Provisional Bills of Quantities for the Proposed Refurbishment of Trans Kalahari Border to a One Stop Border Post, at Buitepos, in Omaheke Region

for

NAMIBIA REVENUE AGENCY

Bid No.:_____

ANNEXURE V: HVAC INSTALLATION

Name of Bidder: _____

Bid Price (N$-Incl. VAT): _____

PROJECT TEAM

Client	Architect	Electrical/Mechanical Engineer	Structural/Civil Engineer	Quantity Surveyor
NAMRA - Namibia Revenue Agency Windhoek, Namibia	Chigama Architects Windhoek, Namibia Tel: 061-259 125	DEKA Consulting Engineers Windhoek, Namibia Tel: 061- 220 959	DEKA Consulting Engineers Windhoek, Namibia Tel: 061- 220 959	Jordaan Oosthuysen Nangolo QS Windhoek, Namibia Tel: 061-22 0081

JANUARY 2024

SECTION I: INSTRUCTIONS TO BIDDERS

Bidders should see the main bidding document for Instruction to Bidders

1 QUALIFICATION CRITERIA

Bidders should see the main bidding document and in addition submit documents in respect of the following:

(a) experience in works of a similar nature and size, and details of work under way or contractually committed; and clients who may be contacted for further information on those contracts;

2 TECHNICAL COMPLIANCE

The Specification and Compliance Sheet details the minimum specifications of the works to be carried out. The specifications have to be met, but no credit will be given for exceeding the specification.

3 PRICES AND CURRENCY OF PAYMENT

Prices for the execution of works shall be fixed in Namibian Dollars as quoted.

Bids shall cover all costs of labour, materials, equipment, overheads, profits and all associated costs for performing the works, and shall include all duties. The whole cost of performing the works shall be included in the items stated, and the cost of any incidental works shall be deemed to be included in the prices quoted.

SECTION II: STATEMENT OF REQUIREMENTS

A. SCOPE OF WORKS, SPECIFICATIONS AND PERFORMANCE REQUIREMENTS

1 CODES OF PRACTICE FOR INSTALLATION

The installation of material will be carried out in accordance with the following Codes of Practice:

1. SABS 400: National Building Regulations
2. SABS 0147: Refrigerating systems including plants associated with air conditioning systems
3. SANS 10147: Refrigeration system including plants associated with air-conditioning systems
4. SNAS 10173: The installation, testing, and balancing of air-conditioning duct work
5. SANS 1238: Air-conditioning ductwork
6. SNAS 1424: Filters for use in air-conditioning and general ventilation
7. SANS 10252: Code of Practice for water storage and plumbing
8. OSHACT: Occupational Health and Safety Act.
9. Labour Act: 1992 Regulation relating to the Health and Safety of Employees at Work.
10. SANS 0142: Code of Practice for the Wiring of Premises.
11. SANS 10252: Code of Practice for water storage and plumbing
12. OSHACT: Occupational Health and Safety Act.
13. Labour Act: 1992 Regulation relating to the Health and Safety of Employees at Work.
14. The relevant local bye-laws and regulations of the supply authority.

All material and equipment supplied and/or installed under this contract shall be new and shall also comply with the requirements laid down in the latest editions of the relevant NRS, SANS, OSHACT or IEC and their amendments (if any).

The material specified is the preferred material. If alternative materials are offered, they shall be separately specified for approval of the engineer. Rates entered in the schedule of quantities shall be for the specified materials. In the event of items bearing the SABS mark being available in respect of the materials and equipment required, only items bearing this mark will be acceptable.

1.1 Equivalency of Standards and Codes

Wherever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract.

2 PARTICULAR PROJECT SPECIFICATIONS

2.1 GENERAL DESCRIPTION OF THE WORKS

The contract covers all the work required for the detail design, supply, delivery to site, installation, testing, commissioning, preventative maintenance for a period of 3 calendar

months and handing over in good working order of a complete heating, ventilation and air conditioning (HVAC) systems as per Engineer's drawings. The Contractor shall install all equipment in accordance with the Manufacturer's instructions and recommendations. The components of supply shall include:

- Air conditioning systems
- Ventilation System

The Contractor shall be responsible for the supply, delivery to site, installation, testing, commissioning and maintenance during the guarantee period [Twelve (12) calendar months] and handing over in good working order of the entire works.

