

**NATIONAL HEALTH LABORATORY SERVICE
(NHLS) LABORATORY AT MANAPO
HOSPITAL CENTRE
MECHANICAL HVAC INSTALLATION
SERVICES**

PROJECT No.: B1620MV

Prepared by: Mekan Engineering Services

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Mekan Engineering Services
9 Connor Avenue
Westdene
9301
Bloemfontein
Tel: (051) 448 4864
Fax: (051) 448 4864

PART V
PROJECT SPECIFICATION

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PART V

NATIONAL HEALTH LABORATORY SERVICE (NHLS) LABORATORY AT MANAPO HOSPITAL CENTRE HVAC INSTALLATION PROJECT SPECIFICATION

1 GENERAL

In this document where the term “Main Contractor”, “Building Contractor” or “Builder” is used, it shall mean the Principal Contractor and where the term “HVAC Contractor”, “Contractor” or “Subcontractor” is used; it shall mean the Contractor appointed in terms of this document.

2 APPLICABLE DOCUMENTS AND DRAWINGS

The supply and installation of the mechanical systems are subject to the following documents forming part of this specification:

Documentation Parts		
Part	V	Project Specification
Part	VI	Schedules of capacities
Part	VII	Schedule of equipment and rates (tender returnables)
Part	VIII	Bills of quantities
Part	IX	Drawings

Where any item or part of this installation is not explicitly described in this section, the Bills of Quantities shall take preference.

All other specifications listed hereafter refer to the latest version as issued by the relevant body.

3 OTHER SPECIFICATIONS

Code	Description
ACT 45	Atmospheric Pollution Prevention Act.
ACT 103	National Building Regulations and Building Standards
OHS ACT	The Occupational Health and Safety Act, Act 85 of 1993

4 SANS SPECIFICATIONS

SANS Code	Description
SANS 1200	Standardized Specifications for Civil Engineering Construction
SANS 064	The preparation of steel surfaces for coating
SANS 0400	The application of the National Building Regulations
SANS 1200 HC	Corrosion protection of structural steelwork

SANS 1091	National colour standards for paint
SANS 460	Copper and copper alloy tubing
SANS 455	Covered electrodes for the manual arc welding of carbon and carbon manganese steels
SANS 044	Welding : Parts I to VII
SANS 046	Copper tube manufacturing code of practice
SANS 0238	Welding and thermal cutting processes – Health and safety
SANS EN 10240	Internal and/or external protective coatings for steel tubes – Specification for hot-dip galvanized coatings applied in automatic plants.
SANS ISO 1461	Hot-dip galvanized coatings on fabricated iron and steel articles – Specification and test methods.
SANS ISO 3575	Continuous hot-dip zinc-coated carbon steel sheet of commercial, lock forming and drawing qualities
SANS 0214	The design, fabrication and inspection of articles for hot-dip galvanizing
SANS 1186-1	Symbolic Safety Signs Part I : Standard signs and general requirements
SANS 62	Steel Pipes Part 1 : Steel pipes of NB not exceeding 200 mm. Steel Pipes Part 2 : Pipes and pipe fittings of nominal bore not exceeding 150 mm, made from steel pipe.
SANS 0147	Refrigerating System including Plants associated with air-conditioning systems
SANS 1125	Room air conditioners and heat pumps
SANS 719	Electric welded low carbon steel pipes for aqueous fluids (ordinary duties)
SANS 23	Brazing alloys containing silver
SANS 0173	The installation, testing and balancing of air-conditioning duct work
SANS 0103	The measurement and rating of environmental noise with respect to annoyance and speech communication
SANS 0140	Identification colour marking
SANS 630	Decorative high-gloss enamel paint for interior and exterior
SANS 763	General coating thickness
SANS 1238	HVAC duct construction standards
SANS 1062	Pressure gauges
SANS 0227-2	Pressure vessels, inspectorates, certification (approval), modified or repaired pressure vessels.
SANS 1424	Filters for use in air-conditioning and general ventilation

5 BS SPECIFICATIONS

BS Code	Description
BS 10	Specification for flanges and bolting for piping, valves and fittings
BS 3601-22	Specification for carbon steel pipes and tubes with specified room temperature properties for pressure purposes
BS 4504	Circular flanges for pipes, valves and fittings (PN designated)
3.1	Specification for steel flanges
3.3	Specification for copper alloy and composite flanges
BS 5000-99	Machines for miscellaneous applications

6 DRAWING REGISTER

Drawing Number	Drawing name	Paper Size
B1620MV-200; Rev A	Ground Floor HVAC Layout	A0

7 DESIGN AND CONTROL CONDITIONS

The equipment offered shall be suitable for continuous operation under the following conditions:

7.1 Design Conditions

The following ambient design conditions were used for the mechanical HVAC design for the facility:

Zone	Design Condition	Design Condition Value
Harrismith		
	Altitude	1670 m
	Summer Dry Bulb	29 °C
	Summer Wet Bulb	18 °C
	Winter Dry Bulb	3 °C
	Winter Wet Bulb	1 °C

Table 1 : Design conditions for the HVAC systems

7.2 Internal Control Conditions

The table below are the internal design condition of each area as identified in the proposed building.

Area	Area Description	Control condition
All air-conditioned spaces	Summer	22 °Cdb ± 2 °C
	Winter	20 °Cdb ± 2 °C
	RH	50% (no active control)

Table 2 : Control temperatures per general classification area

7.3 Electrical Supply

All equipment will be supplied with 3-Phase, 4-wire, 50 Hz AC with a nominal voltage of 400/230V varying between 95% and 105% of the nominal voltage.

8 PROJECT OVERVIEW AND SCOPE OF SUBCONTRACT

8.1 Project Overview

8.1.1 Manapo National Health laboratory located in Phuthaditjhaba, Free State is undergoing an upgrade. The laboratory is existing and it is to be refurbished, replacing all equipment that have reached their economic life and repairing those that require maintenance.

8.2 Scope of HVAC Contract

8.2.1 The scope of the HVAC subcontract includes the engineering, drawings, manufacture, supply, delivery, installation, testing, commissioning, handing over, contract guarantee, servicing and maintenance of the HVAC systems as specified in this document and the attached documentation and drawings.

For the spaces with HVAC services, scope of works includes the following:

8.2.1.1 Offices:

The supply and installation of Dx-Split air-conditioning units, ducted fresh air supply and extract air system for the change room and toilet areas.

8.2.1.2 Lab/Testing spaces:

The supply and installation of Dx-Split air conditioning units, fresh air supply and ducted extract air systems to allow for negative pressure within the spaces.

8.2.1.3 Sluice and Storerooms:

The supply and installation of fresh air supply and extract ventilation systems.

9 DX SPLIT TYPE UNITS

- 9.1 All units are to be of the heat pump, inverter driven type.
- 9.2 Tenderers are to ensure that the split units offered are capable of operating so as to produce the specified **cooling, sensible cooling and heating capacities** (heat pump type) at the conditions specified, and at medium evaporator fan speed.
- 9.3 Tenderers are expected to liaise with the suppliers so as to properly de-rate the units for entering conditions of 24 °C dry bulb temperature, 50% RH (not 27°C), refrigeration pipe lengths and altitude.
- 9.4 It should be noted that the de-rating will be checked thoroughly by the engineer when the units are submitted during construction stage by the successful contractor. Units found to be undersized will be rejected and the correct size units submitted at no additional cost to the Client.
- 9.5 The exact positions of evaporator units will be established on site. Tenderers should allow in their pricing for insulated refrigeration pipe work installed in the positions shown. In selecting the units, tenderers are to ensure that their selections fit into the areas allocated.
- 9.6 All unit types are to be of the same make.
- 9.7 Allowance must be made for suitable galvanized steel mounting brackets for the condenser units whether floor slab mounted or wall mounted.
- 9.8 Compressors shall be of the hermetically sealed type.
- 9.9 The tenderers are to allow for suitable support of the evaporator units.
- 9.10 All units are to have at least 2 evaporator fan speeds.
- 9.11 Approximate pipe routes are shown on the drawings. Where piping penetrates walls and slabs etc., adequate sleeves shall be provided under this contract.
- 9.12 All exposed EXTERNAL pipe work, shall be enclosed in neat galvanized trunking with covers, adequately supported in order to protect the insulation from weathering and damage.
- 9.13 All exposed INTERNAL pipework shall be enclosed in "Eco Duct" trunking complete with bends elbows etc. (individual components are not billed for this item and the tenderer is to establish on site what material is required in this regard, and cost for all straights, bends, tees etc within the billed cost)
- 9.14 Drain piping from the indoor units shall be chased in wall where required and taken from the units to the nearest drain point as shown on the drawings. Drain pipes chased into the walls shall have a minimum slope of 1 in 50 with no sagging.

