

SARS MUSINA WAREHOUSE and OFFICES HVAC INSTALLATION SPECIFICATION

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PART IV

GENERAL TECHNICAL SPECIFICATION

PART IV

GENERAL TECHNICAL SPECIFICATION

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PART V

PROJECT SPECIFICATION

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PART V

SARS MUSINA WAREHOUSE and OFFICES 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	IV	Standard Technical Specification
Part	V	Project Specification
Part	VI	Schedules of capacities
Part	VII	Schedule of equipment and rates (tender returnables)
Part	VIII	Drawings

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

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

3 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

4 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

5 SANS SPECIFICATIONS

SANS Code	Description
SANS 1200	Standardised 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

6 DRAWING REGISTER

Drawing Number	Drawing name	Paper Size
B05.PTA.000533 – M - 100	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
Musina		
	Altitude	548 m
	Summer Dry Bulb	35 °C
	Summer Wet Bulb	25.7 °C
	Winter Dry Bulb	7.6 °C
	Winter Wet Bulb	3.4 °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 building.

Area	Area Description	Control condition
Meeting rooms and Pause area	Summer	22 °Cdb ± 1.5 °C
	Winter	21 °Cdb ± 1.5 °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 SARS is to establish their warehouse and offices at Musina in an existing unoccupied

building. The building is to be refurbished to suite the new occupancy.

- 8.1.2 The building consists of a warehouse and an administration block. The administration block is air conditioned with mid-wall split non inverter air conditioning units and the warehouse ventilated with roof ventilators.
- 8.1.3 The new fit out shall include installation in the boardrooms, pause area and cleaner rooms in the administration block and storerooms in the warehouse.
- 8.1.4 Construction and installation in the new sections is to be complete in September for the administration block and Mid-October for the warehouse.

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. The HVAC scope of works includes the following:

- 8.2.1.1 Admin offices:

The supply and installation of DX-Split inverter air conditioning units in the boardrooms and pause area.

The supply and installation of DX-Split condenser units securely supported on the exterior walls of the administration block, matching installation of existing units.

The supply and installation of extract ventilation system in the cleaner's rooms.

- 8.2.1.2 Warehouse

The supply and installation of roof extract ventilation system in the destruction area and hazardous objects room.

- 8.2.1.3 The installed systems are to be fully checked and commissioned once installed.

9 **DX SPLIT TYPE AIR CONDITIONING SYSTEM (ADMIN OFFICE)**

Refer to parts IV.34, IV.36, IV.38, IV.41, IV.46, IV.63, IV.64, IV.80 of the standard specifications.

9.1 **General**

- 9.1.1 New cassette and mid-wall split air conditioning units are to be supplied for boardroom 1, boardroom 2 and pause area as indicated on the drawings.
- 9.1.2 All units are to be of the heat pump, inverter driven type.
- 9.1.3 Tenderers are to ensure that the split units offered are capable of operating so as to produce the specified **sensible cooling** and total cooling capacities at the conditions

specified, and at medium evaporator fan speed.

- 9.1.4 All condenser units are to be supplied complete with hail guards.
- 9.1.5 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.
- 9.1.6 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.
- 9.1.7 Compressors shall be of the hermetically sealed type.
- 9.1.8 The tenderers are to allow for suitable support of the evaporator units.
- 9.1.9 Approximate pipe routes are shown on the drawings. Where piping penetrates walls and slabs etc., adequate sleeves shall be provided under this contract.
- 9.1.10 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. Trunking to be suitably sized rectangular P2000 or P8000 galvanised "Unistrut", complete with removable cover plate, securely fixed to the walls.
- 9.1.11 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)
- 9.1.12 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)
 - Timer settings
- 9.1.13 Drain piping from the indoor units shall be taken from the units to the nearest drain point as shown on the drawings.
- 9.1.14 The Contractor shall allow for a P-trap in the condensate drainage piping at the drain outlet of all units.
- 9.1.15 All controls and interlocking between the evaporator coil unit, and the condensing unit form part of this contract.
- 9.1.16 All control units shall be of the hardwired type.