The Contractor shall provide all materials, equipment, labour and services necessary for the complete, safe and efficient operation of the HVAC installation in accordance with the intention of this specification and drawings. Bids for the works are invited by the Employer and the successful Bidder shall become a HVAC Contractor.

The specification and drawings form part of and shall be read in conjunction with all contract documents and drawings, bills of quantities and the standard specifications. The project will be executed over an estimated period as suggested by the Mechanical Contractor and shall not exceed the approved completion date of the Principal Contract at the Time of Bid. All work specified in this document form part of this contract unless specifically excluded.

The Works Comprise of the following:

1. Setting out the works.
2. Locate and record existing services.
3. Installation/construction of HVAC infrastructure in accordance with specifications and drawings.
4. Testing, commissioning in accordance to relevant SANS Specifications
5. Tie-in and hand-over of the completed installation, including provision of as-built drawings and spanning sheets.
6. Removal of camp establishment, and trim and finish-off site.
7. The maintenance of the works and compliance with all other requirements of the Contractor's defects liability.

2.2 DESCRIPTION OF SITE AND ACCESS

The site where the works will be executed is situated in Kalahari" border Post, 110 km east from the Town of Gobabis in the Omaheke Region outside Gobabis. Approximate GPS Coordinates:

- Latitude: 22°16'30.43"S
- Longitude: 19°59'22.54"E

No official site inspection will be conducted prior to bid closing date and bidders must ensure that they familiarise themselves with local conditions. The boundaries of the site consist of the area associated with the works to be executed under this contract as per layout drawings

including construction camps, any storage and work areas which the Contractor may require and which are approved by the Engineer.

2.3 DETAILS OF CONTRACT

Special care must be taken not to damage or disturb any of the existing services such as existing water supply lines, roof sheets or any building works. The location and protection of all services however remains the responsibility of the Contractor.

The Contractor will not be allowed unrestricted use of the site but must agree with the Local Authorities and owner of the said property to the size and position of the areas required for the proper execution of the Works. All excess material excavated must be dumped and levelled in designated areas as approved by the Local Authority. The Contractor will be allowed areas for the storage of materials, erection of camp etc. and must limit himself to these areas, which are to be approved.

2.4 CONSTRUCTION PROGRAMME

Bidders should see the main bid. In addition, the Contractor shall provide a detailed programme, providing information on labour and plant resources and an estimated cash flow. The critical path shall be clearly defined and the programme shall be drawn up in sufficient detail.

The Contractor is allowed to plan and programme the Works to suit himself/herself, but has to consider the request of the Employer as to which erven are to be provided with services as a matter of priority. Erven, where the services have been completed, shall be made available for use by the public as soon as possible. The Engineer will confirm the takeover of the completed services at the monthly site meetings. The proposed duration of the works is to include Builders Holiday and special non-working days.

2.5 SURVEY BEACONS, BENCH MARKS AND REFERENCE PEGS

Benchmarks or reference beacons will be pointed out to the Contractor during the site handover. The Contractor is responsible for the setting out of the Works and must include it in the Bidded rates. The Contractor is also responsible to see that no reference/bench marks, beacons and benchmarks are covered up or disturbed.

Should the Contractor's Surveyor identify discrepancies in the design with regard to any of the services to be constructed, he must report this to the Engineer immediately. Under this contract, the Contractor will set out the works and levels, compare the data with that of the design as shown on the drawings and report any discrepancies to the Engineer well in advance of construction.

2.6 SITE FACILITIES AVAILABLE

Water Supply

The Contractor is to liaise with the Local Authorities and owner of the said property to the water take-off points. Arrangements for and payment of water used must be made with the Local Authorities and owner of the said property.

Power Supply
The Contractor is to liaise with the Local Authorities. Arrangements for and payment of electricity used must be made with the Local Authorities.

Contractor's Camp
The Contractor is to liaise with the Local Authorities and the owner of the said property as to where to establish camp. This will be finalized at the Site hand-over. No housing is available for the Contractor's employees, and the Contractor shall make his own arrangements to house his employees. The Contractor will have to make provision of accommodation for the entire team.

2.7 SITE FACILITIES REQUIRED

Laboratory Facilities
None Required.

Temporary Offices
None required.

Sanitary Facilities
Toilets must be supplied for the Contractor's employees. No open defecation will be allowed or tolerated.

Name Board
None Required.