- 9.15 The Contractor shall allow for a P-trap in the condensate drainage piping at the drain outlet of all units.
- 9.16 All controls and interlocking between the evaporator coil unit, and the condensing unit form part of this contract.
- 9.17 Tenderers are to allow for the chasing into walls and installation of conduit for the controller wiring as part of the contract. Hardwired controls are to be used, not infra red type controls. All electrical installations must comply with standard wiring and safety regulations as applicable.
- 9.17.1 The wall controllers are to be of the digital type and shall be capable of accommodating the following functions:
- On/Off
 - Operating mode (heating/cooling/auto)
 - Setpoint
 - Fan speed (hi/med/low)
 - Louver position (if applicable)
 - 7 day Timer settings
- 9.18 All units shall be identified clearly with reference tags positioned discreetly, using "Traffolyte" type labels with black lettering over a white background, both at the evaporators and condensers
- 9.19 All units are to be capable of sensing the room/return air temperature at both the wall controller as well as in the return air of the units. (by selecting the appropriate sensing method.
- 9.20 All units shall be equipped with an auto restart capability thereby allowing the units to automatically restart in the event of a power failure.
- 9.21 All units shall be installed, piped, wired and commissioned in accordance with the manufacturer's recommendations. The electrical contractor shall provide an electrical power point in the form of a single or three phase isolator at each condenser. Connecting to the units form part of this contract.
- 9.22 All wiring is to be neatly carried out and shall be installed in conduit. All the wiring (electrical as well as control wiring), between the indoor and outdoor units, forms part of this contract.
- 9.23 The Selections of each and every unit shall be submitted for approval before ordering of the units and shall comply to the design criteria as indicated in Part VI of the specification document.
- 9.24 The split units are to meet the following design criteria:
- 9.24.1 The indoor and outdoor unit must be interconnected with copper refrigerant piping in terms of the 'suppliers' recommendation
- 9.24.2 The tenderer is to note the distances between the indoor and outdoor units and ensure

suitably sized piping is allowed to accommodate the capacities specified.

- 9.24.3 The return of oil to the compressor is to be ensured by the installation of traps at regular intervals as per the suppliers installation recommendations.
- 9.24.4 All piping through walls shall pass through sleeves which shall be properly sealed after installation.
- 9.24.5 Insulation through sleeves shall be continuous.
- 9.24.6 All external surface mounted piping shall be installed in suitably sized rectangular P2000 or P8000 galvanised "Unistrut", complete with removable cover plate, securely fixed to the walls.
- 9.24.7 All piping and cabling above ceilings shall be installed on factory manufactured galvanised steel cable tray as specified.
- 9.24.8 All refrigerant, liquid and suction, shall be separately insulated with armaflex insulation.
- 9.25 **Outdoor units**
- 9.25.1 Condenser units and evaporator units are shown on the drawings.
- 9.25.2 The exact positions of the condensers will be established on site and indicated on the working drawings.
- 9.25.3 Tenderers shall allow in their pricing for all exposed piping to be installed in galvanized metal trunking with covers.
- 9.25.4 The units shall be of a well-known manufacturer and spares are to be freely available in South Africa. In selecting the units tenderers are to ensure that their selections fit into the areas allocated.
- 9.25.5 The outdoor units are to be constructed from steel plate and painted with acrylic paint and shall be equipped with hail guards.
- 9.25.6 The outdoor unit will have an air-cooled heat exchange coil constructed from copper tubing with aluminum fins. The air being drawn in through three sides of the unit and discharged out of the top of the unit. Each condenser module will have a single fan mounted on top of the coil. The coil will be capable of being divided into multiple sections (dependent on model) to enable the outdoor unit capacity to match the capacity required by the indoor units as specified.
- 9.25.7 The outdoor unit module will have one inverter controlled hermetic scroll compressor capable of controlling the compressor in 1Hz increments.
- 9.25.8 The refrigeration process of the outdoor unit will be maintained by pressure and temperature sensors controlling solenoid valves, check valves and bypass valves. The heating or cooling mode of the outdoor unit will be controlled by a valve system which will reverse the cycle of the refrigerant to change the mode of the outdoor unit.

- 9.25.9 The outdoor unit will have an option for operating in either High Performance Heating mode or COP Priority Heating mode. In High Performance Heating mode the system maintains full heating capacity down to -5 Degrees.
- 9.25.10 The COP Priority Heating mode (if enabled) means the system will target optimum energy performance rather than Heating capacity.
- 9.25.11 The outdoor unit will supply either high pressure liquid, high pressure gas or a combination of both depending on the mode of the indoor units. Refrigerant return to the outdoor unit will be via the other pipe. All pipes shall be insulated.
- 9.25.12 The system will be capable of total pipe runs of up to 100m depending on the outdoor model and location of "BC" controller.
- 9.25.13 Each outdoor unit module will have a starting current of no more than 8 amps.

9.26 **Indoor units**

- 9.26.1 The tenderers are to allow for suitable support of the evaporator units as per the specifications.
- 9.26.2 Contractors are to submit installation details prior to installation for approval making sure that access requirements for maintenance purposes are catered for.
- 9.26.3 Where piping penetrates walls and slabs etc, adequate sleeves shall be provided under this contract. Sleeves and the building-in, making good and waterproofing of the openings shall be included in this contract.
- 9.26.4 All internal exposed refrigerant pipe work where surface mounted, is to be installed in "Ecoduct" type trunking, and piping within voids is to be installed on galvanised cable racks or cable ladders as specified. Allowance must be made in the pricing for same.
- 9.26.5 Each indoor unit will have a heat exchanger which shall be constructed from copper tubing with aluminum fins. The flow of refrigerant through the heat exchanger will be controlled by a linear expansion valve. This valve will be controlled by thermistors and a return air thermistor and shall be capable of controlling the variable capacity of the indoor unit between 25% and 100%.
- 9.26.6 Each indoor cassette and concealed unit will require a 240V AC mains supply. Control will be via the 30V DC fuzzy logic signal from the outdoor unit. The supply of the power to each evaporator will be by others.
- 9.26.7 The cassette units will be manufactured from galvanised steel plate insulated with closed cell expanded polyurethane foam. The ceiling panel will be manufactured from ABS plastic and painted either Munsell 0.70Y 8.59/0.97 or Munsell 6.4Y 8.9/0.4. Air will be discharged by an aerofoil bladed centrifugal turbo fan through four outlets on the perimeter of the ceiling panel. The four outlets shall each include electronically adjustable vanes to alter the angle of the airflow.
The room air will be returned to the unit through one grille in the center of the panel.

The return air to the unit will be filtered through a synthetic fiber washable filter installed in the unit. The unit will have a drain lift up mechanism fitted as standard.

- 9.26.8 The concealed units will be manufactured from galvanised steel plate partially insulated with closed cell expanded polyurethane foam. Air will be discharged by a forward curved centrifugal fan horizontally out of the front of the unit to allow for field supply ductwork and diffusers to distribute the air into the room. Return air will be brought in through the rear of the unit to allow for the return air to be ducted from the room.

9.27 **Drain Piping**

- 9.27.1 Drain piping from the indoor as well as the outdoor unit, (if required) shall be taken from the units to the nearest drain point.
- 9.27.2 Drain pipes shall be of UPVC. No other material shall be considered for drain pipes whether it is indoors or outdoors.
- 9.27.3 Drain pipes shall be installed with no sagging.
- 9.27.4 The piping shall allow for a p-trap in the condensate drainage piping at the drain outlet of each evaporator unit.
- 9.27.5 The contractor shall make provision for cleaning eyes (plugged T's at each end of main lines, at changes in direction, etc. All drain pipes shall be piped to the nearest drain point.
- 9.27.6 All drain pipes shall be tested in the presence and to the satisfaction of the engineer prior to the closing up of the ceilings.

9.28 **Controls & Temperature Sensing**

- 9.28.1 All controls, wiring and interlocking between the evaporator units and the condensing units form part of this contract. Ceiling void control wiring shall be installed in on the cable trays.
- 9.28.2 Wall mounted controllers are to be installed in the approximate positions as shown on the drawings. Exact positions and heights will be finalised on site.
- 9.28.3 Allowance is to be made in the costing for the installation of wall mounted controllers chased into walls complete with conduiting. Partition mounted controllers are to be costed complete with conduiting installed within partition walls, all forming part of this contract.
- 9.28.4 Allowance is to be made in the costing for digital controllers with the following functions:
- On/Off
 - Operating mode including auto mode
 - Set point adjustment
 - Fan speed adjustment

- Louver position (where applicable)
- 7 day timer settings
- Locking of temperature set point
- Filter dirty alarms and other alarms
- Adjustable set point limiting

9.28.5 All units are to be capable of monitoring room temperatures through either the return air of the units (before mixing of fresh air in the return air plenum) as well as at the wall mounted controller. Temperature sensing selection will be made at construction stage.

9.29 **Air flow and Unit Selection**

9.29.1 Tenderers are to ensure that the units selected for tender purposes are capable of producing the required air flows as specified.

9.29.2 Tenderers are to ensure that indoor unit selection complies to the **sensible and total cooling requirements, as well as heating requirements** specified, at medium fan speed. The returnables are to be filled in, indicating the same.

9.30 **Electrical**

9.30.1 All electrical installations must comply with standard wiring and safety regulations as applicable.

9.30.2 All wiring from the evaporator power point (isolator) in the void (supplied by others) to the evaporator units fall under this contract.