- 9.1.17 Tenderers are to allow for the chasing into walls and within partitions for the controller wiring as part of the contract. All electrical installations must comply with standard wiring and safety regulations as applicable.
- 9.1.18 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, as well as on the ceilings in the position of the concealed units.
- 9.1.19 All existing as well as new concealed units are to be capable of sensing the room/return air temperature at both the wall controller as well as at a remotely located sensor in the area served. (by selecting the appropriate sensing method)
- 9.1.20 Tenderers shall allow in their pricing for all exposed piping to be installed in galvanized metal trunking with covers.
- 9.1.21 The unit references shall correspond with those indicated in the final operating and maintenance manuals.
- 9.1.22 All units shall be installed, piped, wired and commissioned in accordance with the manufacturer's recommendations.
- 9.1.23 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.
- 9.1.24 The indoor and outdoor unit must be interconnected with copper refrigerant piping in terms of the 'suppliers' recommendations.
- 9.1.25 The tenderer is to note the distances between the indoor and outdoor units and ensure suitably sized piping is allow for to accommodate the capacities specified.
- 9.1.26 The return of oil to the compressor is to be ensured by the installation of traps at regular intervals.
- 9.1.27 All piping through walls shall pass through sleeves which shall be properly sealed after installation.
- 9.1.28 Insulation through sleeves shall be continuous.
- 9.1.29 All refrigerant, liquid and suction, shall be separately insulated with armaflex insulation

10 AIR OUTLETS, INLETS, GRILLES, DAMPERS

Refer to Parts IV.17, IV.21, IV.22 of the standard specification.

- 10.1 All external weather louvers/grilles shall be of the natural anodised aluminium type complete with opposed blade dampers.

- 10.2 Return air grilles on ducted hide away units shall be suitable for drop in ceiling applications. The existing return air grilles shall be reused wherever possible.
- 10.3 All door grilles are to be supplied under this contract. Installation of the door grilles will be by the main 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 Diffusers shall be of the plate type and shall be coloured white to match the ceiling colour as indicated on the drawings. However, tenderers are to take note of the "wood ceiling" finishes on the floors where the colour of these diffusers are to be agreed upon with the architect prior to ordering.
- 10.6 Flexible ducting shall be insulated for all return and supply air ducting, and shall not exceed 1200mm in length. Existing flexible ducting shall be reused wherever possible.
- 10.7 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.

11 FILTERS

Refer to Part IV.15 of the standard specification.

- 11.1 All filters on concealed units are to be 25mm of the pleated washable type, easily removable for maintenance purposes.

12 ELECTRICAL

- 12.1 All electrical installations must comply with standard wiring and safety regulations as applicable.
- 12.2 All wiring from the evaporator power point (isolator) in the void (supplied by others) to evaporator units fall under this contract.
- 12.3 All cabling from the main AC Distribution board to the respective condensers form part of this contract.
- 12.4 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.
- 12.5 All evaporator units shall be identified clearly with reference tags 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.

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

13 DRAIN PIPING

- 13.1 Drain piping from the indoor as well as the outdoor unit, (if required) shall be taken from the units to the nearest drain point.
- 13.2 Drain pipes shall be of uPVC. No other material shall be considered for drain pipes whether it is indoors or outdoors.
- 13.3 Drain pipes shall be installed with no sagging.
- 13.4 The piping shall allow for a p-trap in the condensate drainage piping at the drain outlet of each evaporator unit.
- 13.5 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.
- 13.6 All drain pipes shall be tested in the presence and to the satisfaction of the engineer prior to the closing up of the ceilings.

14 FAN SYSTEMS

Refer to the Part IV.16, IV.07, IV.15, IV.63 & IV.64 of the standard specification's.

14.1 Extract air fan/ducting systems

- 14.1.1 The contractor is to allow for the supply and installation of extract air fan systems (including explosion proof fan for the warehouse) with ducting, attenuators, inlets, grilles, controls, electrics complete in all respects as indicated.
- 14.1.2 All fans are to be 1440 RPM or slower. (No 2880 RPM fans are acceptable)
- 14.1.3 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.
- 14.1.4 The ventilation systems shall be neatly installed into the ceiling and shall be silent in operation.
- 14.1.5 All system elements are to be easily accessible for maintenance and shall be switched on via a wall mounted switch.

15 DUCTING

Refer to Part IV.17, IV.21, IV.22, IV.36, IV.56 of the standard specifications.

