for kitchen cold room 2°C to 10°C

Temperature required for mortuary cold room 2°C to 4°C

Temperature required for forensic mortuary freezer -8°C to -20°C

Rev 1

Minimum ceiling is to be 2800mm.

Rev 4

Floors shall be level with **NO** floor drain.

Rev 3

MEDICAL GAS

All piped gas installations shall conform to the following:

- i) KwaZulu-Natal Department of Health Specification and Drawings for Medical Gas and Vacuum Services
- ii) SANS 051 Part III. The handling and storage of medical gases and the installation of medical gas, compressed air and vacuum pipeline systems.
- iii) SANS 1409: The outlet sockets and probes for gas and vacuum services.
- iv) SANS 10224: Non-flammable medical gas pipeline system.
- v) SANS 1453: Copper tubes for medical gas and vacuum systems.
- vi) All self generating oxygen plant must comply with ISO 10083
- vii) SANS 10224: Section 6. A master gas alarm system to be installed in the medical gas plant room. A line pressure monitoring gas alarm panel shall be connected to the medical gas lines after the isolation valve box into theatres, I.C.U.'s and H.C.U.'s. This alarm system shall be connected to the emergency power supply.
- viii) Auxiliary alarm signal at telephone switchboard, security or other 24-hour manned location.
- ix) Emergency alarm signal in OT, I.C.U and H.C.U. shall be visual and auditory. To indicate low and high mainline pressure.
- x) All oxygen and vacuum plant shall have a back-up system.
- xi) Isolation valves should be carefully positioned to avoid shutdowns of major sections.

Rev2

These requirements shall comply with the regulations mentioned under each heading unless otherwise specified. An appropriately qualified engineer shall certify all services.

General

All medical gas outlet points shall be numbered and labelled. Numbers shall be allocated and available from the Department of Health Head Office.

Special reference to labelling and testing of medical gas systems as detailed in the Standard Specifications are to be adhered to. A minimum of two weeks notice shall be given to the Health Technology Services.

All Service outlet valves shall be labelled with ivorene labels 35mm long x 15mm high x 1,5mm thick. Label colours match the corresponding service outlet points, which are per the standard colour code for piped services.

Rev 3

Main isolating valve boxes shall be provided at the entry to each ward block.

Rev 4

All medical gases shall be provided by piped systems.

All medical gas outlet points other than vacuum are to be equipped with self isolating valves.

All medical gas plant shall be connected to the essential electrical supply.

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

Minimum Number of Outlet Points

	O ₂	N ₂ O	Vac	LP Air	HP Air	Scav	Rev 1
Operating Theatre	3	3	3	3	2	1	Ref Dwg3039H/02.2E
NICU per cot	2		2	2			On bed head trunking
ICU per bed	2		2	2			On Pendant
High Care per bed	1		1	1			On bed head trunking
Delivery Room per bed	1		1	1			On bed head trunking
Delivery Rescus	1		1	1			On bed head trunking
Casualty per bed	1		1	1			On bed head trunking
Medical equipment store				1			

All other patient areas: Oxygen and Vacuum to cover 50% of beds.

Operating Pressures

Oxygen -	Line Pressure	400 kPa
Oxygen -	Bulk changes to manifold at around	800 kPa
	Between the bulk and manifold	1000 kPa
Nitrous Oxide		400 kPa
Medical Air -	High Pressure (power tools)	700 kPa
Medical Air -	Low Pressure (respiratory purposes)	400 kPa
Vacuum		-40 to -60 kPa
Manifold changes left to right bank		300 kPa
Bulk low-level alarm threshold		25% of volume of tank
Cylinder Contents		15,000 kPa

Vacuum

The vacuum installation shall comply with SANS 051 Part iii. Bacteria Filters shall be installed prior to the vacuum reservoir and pumps. Vacuum liquid bottle traps shall be installed to collect any blood/fluids, etc. that may be drawn into the pipeline. One bottle trap per theatre, ICU, ward block and other patient unit, shall be supplied. Bottle traps should ideally be placed in sluice rooms. Care shall be given to the location of the exhaust discharge of vacuum plants taking into account the standard specification and the location of other air intakes.

Medical Air

Medical air (low pressure) for respiratory purposes shall be provided at a fixed pipeline pressure of 400 kPa. Medical air (high pressure) for driving power tools shall be provided at a terminal usage pressure of 700 kPa.

Care shall be given to the location of the air intake taking into account the standard specification and the location of other exhaust discharges.

Scavenging

A separate anaesthetic gas scavenging, a low-pressure suction system, that removes exhaled anaesthetic gases from the patient circuit, shall be provided. Each outlet point shall have its own balancing valve to allow the system to be balanced progressively from the furthest outlet point towards the fan motor. One system can be utilised for 1 or more theatres.

Scavenging system shall be switched from the nurse's station in the theatre complex. Rev 1

LP GAS

LP gas installations in pathology laboratories and other buildings shall comply with SANS 10087-3.