9.30.3 All cabling from the main AC Distribution board to the respective condensers form part of this contract.

9.30.4 All condenser units shall be identified clearly with reference tags positioned discreetly, using "Traffolyte" type labels with black lettering over a white background. The references shall correspond with those indicated in the final operating and maintenance manuals, and as built drawings.

9.30.5 All evaporator units shall be identified clearly with reference tags positioned on the underside of the ceiling Tee using Traffolyte type labels with black lettering over a white background. The references shall correspond with those indicated in the final operating and maintenance manuals and as built drawings.

9.30.6 All the wiring (electrical as well as control wiring), between the indoor and outdoor units, forms part of this contract

9.31 **Refrigerant Piping**

9.31.1 All pipework to be carried out in refrigerant quality soft/medium drawn copper tubing to BS EN14276:2007 (or latest version) and complete with the appropriate headers and joints.

- 9.31.2 Pipework should be installed by an Approved Refrigeration Engineer (certificate approval must be submitted prior to installation commencement).
- 9.31.3 Longest possible lengths of copper pipe should be utilised to minimise joints on site.
- 9.31.4 Appropriate refrigeration installation tools must be utilised.
- 9.31.5 Oxygen Free Nitrogen (OFN) must be utilised at all times in the system during brazing.
- 9.31.6 All pipework (suction and liquid lines) are to be insulated with slip on close cell elastomeric pipe insulation (as manufactured by Armaflex or equal).
- 9.31.7 After installation of pipework, and prior to sealing of insulation joints and starting of equipment, pipework should be pressure tested as follows in accordance with BS EN378:2008 (or latest version).
- 9.31.8 Refrigerant charge weight must be calculated, to the actual installed length of pipework in accordance with the suppliers recommendations.
- 9.31.9 The charging should be carried out using appropriate charging scales. Once completed documentation of factory charge, additional charge and total charge is to be included in the manuals.
- 9.31.10 Pipework to be properly fixed and supported at a minimum of 1.5 meters centers, run on trays as specified.

10 AIR OUTLETS, INLETS, GRILLES, DAMPERS

- 10.1 All external weather louvers/grilles shall be of the natural anodised aluminium type (for costing purposes) complete with opposed blade dampers. (final color finish shall be confirmed by Architect)
- 10.2 Return air grilles on ducted hide away units shall be of the hingable type, suitable for drop in ceiling applications. The return air grilles shall be powder coated white to match the ceiling colour. A sample of the return air grilles is to be submitted for approval.
- 10.3 All door grilles are to be supplied under this contract. Installation of the door grilles will be by the HVAC contractor. Making of the door openings shall be by the main contractor.
- 10.4 Door grilles shall be of natural anodised aluminium for pricing purposes. (Final colour/finish shall be confirmed by the Architect)
- 10.5 Extract air terminals and Fresh air terminal shall be of the disc valve type (as indicated on the drawings) and shall be coloured white to match the ceiling grid colour.
- 10.6 Conventional diffusers shall be of the plate type and shall be coloured white to match

the ceiling colour as indicated on the drawings

- 10.7 All side outlet grilles shall be supplied complete with opposed blade dampers. The grilles shall be coloured white to suite the colour of the bulkheads in which they are installed.
- 10.8 Flexible ducting shall be insulated for all supply air ducting, and shall not exceed 1200mm in length. Return air and extract flexible ducting shall be un-insulated.
- 10.9 All balancing dampers are to be of the opposed blade type equal to Trox and all butterfly balancing dampers are to be equal to Trox butterfly dampers type BDQ.
- 10.10 All Fire dampers shall be supplied complete with thermal links.

11 FILTERS

- 11.1 All filters shall be similar or equivalent to "Trox" or approved manufacturer.
- 11.2 All fresh air systems shall be priced complete with filters and filter frames.
- 11.3 Supply and install primary filters on built-up rooftop units as described.
- 11.4 Filter Type and Efficiencies:

Designation	Filter Class	Filter Type	Filter Size	Quantity l/s each
Primary filters on fresh air intakes	Class to EN 779	G4, as Trox F 718	Various	Various to suite

- 11.4.1 All filters will be installed such to be easy accessible and maintainable. Slide in type filters are NOT permissible.

12 FAN SYSTEMS

12.1 Toilet and fresh air fan/ducting systems

- 12.1.1 The contractor is to allow for the supply and installation of extract and fresh air fan systems complete with ducting, attenuators, inlets, grilles, controls, electrics complete in all respects as indicated.
- 12.1.2 All fans are to be 1440 RPM or slower. (No 2880 RPM fans are acceptable)
- 12.1.3 The systems are to be supplied complete with suitably selected sound attenuators as shown so as to comply with the sound requirements as indicated in the specification.
- 12.1.4 The ventilation systems shall be neatly installed into the ceiling and shall be silent in operation.

- 12.1.5 All system elements are to be easily accessible for maintenance and shall be switched on via a wall mounted switch.

13 ELECTRICAL INSTALLATION

13.1 General Requirements

- 13.1.1 The electrical installation as a whole shall comply with statutory and local laws and regulations.
- 13.1.2 The electrical supply shall be nominal three phase, 400/230 V, 50 Hz.
- 13.1.3 All equipment shall be suitable to operate within a range of 90 % to 10 % of this voltage.
- 13.1.4 All electrical panels shall be electric orange.
- 13.1.5 All exposed distribution boards shall be weatherproof with an IP 65 rating.
- 13.1.6 All motors and equipment shall be provided with over current/earth leakage protection as well as single-phase protection.
- 13.1.7 Equipment shall also be protected against phase failure and phase reversal. All equipment shall be protected against lightning.
- 13.1.8 All equipment shall re-start automatically after a power failure.
- 13.1.9 All motors in excess of 10 kW shall be provided with star-delta starters.
- 13.1.10 All motor control circuits shall be designed to permit sequenced starting of motors for all conditions.
- 13.1.11 Motor control circuits may also be of the electronic type if all functions and interlocking features are re-programmable on site.
- 13.1.12 Where starters from the same type of equipment are installed in the same board, then the starters shall be spaced in such a way that the wiring and other switchgear can be removed (or repaired) without having to isolate the board as a whole.
- 13.1.13 Each starter shall have a separate neutral connection in order to disconnect a particular starter (for testing purposes) without affecting the other starters abilities.

13.2 Electrical Scope

- 13.2.1 The electrical contractor is to provide all electrical distribution boards serving HVAC equipment.
- 13.2.2 The electrical contractor will provide a main incoming cable to all HVAC distribution

boards.

- 13.2.3 All electrical cabling from the HVAC DB's to all HVAC equipment is to form part of the electrical contractors scope of works. The electrical contractor will provide isolators for the HVAC equipment.
- 13.2.4 A CoC is to be provided for all electrical work carried out by the HVAC contractor.
- 13.2.5 All isolators PVC conduit on the roof shall not be accepted. Any conduit used on the roof shall be hot dipped galvanized conduit.
- 13.2.6 All HVAC distribution boards shall be supplied complete with the necessary switchgear so as to switch off the power to all HVAC equipment in the event of a fire detection signal.
- 13.2.7 The electrical distribution boards are to be supplied complete with a 7 day programmable timer so as to switch all extraction and fresh air systems on and off at preset times.
- 13.2.8 The electrical distribution boards shall be supplied with 10% spare space to accommodate additional circuit breakers.

14 DUCTING

- 14.1 All extraction system and exhaust ducting shall be un-insulated, galvanised sheet metal steel ducting.
- 14.2 All internal in-ceiling void supply ducting shall be of galvanised sheet metal steel, externally insulated with 25 mm thick foil faced insulation.
- 14.3 All external package unit ducting shall be of galvanised sheet metal steel, internally insulated using 25mm sonic liner.
- 14.4 Manual air volume and control dampers shall be installed in all the branch ducts to ensure proper air balancing as indicated.
- 14.5 Position of the sound attenuators is indicated on the drawings. The length, as indicated, is sufficient for tendering purposes. The final selection shall be done by the Contractor at his expense and all calculations shall be submitted to the Engineer for approval. All cylindrical sound attenuators shall be fitted with pods.
- 14.6 Inspection and test openings shall be provided at all positions where it is required.
- 14.7 Ducting shall be airtight. No leaks at joints shall be permitted. All ducting shall be flanged.
- 14.8 All rectangular ducting is to be Mezz flanged only.

14.9 All duct branches must be properly radii, including take-offs just before air outlets.

15 NOISE LEVELS

15.1 General

15.1.1 The maximum noise level (NC levels) in the areas are to be as follows.

- Offices : NC 35
- General areas : NC 35
- Meeting rooms : NC 30

15.1.2 Noise levels outside the buildings shall not exceed the noise levels as laid down by the local authority. The outside noise levels shall also be taken into account when determining the indoor noise levels. If the condensing units of the fresh air package unit requires attenuation, the Tenderer shall make provision for that in his tender.