- 15.1 All extraction system and exhaust ducting shall be un-insulated, galvanised sheet metal steel ducting.
- 15.2 Manual air volume and control dampers shall be installed in all the branch ducts to ensure proper air balancing as indicated. Butterfly dampers shall be fitted to all spigot off takes serving diffusers.
- 15.3 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.
- 15.4 Inspection and test openings shall be provided at all positions where it is required.
- 15.5 Ducting shall be airtight. No leaks at joints shall be permitted. All ducting shall be flanged.
- 15.6 All rectangular ducting is to be Mezz flanged only.
- 15.7 All duct branches must be properly radii, including take-offs just before air outlets.

16 NOISE LEVELS

Refer to Part IV.16, IV.17 of the standard specification.

16.1 General

- 16.1.1 The maximum noise level (NC levels) in the areas are to be as follows.
- Pause area : NC 35
 - Meeting rooms : NC 30
 - General public areas : NC 40
- 16.1.2 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.
- 16.1.3 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.
- 16.1.4 The above noise levels shall not be exceeded with all mechanical equipment running.
- 16.1.5 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

16.1.6 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.

16.1.7 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.

17 ANTI VIBRATION MOUNTINGS

17.1 Refer to Part IV.7 of the standard specification.

17.1.1 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 split units and extract fans.

17.1.2 Inertia bases, where required by the Supplier in order to meet the specification shall be included in the tender price.

18 BUILDER'S WORK

18.1 The following builder's work shall form part of the mechanical contract:

18.1.1 The contractor shall prepare builders work drawings based on the layout drawings which he shall obtain from the Architect via the main contractor.

18.1.2 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.

18.1.3 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.

18.1.4 Where required, all openings shall be sealed after installation of systems.

18.1.5 The removal from site of all redundant equipment and materials.

18.1.6 The hoisting and positioning of all equipment.

18.1.7 Scaffolding as required.

18.1.8 The installation of door grilles, louvers etc into openings provided by the main

contractor.

- 18.1.9 The mechanical engineer will coordinate all mechanical services with the main contractor and other subcontractors in all respects.

19 WORKSHOP DRAWINGS

- 19.1 Refer to Part IV.01 and IV.80 of the standard specifications.
- 19.1.1 Three copies of all workshop drawings must be submitted for approval before ordering and installation can commence.
- 19.1.2 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.
- 19.1.3 The workshop drawings shall include the following:
- 19.1.4 Equipment layout and sections.
- 19.1.5 Electric wiring and control circuits, and electrical power requirements.
- 19.1.6 Builder's work drawings as specified.

20 TRAINING

Refer to Part IV.01 and IV.80 of the standard specifications.

- 20.1 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.
- 20.2 The Maintenance and Operating Manuals shall be in the possession of the Client before the training commences.

21 GENERAL REQUIREMENTS

Refer too Part IV.01 & IV.80 of the standard specifications.

- 21.1 Site supervision by Subcontractor
- 21.1.1 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.

- 21.1.2 The Subcontractor shall replace the supervisor at his own cost if the aforementioned supervisor is unable to perform his duties satisfactorily.
- 21.1.3 The submission of the supervisor's CV is required only after the Subcontractor has been appointed.
- 21.1.4 Standard Specification
Refer to Part IV.1, Clause 1.
- 21.1.5 Project Specification
Refer to Part IV.1, Clause 2
The term "Detail Technical Specification" should read "Project Specification".
- 21.1.6 Equivalent Manufacture
Refer to Part IV.1, Clause 3.
- 21.1.7 Equipment Installation
Refer to Part IV.1, Clause 4.
- 21.2 Local Representation
Refer to Part IV.1, Clause 5.
- 21.3 Submissions by Subcontractor
- 21.3.1 Submissions with regard to equipment (all with spares that are freely available in South Africa.)
- 21.3.2 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.
- 21.3.3 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
- 21.3.4 The above submissions are required after appointment of the Subcontractor and in

accordance with the requirements of the main contract program.

21.3.5 The following submissions are required upon appointment :

- All split units
- All fan systems
- Mounting, support, suspension details piping and ducting
- Grilles
- Wall mounted controllers (split units)
- Any other components as required by the engineer

21.4 Marked-up Drawings and Shop Drawings:

Refer to part IV.1, Clauses 6 and 7

21.4.1 Marked-up structural and other drawings:

21.4.1.1 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.

21.4.2 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.

21.4.3 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.

21.5 Installation Fit

Refer to Part IV.1, Clause 8.

21.6 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.

21.7 Wooded and Steel Frames and Sleeves

Refer to Part IV.I, Clause 10.