Rain Gauge
Rainfall during the construction period shall be measured on each site from a representative point. All equipment necessary is to be supplied, installed and maintained by the Contractor at his own expense and access to such point must be restricted. The Engineer must approve rainfall measurement and equipment.

3 FEATURES REQUIRING SPECIAL ATTENTION

3.1 Existing Services

No detail regarding existing services is available. The Contractor will be responsible to determine the position of all existing services with the cooperation of staff of the Ministry of Education, Arts and Culture. During site establishment and setting out, the position of existing lines shall be located prior to construction. Any damage to existing infrastructure shall be reported to the Engineer, and repaired at the Contractor's cost.

3.2 Care, Damage and Protection

When locating any services, the Contractor must take extreme care to avoid damage. The repair of all damaged existing services will be for the account of the Contractor.

3.3 Requirements for Temporary Works

Any excavation or spoiled material (dumps) that may, in the opinion of the Engineer, be a danger to the public or its property must be barricaded in such a way that no accidents or

damages will occur to either. Two strategically placed warning lights must be placed at the barricaded site to warn the public during the night (if applicable).

The Contractor shall be responsible for his own access roads for construction and shall be expected to maintain these and make allowance for such under the Preliminary and General items.

3.4 Safety requirements

The Contractor's attention is drawn to the safety on the site. Although the construction area is remote and unoccupied, public does have access to the site and movement of people through the site might occur from time to time.

The Contractor shall be responsible for the safety on the site at all times and he shall adhere to the laws and bylaws as well as the safety regulations. Works in progress shall be barricaded and warning signs erected as required by the law.

3.5 Occupational Health and Safety Act

All Occupational Health and Safety Act regulations pertaining to the work being carried out must be adhered to. The Contractor's employees and sub-contractor's (including their employees) shall at all times be supervised by a competent supervisor appointed in writing in terms of Reg. 11.1 of the General Safety Regulations of the Occupational Health and Safety Act and made aware of his responsibilities.

3.6 Extension of Time for Completion for Abnormal Rainfall

Extension of time for completion shall be granted under the Conditions of Contract for "Special Circumstances" arising from abnormal rainfall. Abnormal rainfall is defined as any rainfall in excess of 30% of the averages. The Contractor must, therefore, after a study of the rainfall pattern of Omaheke area of previous years, allowing for working time lost due to normal rainfall. No claim for extension of time shall be considered where the working time was lost as the result of rain, which could normally have been expected to fall during a certain period of time.

4 SUB-CONTRACTORS

The employment of specialised and selected sub-contractors is not envisaged on this project. If the Contractor intent to use a sub-contractor for certain activities of the works, he shall state in his Bid, which sub-contractor he intends to employ for any specific works. The Employer reserves the right, to accept or reject sub-contractor(s) if previous work was of an unsatisfactory standard.

5 SURPLUS MATERIALS

Due to the uncertain nature of certain aspects of the works at the Bid stage, the Contractor shall make arrangements with his suppliers to return surplus material after completion of the contract.

The Contractor is therefore required to store his material in such a manner that this will not be damaged whilst in storage. No payment will be made for material not used in the Works and that cannot be returned to the suppliers.

6 LABOUR REQUIREMENTS AND SAFETY OF WORKMEN

The entire works shall be carried out in accordance with the requirements of all relevant Government Acts and Regulations. The Contractor shall not enter or work on, in or in close proximity of any existing structure, pump station, sump, manhole and such like without obtaining the prior permission of the Engineers. The Contractor shall provide suitable and safe access in form of ladders, gangways, etc. to all parts of the works as may be required for construction purposes of for inspection by the Engineer.

The Contractor shall take precautions to ensure the safety of his employees and other persons on the site of the works. All precautions shall be taken to protect workmen from falling material and other dangers whilst carrying out duties. Shafts and trenches shall in every way be kept safe for persons working therein.

Labour intensive construction methods should be used as far as possible and local labourers shall be employed. The Contractor shall abide by the relevant laws governing the employment and accommodation of labour. All arrangements affecting his labour force shall be the sole responsibility of the Contractor.

7 PAYMENT OF FIXED-CHARGE ITEMS

The sum total of the fixed-charge item "Provision of Facilities on site" will be paid as follows:

(b) Fifty percent (50%) of the Bided sum when in the opinion of the Engineer, the Contractor's camp, stores, offices, etc. are substantially complete, provided that seventy percent (70%) of the mechanical plant, has arrived on site and is in working order.