15.1.3 Acoustical calculations shall be performed by a specialist and the selection of sound attenuators shall be submitted to the Engineer after the appointment of the successful tenderer. All costs for the aforementioned shall be included in the tender amount.

15.1.4 The above noise levels shall not be exceeded with all mechanical equipment running.

15.1.5 In selecting the sound attenuators, the following parameters should be used as guidelines:

- Splitter thickness \pm 200 mm
- Airway gap \pm 120 mm
- Length \pm 1500 mm

15.1.6 Noise levels of all equipment shall be submitted to the engineer. Any sound tests required due to equipment suspected of exceeding the noise levels once installed shall be for the contractors account.

15.1.7 Cylindrical attenuators shall be complete with pods with diameter 350 mm and up. All attenuators shall be complete with flanges, brackets, bolts, feet, etc, as required.

16 ANTI VIBRATION MOUNTINGS

16.1.1 Vibration isolation pads shall be provided for all moving equipment in order to prevent vibration carry-over to any structure and to prevent unacceptable noise levels. This includes package unit, split units, extract fans, chillers, pumps, cooling towers and condensers.

16.1.2 Inertia bases, where required by the Supplier in order to meet the specification shall be

included in the tender price.

17 BUILDER'S WORK

- 17.1 The following builder's work shall form part of the mechanical contract:
 - 17.1.1 The contractor shall prepare builders work drawings based on the layout drawings which he shall obtain from the Architect via the main contractor.
 - 17.1.2 The HVAC contractor shall prepare these drawings immediately after appointment (within the main contractor's program) and in consultation with the main contractor and shall have the drawings signed off by the mechanical engineer and architect.
 - 17.1.3 The contractor shall liaise with the main contractor and shall assist the main contractor to ensure that all sleeves, openings , etc. are in place prior to the building of walls, casting of concrete etc.
 - 17.1.4 Where required, all openings shall be sealed after installation of systems.
 - 17.1.5 The removal from site of all redundant equipment and materials.
 - 17.1.6 The hoisting and rigging and positioning of all equipment.
 - 17.1.7 Scaffolding as required.
 - 17.1.8 The installation of door grilles, louvers etc into openings provided by the main contractor.
 - 17.1.9 The mechanical engineer will coordinate all mechanical services with the main contractor and other subcontractors in all respects.

18 WORKSHOP DRAWINGS

- 18.1.1 Three copies of all workshop drawings must be submitted for approval before ordering and installation can commence.
- 18.1.2 The submission of these drawings shall be in accordance with the program and shall leave sufficient time for the Engineer to check these drawings properly.
- 18.1.3 The workshop drawings shall include the following:
 - 18.1.3.1 Equipment layout and sections.
 - 18.1.3.2 Electric wiring and control circuits, and electrical power requirements.
 - 18.1.3.3 Builder's work drawings as specified.

19 TRAINING

- 19.1 The Contractor shall provide instructors to train the Clients service personnel. These instructors shall be available for a total period of three working days (eight hours per day) after the system has been commissioned and handed over to the Client.
- 19.2 The Maintenance and Operating Manuals shall be in the possession of the Client before the training commences.

20 GENERAL REQUIREMENTS

- 20.1 Site supervision by Subcontractor
- 20.1.1 The Subcontractor is responsible for the supervision on this contract. A complete CV of the person responsible for the site supervision shall be submitted to the Engineer. The Engineer may require an interview with the proposed supervisor. The final choice of the supervisor shall not in any way alter the final tender amount on this subcontract.
- 20.1.2 The Subcontractor shall replace the supervisor at his own cost if the aforementioned supervisor is unable to perform his duties satisfactorily.
- 20.1.3 The submission of the supervisor's CV is required only after the Subcontractor has been appointed.
- 20.2 Standard Specification
- 20.3 Project Specification
- 20.4 Equivalent Manufacture
- 20.5 Equipment Installation
- 20.6 Local Representation
- 20.7 Submissions by Subcontractor
- 20.7.1 Submissions with regard to equipment (all with spares that are freely available in South Africa.)
- 20.7.2 The Subcontractor should take note that all equipment selections approved (or not rejected) by the Engineer shall not free the Subcontractor to comply with the specification.
- 20.7.3 The following information with regard to equipment selections shall be submitted to the Engineer:
- Manufacture, name and model

- Diagrams, tables and graphs to explain the functioning of equipment, where applicable
- Applicable pamphlets or catalogue information
- Name and address of manufacturer and/or distributor
- Number of years that equipment has been available in RSA
- Any other relevant information required by the Engineer

20.7.4 The above submissions are required after appointment of the Subcontractor and in accordance with the requirements of the main contract program.

20.7.5 The following submissions are required upon appointment :

- All split units
- All fan systems
- Mounting, support, suspension details piping and ducting
- Diffusers, and grilles disc valves, hingeable return air grilles.
- Wall mounted controllers (Package unit and split units)
- Fire dampers
- Any other components as required by the engineer

20.8 Marked-up Drawings and Shop Drawings:

20.8.1 Marked-up structural and other drawings:

20.8.1.1 The marked-up structural, architectural drawings and other drawings referred to shall be submitted the program constraints after appointment of the Subcontractor and shall include the following information:

- All dimensions and positions of openings and sleeves through both brick and partitions, required to fit the HVAC installation.
- Dimensions and positions of plinths (machine bases) required to locate equipment. The point loading and any forces generated by equipment shall also be shown on these drawings.
- Installation positions of wooded, glass fibre or steel frames or sleeves to be built in by the principal contractor.
- Any other requirements in respect of water supply points, drain points, power supplies, etc. that may be required and to not form part of this subcontract.

20.8.2 Shop Drawings and As-built Drawings

- Where equipment is indicated on the shop drawings, the shop drawings must also be signed by the supplier of such equipment approving the application, positioning and installation details of his equipment (i.e. Condensers, units, package units, fans, pumps, etc.).
- All shop drawings shall be approved and signed by the Engineer. All electrical diagrams shall be approved and signed by an electrical professional registered engineer (employed by the contractor) and by the contractor's

specialist control supplier.

- Required service space around equipment (marked-up).
- Operating mass of equipment.
- Calculated point loads at all hangers, supports, brackets, etc. used to suspend the installation from or supporting the installation.
- Electrical operating and motor loads.

20.8.3 The successful Subcontractor shall verify that provision has been made for all openings, wooded frames, sleeves, etc. as described above and that such openings, frames, etc. are in the correct position before any concrete casting or building work is done.

20.9 Installation Fit

20.10 Supports

Refer to Part IV.I, Clause 9. No supports are shown on the drawings nor are they billed. The Subcontractor shall allow for sufficient supports as specified in Part IV.34, Clause 34.10.2.2.

20.11 Wooded and Steel Frames and Sleeves

20.12 Samples to be supplied

The contractor shall supply the following samples

- Diffusers and disc valves
- Grilles
- Wall mounted controllers for splits systems.
- Support systems for piping
- Drain piping – blue uPVC (white PVC conduit is unacceptable)
- Other samples as may be required by the engineer.

20.13 Performance of Systems and Equipment

The systems, equipment and layout designed by the Engineer shall conform to his requirements with regard to installation and performance in accordance with the specification. This suggests that the performance of the equipment in the system supplied and installed by the Subcontractor, shall be in accordance with the design and performance figures as published by the manufacturers and/or suppliers.

The efficiency of the design of the specified system is not the responsibility of the Subcontractor. It is, however the responsibility of the Subcontractor to see to it that the quality of the workmanship and the installation of the equipment shall conform to the requirements of the Engineer and to the satisfaction of the manufacturer and/or supplier.

It is furthermore accepted that the Subcontractor has assured himself that all equipment supplied and installed under this contract shall perform within the given

limits, as stated by the manufacturer/supplier, to confirm to the specification.

20.14 Protection, Cleaning, Adjustments, Commissioning, Test and O&M Manuals

20.14.1 The Subcontractor shall be responsible for the running of the installation, including the maintenance and replacement of worn parts, from the start-up date until it is handed to the Owner.

20.14.2 The HVAC installation shall be maintained for one (1) year after the final hand over to the client. The maintenance shall include twelve monthly maintenance visits and the servicing and maintenance of all HVAC equipment installed as part of this contract. Cleaning of the filters on a monthly basis shall be included. The cost for the one year maintenance shall be included in the tender price.

20.14.3 The contractor shall provide the entire operating and maintenance manual in electronic format. The contractor shall in addition provide four (4) hard copies of the entire manual, and 4 CD's of the entire manual and as built drawings. Drawings shall be in the latest AutoCAD Format.

20.14.4 Operating manuals and as-built drawings shall be submitted to the engineer for approval prior to making copies. No final claims will be entertained until such time as the above is approved and received in full.

20.15 Language

20.15.1 All notices on equipment shall be in English.

20.16 Standard Specifications

20.16.1 The contractor shall in all instances refer to the standard specifications as it forms an integral part of this document. This includes Part IV, the SANS specifications and BS specifications.