21.8 Samples to be supplied

The contractor shall supply the following samples

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

21.9 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.

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

Refer to Part IV.80

- 21.10.1 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.
- 21.10.2 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.
- 21.10.3 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.
- 21.10.4 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.
- 21.11 Language
- 21.11.1 All notices on equipment shall be in English.
- 21.12 Standard Specifications
- 21.12.1 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.
- 22 PROTECTION, CLEANING, ADJUSTMENTS, AND TESTS**
- 22.1 Refer to part IV.41 of the Standard Specification.
- 23 EXTENDED GUARANTEE**
- 23.1 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.

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 airconditioning 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 : 35,0°Cdb/25.7°Cwb
- 6.2.2. Condenser selection @ 40,0°Cdb
- 6.2.3. Winter ambient :-7.6°Cdb/3.4°Cwb
- 6.2.4. Site Altitude: 548m 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.

6.1. FANS

FANS:	AREAS SERVED	NR OFF	AIR FLOW RATE	ESTIMATED STATIC PRESSURE	POWER INPUT (APPROX)		SPECIAL REQUIREMENT
ADMIN BLOCK							
UNITS			L/s	Pa	V/ Phase/Hz	kW	
IF	Cleaner's room extract systems	1	240	200	230/1/50	0.2	Inline tube fan
WAREHOUSE							
UNITS			L/s	Pa	V/ Phase/Hz	kW	
EF1	Hazardous objects extract system	1	1750	300	400/3/50	3	Explosion proof roof fan
EF2	Destruction area extract system	1	1810	300	400/3/50	3	Explosion proof roof fan

6.5 DX SPLIT UNITS INVERTER TYPE (HEAT PUMP)

INDOOR UNITS	Type	Estim. airflow at med fan speed (l/s)	Total Cooling capacity at med fan speed	Sensible Cooling Capacity at med fan speed	Heating Capacity
ADMIN BLOCK	GROUND FLOOR				
		(l/s)	(kW)	(Kw)	(kW)
AC01	Cassette	N/A	7.2	5.8	2.9
AC01	Cassette	N/A	7.5	5.7	2.5
AC02	Midwall	N/A	5.2	2.9	1.6

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 VII

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	MAKE	POWER INPUT (APPROX)	MODEL AND SIZE
ADMIN BLOCK					
IF	Cleaner's room extract systems	1			
WAREHOUSE					
EF1	Hazardous objects extract system	1			
EF2	Destruction area extract system	1			

7.3 DX SPLIT UNITS

	ADMIN BLOCK			COOLING ONLY	
<u>INDOOR UNITS</u>	Make	Model	Airflow at med fan speed (l/s)	Total Cooling capacity at med fan speed	Sensible Cooling Capacity at med fan speed
			(l/s)	(kW)	(kW)
MW F1			N/A		
MW F2			N/A		

7.4 MISCELLANEOUS ITEMS

MISCELLANEOUS	MANUFACTURE	MODEL NR
DIFFUSERS		
GRILLES		
DAMPERS		
ELECTRONIC CONTROLS		
CIRCUIT BREAKERS		
ACTUATORS		
OTHER		

7.5 SUB-CONTRACTORS

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

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

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)
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 %

7.8 COMPANY DETAILS AND PREVIOUS EXPERIENCE

7.8.1 Company Organogram & resources

The tenderer is to submit their company résumé indicating the organizational structure. Resources, designations, and infrastructure are to be clearly described/illustrated.

7.8.2 Similar Projects undertaken:

Submit list of previous projects undertaken of a similar nature. List of previous air handling unit, refurbishment commissioning, air balancing projects undertaken in the last five years.

Project 1:

Project Name	
Date	
Contract value	
Reference name	
Reference Contact Number	
Project description (scope)	

Project 2:

Project Name	
Date	
Contract value	
Reference name	
Reference Contact Number	
Project description (scope)	

Project 3:

Project Name	
Date	
Contract value	
Reference name	
Reference Contact Number	
Project description (scope)	

Project 4:

Project Name	
Date	
Contract value	
Reference name	
Reference Contact Number	
Project description (scope)	

Project 5:

Project Name	
Date	
Contract value	
Reference name	
Reference Contact Number	
Project description (scope)	

PART VIII

HVAC AND MECHANICAL INSTALLATION

DRAWINGS