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 colour coded 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. Rev 2
- b) All nightlights and main up lights shall be switched per bedhead duct from entrance door.
- 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 and Paediatric Intensive Care Units (ICU's)

- a) Ceiling lights (Two per bed and dimmable fluorescent – Switched from pendent 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
 - Essential Supply – Patient General Use Only
- b) The pendent shall be located at the head and to the left of the bed and shall be at least 1500mm from the back wall.
- 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:
 - a. UPS Supply – Patient Life support only.
 - b. Essential Supply – Patient General use only
- b) Installation height 1000mm to centre of bed head ducting. Rev 2

Casualty/ Trauma Wards

a) Regional and Tertiary Hospital

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).

District Hospital

Eight (8) switched socket outlets per bed on Emergency supply. (Minimum of 2 circuits per bed with a maximum of eight (8) socket outlets per circuit). Rev 4

- b) Medical gas outlets (Oxygen, Vacuum and Medical Air Low Pressure -1 set per bed) Rev 4
- c) Medical gas outlet points (Oxygen and Vacuum – 1 set per bed) Rev2
- d) One nurse / emergency call point per bed.
- e) Ceiling mounted medical light - 24 volt 80 watt 30 000 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 over bedhead ducting shall be 1900mm from floor level to underneath of unit and at least 1500mm from the back wall. Rev 4
- b) The Bedhead Ducting shall be suspended from the ceiling. Rev 4

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 outlets (Oxygen, Vacuum and Medical Air Low Pressure 1 set per bed).Rev 4
- 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:

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 30 000 lux @ 1 metre.
- e) 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

Procedure / Stitch Rooms:

Rev 4

- a) Eight switched socket outlets per bed. (Minimum of 2 circuits per bed with a maximum of eight (8) socket outlets per circuit).
- b) Medical gas outlets (Oxygen, Vacuum and Medical Air Low Pressure 1 set per bed).
- c) Ceiling mounted medical light - 24 volt 80 watt 30 000 lux measured @ 1 metre.
- d) General ceiling lighting shall be supplied. One emergency call point per bed.

Installation height of bed head ducting shall be 1500mm from floor level to centre of unit.

MEDICAL WASTE

The policy of this Department is to outsource medical waste disposal.

STERILIZATION AND DISINFECTION

Steam Autoclaves

Refer to KwaZulu-Natal Department of Health Standard Specification.

The sterilizer door shall be of the automatic vertical sliding, counter balanced type. Throughput requirement for autoclaves shall be confirmed for each institution in order to determine sizing, number and cycle requirements. All autoclaves shall be equipped with recording instruments as per standard specs. All autoclaves are to have Electric control valves. The internal chambers of autoclaves shall be manufactured from Grade 304L Stainless Steel, with the exception of Laboratory autoclaves, which shall be Grade 316 Stainless Steel. Care shall be taken during fabrication to ensure that material limits are not exceeded. On completion all chambers are to be pickled and passivated. Rev 5

Each autoclave shall be provided with a loading trolley and internal chamber cradle. Rev 1

For servicing purposes an inter-leading access door shall be provided between the Autoclave plant room and the CSSD department lockable from plant room side. Rev 5

Where possible the condensate collection drain point shall be placed outside the plant room.

Because of the high temperatures of discharge water from autoclaves and other steam-operated equipment, sewer branch lines to the gullies receiving the condensate should be stainless steel/cast iron for at least the first 6 metres.

Gas Sterilizers

Ethylene Oxide Sterilizer: Refer to SANS 10213 and 11135

Instrument Washers

Refer to standard specification.

All C.S.S.D's shall be equipped with an instrument washer.

Bedpan Washers

Bedpan washers to be provided in all ward sluice rooms.

In rural hospitals mechanical water driven sluicing sinks shall be provided.

In urban hospitals electrically driven bed pan sluicing machines shall be provided. Rev 5

HOT WATER SYSTEMS

The preferred system for the provision of hot water in large quantities is Heat Pumps. Rev 5

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

Solar water heating, energy recovery units and heat pumps shall be considered in the design stage for all new facilities and the renovation of existing facilities. Investigation into the quality of electrical and water supply needs to be evaluated.

Rev 4

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 heat pumps coupled to storage tank(s). These storage tanks are not to exceed 2,500L capacity per unit.

Rev 5

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°C.

Hot water temperature for paediatric wards shall not exceed 40°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°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.

LAUNDRIES

Other than Central Laundries, equipment shall be kept to a standard size at all Health Institutions to suit the application and shall comply with the following sizes for which technical specifications are available.

Rev 1

- a) Sluice Machine (9 to 25kg).
- b) Roll Ironer single roll (1.9 to 2.0 metres)
- 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

Layouts shall be discussed with this Department's Electrical and Mechanical Section. The complete equipment layout, including sinks, worktops, canopies, etc. will 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 dishwash 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 needs to be verified by calculation to relate to the number of meals served per sitting.

Technical Specifications are available for the following equipment:

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

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.

CONTENTS OF PIPING	COLOUR (CODE)
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 Rev 1
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.

RECOMMENDED NOISE RATINGS INSIDE BUILDINGS

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