21 PROTECTION, CLEANING, ADJUSTMENTS, AND TESTS

22 EXTENDED GUARANTEE

22.1 The Contractor shall allow for extension in the guarantee of any equipment if any such equipment is not guaranteed by the supplier for twelve (12) months after the official handover.

23 AIR CONDITIONING AND VENTILATION INSTALLATION QUALITY ASSURANCE

23.1 The Air Conditioning and Ventilation Contractor shall be responsible for implementing a full quality assurance plan covering all activities included in this contract.

- 23.2 Contractors and suppliers with ISO 9000 certification will be considered favourably in the adjudication process.
- 23.3 Contractors who do not have ISO 9000 certification shall provide a comprehensive quality assurance plan in accordance with ISO 9000 provisions at the time their bid is accepted.
- 23.4 This quality plan shall cover design activities, procurement, storage, construction, handover, maintenance and guarantee.

24 QUALITY MANAGEMENT PLAN

- 24.1 A Quality Management Plan shall be prepared by the successful Air Conditioning and Ventilation contractor and this plan shall be submitted to the Engineer for approval within 14 days of receiving a notice of the appointment. The QMP shall include items below.
- 24.2 A responsibility matrix identifying all parties in the contractor's organization who are involved in the project or who are responsible for aspects of the project. The specific activities shall be identified with the responsible individual.
- 24.3 A list of all applicable specifications and third party inspections required.
- 24.4 A list of all inspection hold points with actions and responsibilities to ensure that these are timely inspected.
- 24.5 A list of all inputs required from the Engineer or the client with actions and responsibilities to ensure that the proper persons are advised in good time.

PART VI

HVAC AND MECHANICAL INSTALLATION

SCHEDULE OF CAPACITIES

SCHEDULE OF CAPACITIES

PART VI

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SCHEDULE OF CAPACITIES

PART VI

6.1. GENERAL

- 6.1.1. Fan static pressure etc are to be calculated by the contractor to suit the equipment and systems offered. Fan pressures given are the estimated static pressures applicable to local altitude. Values listed are a guide for tender purposes only.
- 6.1.2. Note that all fan pressures given are **static** pressures and not total pressure.
- 6.1.3. All air conditioning units are to be selected to satisfy the **total cooling, sensible cooling and heating requirements** indicated in the schedules. **(All at medium fan speed)**

6.2. AMBIENT CONDITIONS

- 6.2.1. Summer ambient : 29,0°Cdb/18°Cwb
- 6.2.2. Condenser selection @ 50,0°Cdb
- 6.2.3. Winter ambient : 3°Cdb/1°Cwb
- 6.2.4. Site Altitude: 1670m above sea level. Equipment selected must be rated accordingly.

6.3. ROOM CONDITIONS

- 6.3.1. The room temperatures, humidities and pressures for the various rooms are indicated in Part V of the Project Specification.

6.4. FANS

FANS:	AREAS SERVED	NR OFF	AIR FLOW RATE	RPMs	ESTIMATED STATIC PRESSURE	POWER INPUT (APPROX)		SPECIAL REQUIREMENT
GROUND FL.								
UNITS			L/s		Pa	V/ Phase/Hz	kW	
EAFF1	Toilets	1	400	1440	180	400/3/50	0.25	Axial flow fan
EAFF2	Main Laboratory	1	340	-	250	240/1/50	0.2	Inline fan
EAFF3	TB Lab/Tea Lounge	2	60	-	200	240/1/50	0.2	Inline fan
EAFF4	Waste/Sluice Room	1	110	-	200	240/1/50	0.2	Inline fan
FAFF1	Offices and Other	1	1255	1440	450	400/3/50	2.2	Axial flow fan

6.5. DX SPLIT UNITS INVERTER TYPE (HEAT PUMP)

<u>INDOOR UNITS</u>	Type	Estim. airflow at med fan speed	Total Cooling capacity at med fan speed	Sensible Cooling Capacity at med fan speed
			(l/s)	(kW)
AC1	High Mid Wall	N/A	2.6	1.4
AC2	High Mid Wall	N/A	3.5	3
AC3	High Mid Wall	N/A	7	6

PART VII

HVAC AND MECHANICAL INSTALLATION

SCHEDULE OF EQUIPMENT OFFERED
AND RATES SCHEDULE

SCHEDULE OF CAPACITIES

PART VII

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SCHEDULE OF EQUIPMENT OFFERED

PART 7

7.1 SCHEDULE OF INFORMATION

7.1.1 This section is to be completed in full by the tenderer. Information not supplied could invalidate the tender.

7.2 FANS

FANS:	AREAS SERVED	NR OFF	AIR FLOW RATE	RPMs	ESTIMATED STATIC PRESSURE	POWER INPUT (APPROX)		SPECIAL REQUIREMENT
						V/ Phase/Hz	kW	
GROUND FL.								
UNITS			L/s		Pa	V/ Phase/Hz	kW	
EAFF1	Toilets	1						
EAFF2	Main Laboratory	1						
EAFF3	TB Lab/Tea Lounge	2						
EAFF4	Waste/Sluice Room	1						
FAFF1	Offices and Other	1						

7.3 DX SPLIT UNITS INVERTER TYPE (HEAT PUMP)

<u>INDOOR UNITS</u>	Type	Estim. airflow at med fan speed	Total Cooling capacity at med fan speed	Sensible Cooling Capacity at med fan speed
		(l/s)	(kW)	(kW)
AC1	High Mid Wall	N/A		
AC2	High Mid Wall	N/A		
AC3	High Mid Wall	N/A		

7.4 MISCELLANEOUS ITEMS

MISCELLANEOUS	MANUFACTURE	MODEL NR
DIFFUSERS		
GRILLES		
DAMPERS		
ELECTRONIC CONTROLS		
HVAC DISTRIBUTION BOARDS		
ELECTRICAL SWITCHGEAR		
CIRCUIT BREAKERS		
OTHER		

7.5 SUB-CONTRACTORS

SUB-CONTRACTORS	COMPANY NAME
ELECTRICAL CONTRACTOR	
INSULATION CONTRACTOR	
PIPING CONTRACTOR	
CONTROLS CONTRACTOR	
DUCT INSULATION	
DUCTING MANUFACTURER	
BMS CONTRACTOR	

7.6 HVAC RATES FOR ADDITIONS/OMISSIONS

7.6.1 General

All rates are to include markup, supply, installation, profit, engineering overheads, travelling etc, but are to exclude and surcharges or taxes.

7.6.2 Labour Rates per resource type

Labour rates are to include bonuses, profit, compulsory contribution, overheads, supervision administration and drawing office time.

Description	Normal hours (R/hr)	After hours, Saturdays (R/hr)	Sundays, holidays (R/hr)
Duct erector	R	R	R
Piping fitter	R	R	R
Electrician	R	R	R
Draughtsman	R	R	R
Other	R	R	R

7.6.3 Labour Rates per category type

Labor rates are to include bonuses, profit, compulsory contribution, overheads, supervision administration and drawing office time.

Description	Normal hours (R/hr)	After hours, Saturdays (R/hr)	Sundays, holidays (R/hr)
Unskilled	R	R	R
Semi-Skilled	R	R	R
Skilled	R	R	R
Technician	R	R	R
Team (1x skilled, 1 x semiskilled, 1 x tech)	R	R	R
Other	R	R	R
	R	R	R

7.7 MARK-UP ON UNSCHEDULED MATERIALS (VARIATION ORDERS)

Percentage mark-up for overhead cost and profit applicable to all nett material (based on proof of cost) to be supplied and performed as required under this contract as instructed.

VARIATION ORDER ADDITIONS %

PART VIII

HVAC AND MECHANICAL INSTALLATION

BILL OF QUANTITIES

PART IX

HVAC AND MECHANICAL INSTALLATION

DRAWINGS

NATIONAL HEALTH LABORATORY SERVICE (NHLS) LABORATORY AT MANAPO HOSPITAL CENTRE

Jan-26

Preambles to Bills of Quantities

ITEM NO.	DESCRIPTION				
A	PREAMBLES TO BILLS OF QUANTITIES				
A1	These Bills of Quantities contain pages numbered consecutively.				
A2	Before the Tenderer submits his tender he should check the number of pages, and if any are found missing or duplicated, or the figures or writing indistinct, he should apply to the Engineer at once and have same rectified as no liability whatsoever will be admitted by the Engineer in respect of errors in tender due to the foregoing.				
A3	The Bills of Quantities form part of and must be read in conjunction with the Specification, which document contains the full description of the work to be done and material and equipment to be used and unless otherwise described in the Bills of Quantities, reference should be made to the Specification for the full meaning of descriptions of work to be done and materials and equipment to be used in this service.				
A4	All item rates and extensions must be priced in detail before submission of Tenders..				
A5	The total tender price in the bill shall constitute the contract price of the successful Tenderer.				
A6	Tenderers are advised to check their item extensions and total additions, as no claim for arithmetical errors will be considered.				
A7	No alteration, erasure or addition is to be made in the text of the Bills of Quantities. Should any alteration, erasure or addition be made, it will not be recognised but the original wording of the Bills of Quantities will be adhered to.				
A8	The priced Bills of Quantities of the successful Tenderer will be checked and the Engineer reserves the right to call for adjustments to any individual price and to rectify any discrepancy whilst the Total Tender Price, as submitted, remains unaltered.				
A9	The responsibility for the accuracy of the quantities written into the Bills remains with the person who prepared the Bills. The Tenderer shall be relieved of responsibility of measuring quantities at the tender stage, and the tender sum submitted shall be in respect of the quantities set out in the Bills, although he will be required to make his assessment of items such as brackets, fixings, etc., from details stated in the Bills and shall include in the item price for such small installation materials as are required for the complete installation in accordance with the specification.				

NATIONAL HEALTH LABORATORY SERVICE (NHLS) LABORATORY AT MANAPO HOSPITAL CENTRE

Jan-26

Preambles to Bills of Quantities

ITEM NO.	DESCRIPTION				
A10	The quantities and descriptions in these Bills of <u>Quantities are provisional and are not to be used for ordering materials.</u>				
A11	Variations in the scope and extent of the work included in the Bills shall be allowed to meet the Employer's requirements and shall be measured and costed at rates entered in the Bills, where appropriate, and shall form an addition to or deduction from the total of the Bills. Any items or variation for which rates have not been included in the Bills shall be agreed and priced as non-scheduled items in accordance with the provisions of the contract.				
A12	Unless a separate rate for the supply and for the installation of any items is specifically called or, the supply and installation costs of any item shall be fully included in the unit price.				
A13	The description of each item shall, unless otherwise stated herein, be held to include making, conveying and delivery, unloading storing, unpacking, hoisting, setting, fitting and fixing in position, cutting and waste, patterns, models and templates, plant, temporary works, return of packings, establishment charges, profit and all other obligations arising out of the Conditions of Contract.				
A14	All measurements are nett, unless otherwise stated, and Tenderers must allow in the rate for wastage.				
A15	Hangers, supports, splices, joining drilling etc shall form part of unit rate.				
A16	All materials or equipment specified under a trade name, catalogue or reference number shall, for competitive tender pricing, be exactly as described in this tender.				
A17	Prices for individual items in this Bill of Quantities must be exclusive of VAT. Provision has been made in the Final Summary of this document for the lump sum addition of VAT				
A18	The Client and/or Engineer shall not be responsible for any losses incurred due to loss of interest through the VAT system.				

NATIONAL HEALTH LABORATORY SERVICE (NHLS) LABORATORY AT MANAPO HOSPITAL CENTRE

Jan-26

Preambles to Bills of Quantities

ITEM NO.	DESCRIPTION				
A19	Tenderers shall price the Preliminary and General (P & G's) in terms of the Conditions of Contract and in consultation with the Main Contractor and the main programme				

NATIONAL HEALTH LABORATORY SERVICE (NHLS) LABORATORY AT MANAPO HOSPITAL CENTRE

Preambles to Bills of Quantities

Jan-26

ITEM NO.	DESCRIPTION				
B	AIR CONDITIONING INSTALLATION				
	PREAMBLES				
B1	<p>Ducting</p> <p>Where transformations or reducers occur, the larger size ductwork has been measured over the fitting. Descriptions of ductwork shall be deemed to include jointing materials, sealants, couplers in the running stiffeners, length and access inspection panels in and duct and piping support systems</p> <p>Dimensions, as seen on plan are given in the following sequence:</p> <p>(a) Horizontal parallel to the line of sight</p> <p>(b) Vertical at right angles to the line of sight</p> <p>Descriptions of fittings shall be deemed to include for cutting, forming openings and jointing to ducting.</p> <p>Fire dampers shall be installed where indicated. Small ducts shall be reinforced with angle iron at wall penetrations, as indicated.</p>				
B2	<p>Air diffusion</p> <p>Description of air terminals, grilles, louvres and the like shall be deemed to include necks, frames, supports and flexible connections.</p>				
B3	<p>Fans</p> <p>Description of fan assemblies shall be deemed to include supports from the structure, flexible or other connections to ductwork, vibration isolation mounting and airtight inspection doors. Electrical interface equipment included.</p>				
B4	<p>Sound attenuators</p> <p>Descriptions of sound attenuators shall be deemed to include flanged or flexible connections to ductwork and supports from the structure.</p>				
B5	<p>Piping</p> <p>Description of piping shall be deemed to include joints, flanges, fittings, supports, brackets, painting etc.</p>				

NATIONAL HEALTH LABORATORY SERVICE (NHLS) LABORATORY AT MANAPO HOSPITAL CENTRE

Preambles to Bills of Quantities

Jan-26

ITEM NO.	DESCRIPTION				
B6	<p>Valves</p> <p>Descriptions of valves shall be deemed to include flanged or screwed connections to piping, reducers, supports, etc.</p>				
B7	<p>Assembling</p> <p>Descriptions of manufactured items shall be deemed to include for complete assembling and handing over in a proper working order.</p>				
B8	<p>Pricing</p> <p>It is expected from the Tenderer to price each individual item in this bill of quantities and no alterations, omissions or additions shall be made to the bill or specification.</p>				
B9	<p>Value Added Tax (VAT)</p> <p>Prices for individual items in this bill must be exclusive of VAT. Provision has been made in the Final Summary of this bill for the lump sum addition of VAT.</p>				
B10	<p>Ductwork etc</p> <p>Galvanised sheet steel low velocity supply air ducts etc, fixed horizontally, complete with necessary joints, connections, cutting, longitudinal seams, transverse joints, cross breaking and/or beading, duct stiffening, tie rods, hangers, rivets, screws, bolts and other fastening equipment, sealing and short lengths, as described.</p>				

NATIONAL HEALTH LABORATORY SERVICE (NHLS) LABORATORY AT MANAPO HOSPITAL CENTRE

Jan-26

Laboratory Bills of Quantities

ITEM NO.	DESCRIPTION	UNIT	QTY	RATE	TOTAL
	DUCT WORK				
	Rectangular galvanized low pressure ducting supported from structural steel via hangars and 8mm threaded bar				
	Note: Rate to include for support mechanisms				
1	Category 1 ducting	m ²	175		
2	Category 3 ducting	m ²	7		
	Extra over for low pressure ducting - Category ducting				
3	Category 1 - Radius bends, Square bends, 45° bends, 15° bends, 90° bends, transformations, tees, stop ends or branches	no.	110		
4	Category 3 - Radius bends, Square bends, 45° bends, 15° bends, 90° bends, transformations, tees, stop ends or branches	no.	2		
	Round un-insulated galvanized low pressure ducting not exceeding 1m below steel trusses or concrete soffits including support mechanisms and spigots				
5	500 mm Ø	m	2		
6	250 mm Ø	m	4		
7	200 mm Ø	m	32		
	FLEXIBLE UNINSULATED DUCTING				
	Uninsulated flexible ductwork not exceeding 1.5m girth, externally insulated with 25mm foil faced fibreglass, including jubilee duct clamps and vapour barrier tape				
8	250 mm Ø	m	4		
9	200 mm Ø	m	50		
	DIFFUSION AND GRILLES				
10	(600 x 600)mm supply air grille c/w OBD, plenum box and associated spigot connection - by Brian Rickard or Equal	no.	2		
11	(300 x 200)mm fresh air grille c/w OBD and associated connection	no.	3		
12	(400 x 200)mm fresh air grille c/w OBD and associated connection	no.	1		
13	(500 x 200)mm extract air grille c/w OBD and associated connection	no.	2		
14	(300 x 250)mm opposed blade dampers	no.	1		
15	(350 x 250)mm opposed blade dampers	no.	3		
16	(200 x 250)mm opposed blade dampers	no.	1		
17	(500 x 300)mm opposed blade dampers	no.	1		
18	(400 x 300)mm opposed blade dampers	no.	1		
19	(250 x 250)mm opposed blade dampers	no.	1		
20	200mm dia. Butterfly damper	no.	20		
21	Door grille (600 x 400)mm	no.	14		
TOTAL FOR THIS BILL:					

NATIONAL HEALTH LABORATORY SERVICE (NHLS) LABORATORY AT MANAPO HOSPITAL CENTRE
Laboratory Bills of Quantities

Jan-26

ITEM NO.	DESCRIPTION	UNIT	QTY	RATE	TOTAL
22	Aluminium disc valves 200 diameter	no.	20		
23	(600 x 600) Standard adjustable square 200 dia. CAV Swirl Diffuser complete with mounting frame - by Brian Rickard or Equal	no.	6		
24	(250 x 250)mm storm resistant weather louvre c/w WMS	no.	2		
25	(400 x 400)mm storm resistant weather louvre c/w WMS	no.	1		
26	(1000 x 500)mm storm resistant weather louvre c/w WMS	no.	1		
27	200 mm Ø wire mesh screen	no.	1		
28	500 mm Ø wire mesh screen	no.	1		
EQUIPMENT AND FANS					
29	Mid-Wall inverter type heat pump unit complete with drain pump, brackets and wall mounted controller as specified. Cooling capacity 2.6Kw Matching condenser unit	no. no.	5 5		
30	Mid-Wall inverter type heat pump unit complete with drain pump, brackets and wall mounted controller as specified. Cooling capacity 3.5Kw Matching condenser unit	no. no.	3 3		
31	Mid-Wall inverter type heat pump unit complete with drain pump, brackets and wall mounted controller as specified. Cooling capacity 7Kw Matching condenser unit	no. no.	6 6		
32	Refrigerant copper piping and approved insulation similar or equal to Armourflex, to units, etc., including all fitments and suspending below suspension level (single way)	m	140		
33	PVC conduit installed in ceiling void and chased in wall /partitions, wall box, wall controllers with vibration pads to suite. (Allow 15m PVC conduit per unit)	Sum	1		
34	Condesate drain piping for each unit complete with supports, reduceres, tees, bends as shown 20mm diameter uPVC drain piping	m	115		
35	Inline tube fan 200 mm Ø, 60l/s, 200Pa complete with round duct pieces, flexible connections, flanges, supports, AV mounts and associated accessories	no.	2		
36	200 mm Ø matching sound attenuator	no.	4		
37	Inline tube fan 315 mm Ø, 340l/s, 250Pa complete with round duct pieces, flexible connections, flanges, supports, AV mounts and associated accessories	no.	1		
38	315 mm Ø matching sound attenuator	no.	2		
TOTAL FOR THIS BILL TO SUMMARY PAGE:					

NATIONAL HEALTH LABORATORY SERVICE (NHLS) LABORATORY AT MANAPO HOSPITAL CENTRE
Laboratory Bills of Quantities

Jan-26

ITEM NO.	DESCRIPTION	UNIT	QTY	RATE	TOTAL
39	Inline tube fan 200 mm Ø, 110l/s, 200Pa complete with round duct pieces, flexible connections, flanges, supports, AV mounts and associated accessories	no.	1		
40	200 mm Ø matching sound attenuator	no.	2		
41	Axial flow fan 500 dia. (400l/s, 180Pa, 1440rpm) c/w canvas collars matching flanges, av mounting feet, mounting feet and brackets	no.	1		
42	Axial flow fan 800 dia. (1255l/s, 450Pa, 1440rpm) c/w canvas collars matching flanges, av mounting feet, mounting feet and brackets	no.	1		
43	500 mm Ø sound attenuator, selected for NC 35	no.	2		
44	800 mm Ø sound attenuator, selected for NC 35	no.	2		
45	Filter box (1000 x 500 x 300)mm	no.	1		
46	Filter (1000 x 500 x 50)mm	no.	1		
47	Galvanized light duty cable trays including hangar supports for running refrigerant piping and condensate piping	Sum	1		
ELECTRICS AND CONTROLS					
48	All electrics, wiring and controls associated with the Dx air conditioning units and fans.	Sum	1		
49	Galvanized light duty cable trays including hangar supports for running cables	Sum	1		
EXISTING EQUIPMENT					
50	Decommissioning of the existing installation including all controls and electrics associated with the HVAC equipment. Dismantling of existing HVAC equipment.	Sum	1		
51	Lifting, rigging and transportation of stripped equipment for disposal	Sum	1		
TOTAL FOR THIS BILL TO SUMMARY PAGE:					

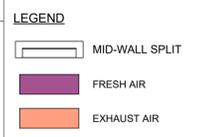
NATIONAL HEALTH LABORATORY SERVICE (NHLS) LABORATORY AT MANAPO HOSPITAL CENTRE
Preliminary and General

Jan-26

ITEM NO.	DESCRIPTION	UNIT	QTY	RATE	TOTAL
	P's & G's				
1	Site Establishment	sum	1		
2	Compliance with Health and Safety	sum	1		
3	Quality Management Plan	sum	1		
4	Technical Submissions and Engineering calculations	sum	1		
5	Workshop drawings	sum	1		
6	Engineering and Supervision	sum	1		
7	Transport of Materials	sum	1		
8	Rigging	sum	1		
9	Supply and erection of scaffolding	sum	1		
10	Meeting attendance throughout contract	sum	1		
11	Testing and Commissioning	sum	1		
12	Training	sum	1		
13	Operating and maintenance manuals & As Built drawings	sum	1		
14	CoC certificates for all HVAC related electrical works	sum	1		
15	1 year Maintenance and Warranty	sum	1		
TOTAL FOR THIS BILL TO SUMMARY PAGE:					

NATIONAL HEALTH LABORATORY SERVICE (NHLS) LABORATORY AT MANAPO HOSPITAL CENTRE		Jan-26
Summary		
ITEM NO.	DESCRIPTION	AMOUNT
	BILL SUMMARY	
1	SUMMARY LABORATORY	
2	SUMMARY P&G's	
TOTAL FOR THIS BILL (EXCLUDING VAT):		

- NOTES:**
- DUCTING TO BE MANUFACTURED IN ACCORDANCE TO SMACNA STANDARDS
 - ALL DUCT DIMENSIONS INCLUDING DIMENSIONS FOR INSULATED DUCTS REFERS TO THE SHEET METAL SIZE.
 - ALL DUCT PASSING THROUGH CONCRETE OR BRICK WALLS SHALL BE ISOLATED FROM THE WALLS BY MEANS OF A HIGH DENSITY GLOSS FIBRE COLLAR OF AT LEAST 25mm IN THICKNESS.
 - GALVANISED STEEL SHALL BE USED FOR ALL AIR-CONDITIONING AND VENTILATION DUCTING
 - ALL DUCTING SHALL BE PROVIDED WITH MEZZ FLANGES.
 - ALL SUPPLY AND RETURN AIR DUCTING EXPOSED TO OUTDOORS SHALL BE EXTERNALLY DOUBLE CLADDED AND INSULATED AGAINST DIRECT SOLAR HEAT GAINS.
 - ALL OPEN END DUCTS TO BE CAPPED OFF WITH PLASTIC PRIOR TO DELIVERY TO SITE.
 - DUCT HANGERS
- | LONGEST DUCT DIMENSION (mm) | ROUND HANGER (mm) | GALVANISED STRIP HANGERS (mm) | SHELF ANGLES | HANGER SPACING (m) |
|-----------------------------|-------------------|-------------------------------|--------------|--------------------|
| UP TO 760 | 6 | 25x16 | 25x25x3 | 3.0 |
| 761 TO 1000 | 10 | 25x16 | 38x38x3 | 3.0 |
| 1000 TO 2100 | 10 | 25x16 | 50x50x3 | 2.4 |
| 2100 TO 2400 | 10 | 25x16 | 50x50x6 | 2.4 |
| 2401 TO ABOVE | 12 | 25x16 | 50x50x6 | 2.4 |
- ALL DIFFUSER SUPPLY FLEXIBLE TO COME c/w JUBILEE CLAMPS AND SEALED WITH DUCT TAPE ON FINAL INSTALLATION.
 - ALL SUPPLY AIR DUCTING TO BE INSULATED EXTERNALLY WITH 25mm FOIL FACED FIBREGLASS TYPE FRK - ONLY AC DUCT
 - ALL FLEXIBLES TO BE THERMALLY INSULATED - ONLY AC DUCT



- LEGEND**
- [T] WALL MOUNTED THERMOSTAT MOUNTED @ 1450mm A.F.F.L
 - [CT] ABOVE CEILING CONTROL THERMOSTAT LINKED @ DIFFUSER.
 - [S] CEILING MOUNTED TEMPERATURE SENSOR LINKED TO BMS. (ALL SCREEN/CONTROL CABLES TO RUN IN P8000 UNISTRUT).
 - [SS] STATIC PRESSURE SENSOR MOUNTED IN DUCT
 - [BTS] ZONE TEMPERATURE SENSOR @ RETURN AIR DUCT
 - * DOOR UNDERCUT - 40mm
- ELECTRICAL LEGEND**
- [1P] 1 PHASE ELECTRICAL EQUIPMENT
 - [3P] 3 PHASE ELECTRICAL EQUIPMENT
 - [5A] 5A PLUG COMPLETE WITH SHAVED EARTH PINS
 - [AC-DB] AC-DB
 - [P8000] P 8000 UNISTRUT 2 OFF

CLIENT
 NATIONAL HEALTH LABORATORY SERVICE

ARCHITECT
 DESIGNSCAPE architects

REVISIONS

REV.	DATE	BY	DESCRIPTION
A	19/01/2020	H.N	ISSUE FOR TENDER

ISSUED FOR

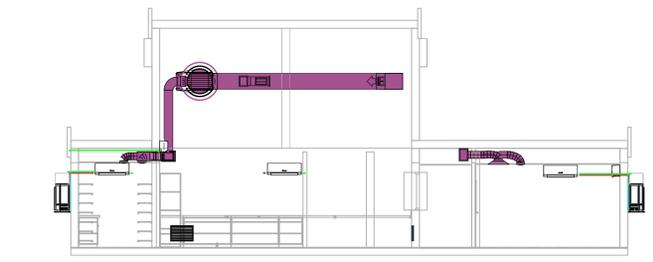
	PRELIMINARY	COUNCIL SUBMISSION
X	TENDER	AS BUILT

MANAPO NATIONAL HEALTH LABORATORY SERVICES

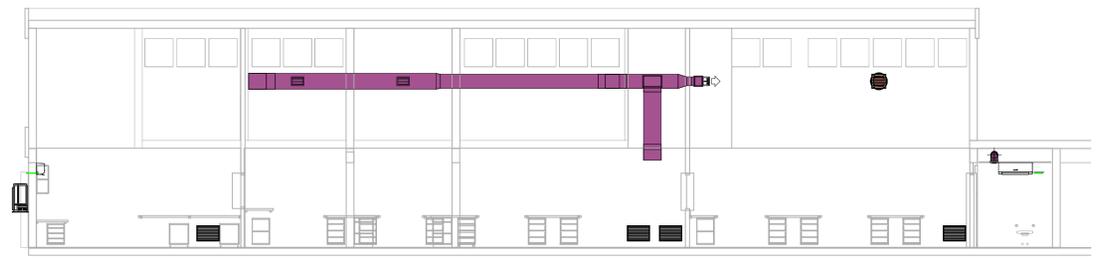
GROUND FLOOR HVAC LAYOUT

Mekan Engineering Services
 9 Connor Ave
 Westdene
 Bloemfontein
 9301
 TEL: 051 448 4864
 FAX: 051 448 4123
 E mail: info@mekan.co.za
 Web Site: www.mekangroup.co.za
 Reg no 201712367307

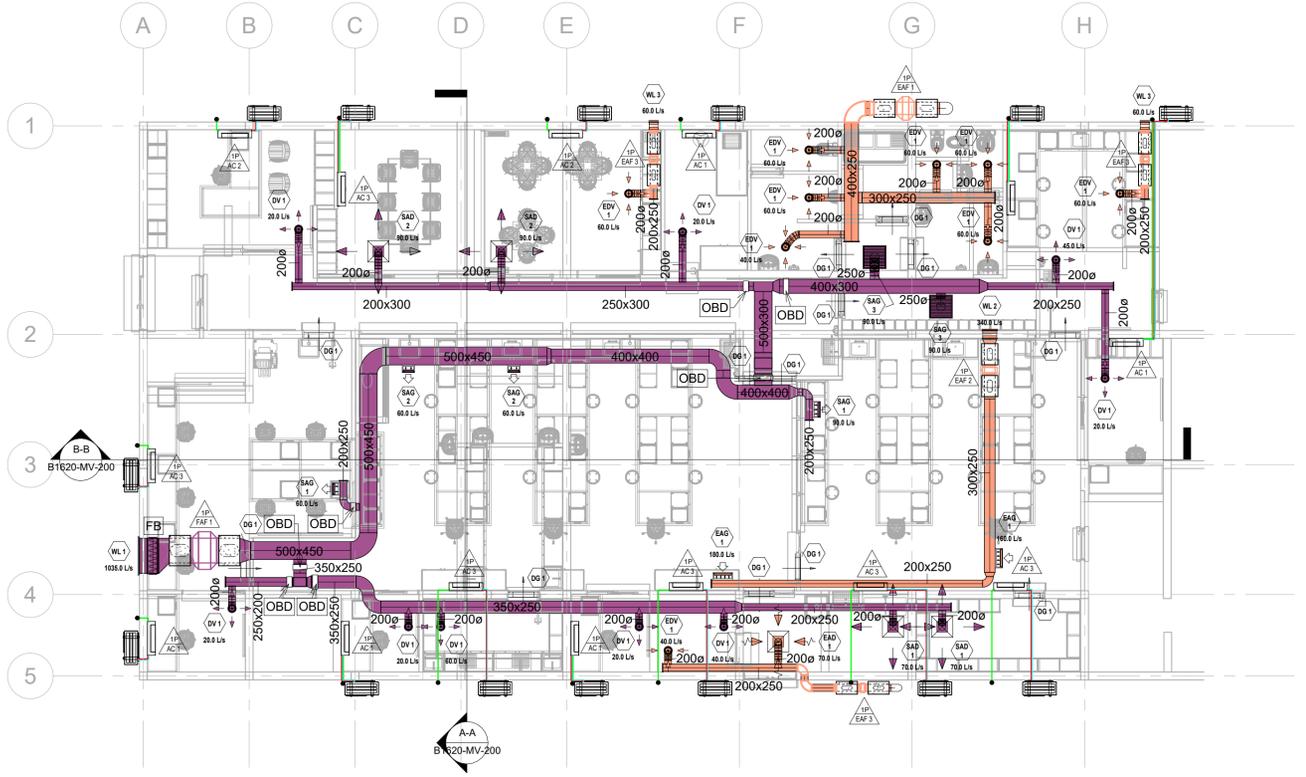
Drawn By	Designed By	Senior Engineer	Date
H.N	W.M		16/01/2020
Discipline	Project Engineer	Pi. Registration No.	Scale
HVAC SERVICES			As indicated
Drawing No.	Rev No.		
B1620-MV-200	A		



SECTION A-A
1 : 100



SECTION B-B
1 : 100



GROUND FLOOR
1 : 100

Air Terminal Schedule

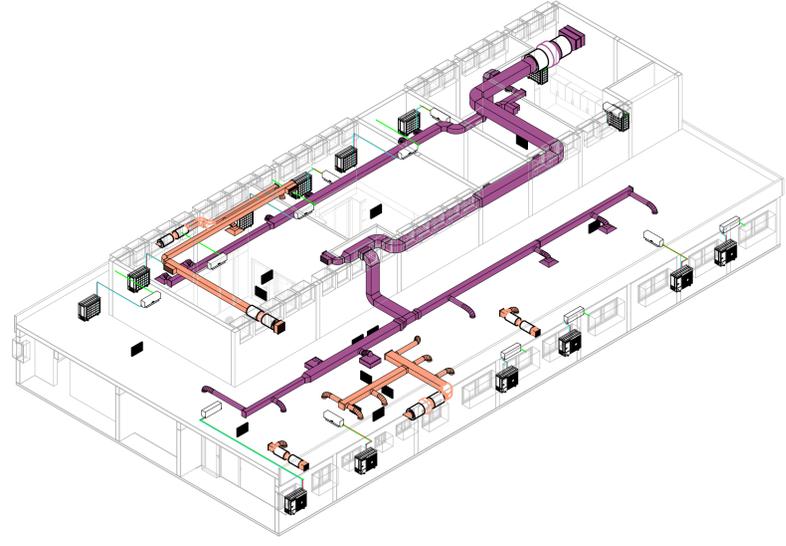
Mark	Description	Flow	Size	Count
DG 1	DOOR GRILLE	0.0 L/s	600x400	13
DV 1	FRESH AIR DISC VALVE	<varies>	200ø	9
EAD 1	EXTRACT AIR GRILLE	70.0 L/s	300x300	1
EAG 1	EXTRACT AIR GRILLE c/w OBD	<varies>	500x200	2
EDV 1	EXTRACT AIR DISC VALVE	<varies>	200ø	9
SAD 1	FRESH AIR DIFFUSER	70.0 L/s	300x300	2
SAD 2	FRESH AIR DIFFUSER	90.0 L/s	300x300	2
SAG 1	FRESH AIR GRILLE c/w OBD	<varies>	<varies>	2
SAG 2	FRESH AIR GRILLE c/w OBD	60.0 L/s	300x200	2
SAG 3	FRESH AIR GRILLE c/w OBD	90.0 L/s	600x600	2
WL 1	WEATHER LOUVRE c/w WMS	1035.0 L/s	1000x500	1
WL 2	WEATHER LOUVRE c/w WMS	340.0 L/s	400x400	1
WL 3	WEATHER LOUVRE c/w WMS	60.0 L/s	250x250	2

Mechanical Equipment Schedule

Mark	Description	Cooling Capacity (kW)	Power In (kW)	Power/pH/Hz	Count
AC 1	MID-WALL SPLIT	2.6 kW	0.85 kW	240V/1pH/50Hz	5
AC 2	MID-WALL SPLIT	3.5 kW	1.1 kW	240V/1pH/50Hz	3
AC 3	MID-WALL SPLIT	7.0 kW	2.1 kW	240V/1pH/50Hz	6

Fan Equipment Schedule

Mark	Description	Static Pressure	Power In (kW)	Power/pH/Hz	Count
EAF 1	DIA.500 AXIAL FLOW FAN c/w ATTENUATORS	180 Pa	0.25 kW	400V/3pH/50Hz	1
EAF 2	DIA.315 INLINE FAN c/w ATTENUATORS	250 Pa	0.2 kW	240V/1pH/50Hz	1
EAF 3	DIA.200 INLINE FAN c/w ATTENUATORS	200 Pa	0.2 kW	240V/1pH/50Hz	3
FAF 1	DIA.800 AXIAL FLOW FAN c/w ATTENUATORS	450 Pa	2.2 kW	400V/3pH/50Hz	1



REFERENCE DRAWINGS

REFERENCE DESCRIPTION	DRAWING NO.	REV	REV DATE