The remaining fifty percent (50%) in equal portions after the Payment certificate on which the certified total payment to date shall first exceed fifty percent (50%) of the value of the accepted Bid.

8 TECHNICAL SPECIFICATIONS

8.1 COORDINATION OF WORKS

Supply and installation of HVAC & R as outlined in Engineer's Drawings. The successful Bidder shall provide all materials, tools, equipment, labour and services necessary for the complete, safe and efficient operation of the installation in accordance with the intent of this specification.

COORDINATION SCHEDULE			
General	Mech Cont.	Main Cont.	Elect. Cont.
The supply and erection of all scaffolding necessary for the mech. Installation.		√	
All rigging, hoisting and associated tools required for installation/ erection mech. Equipment.	√		
Removal from site of excess and waste material generated during the mech. Installation	√		
Co-ordinate space conditions, pipe & cable routes and terminations of the various services with all trades involved for proper installation of the work.	√	√	√
Building			
Chasing of pipes & conduit into brick walls.	√		
Cutting and core drilling required in structural members		√	
Openings & holes in roof structure		√	
Casting / building in of sleeves in concrete members and walls		√	
Sealing of all openings where ducting, piping or cabling goes through walls, slabs & shafts.	√		
The provision of flashing & waterproofing for duct/roof penetrations.		√	
Casting of all concrete bases and plinths for equipment as required.		√	
Marking/ Indication of plinths, holes & sleeves required	√		
Making good of building structure after installation (Painting & plastering)		√	
Painting& priming of material & equipment forming part of mech. Installation	√		
Provision of pipe supports, trunking, cable trays and vibration eliminators as required for mech. Inst.	√		
Supply and fitting of timber frames where necessary.		√	
Access panels in ceilings.		√	
Cutting of ceiling tiles & cut outs in doors		√	
Supply & installation of louvers		√	
Supply & Installation of door grilles			
Electrical			
Electrical power supplies (Isolator) to mechanical equipment.			√

The provision of all necessary controls, instrumentation, and wiring from the control panels to the equipment as specified herein.	√		

8.2 HEATING VENTILATION AIR CONDITIONING AND REFRIGERATION

8.2.1 General Specification

These specifications and standards contain the general requirements for the equipment, materials, installation, testing, commissioning and maintenance to be used in all disciplines of mechanical installations.

It is not intended that all requirements described herein shall necessarily form part of the installation, as it should be read in conjunction with the drawings, the detail project Specifications and the bill of quantities relating to the project. However, all parts, fittings, apparatus and materials supplied under the contract shall conform to the requirements of these specifications unless specifically revised in the other parts of the contract document.

Where the specification calls for a particular manufacturer's material or equipment, this shall be supplied as indicated. In the event of the unavailability of the specified equipment or if the Contractor wish to offer an alternative to the specified equipment, such offer/alternative shall be approved by the Engineer before the equipment can be ordered. It is the responsibility of the Contractor to select all equipment and to position it into a building space as provided. All equipment offered shall be standard factory products of high performance with a minimum of fifteen years expected life span and service life.

All work is to be executed in a first class workmanlike manner and all equipment supplied shall be of new high quality material, design and manufacture, suitable for providing an efficient, reliable and trouble free service. The contractor shall ensure, before ordering of equipment, that the plant room dimensions and access to the plant room are to his satisfaction. Special care shall be taken not to damage equipment during positioning and installation. All faulty and damaged equipment shall be replaced by new before handover (or made good, only if approved by the engineer).

All materials to be used shall be compatible with the total installation. The piping to be used shall be as specified in the detail and standard specification for domestic hot and cold water installations.

8.2.2 Technical Specification

The manufacture, supply, delivery, installation and commissioning of the following HVAC & Refrigeration equipment are required

8.2.2.1 Refrigerant Insulation

All refrigerant suction tubes shall be insulated with 10 mm TERMAFLEX Type 33SE peroxydically improved (crosslinked) polyethylene foam tube insulation with quick-zip fastener, which shall meet the following requirements:

Temperature range	- 80 to + 120°C.
Thermal conductivity: + 30°C 0°C – 30°C	 0,038 °C W/m²K 0,038 °C W/m²K 0,031 °C W/m²K
Specific mass	35 kg/m³
Odour properties	Neutral
Cellular structure	Totally enclosed
Fire properties	Self-extinguished to DIN 4012-B1 and ASTMD-11692-59T.

Insulation exposed to weather, or where required for protection against mechanical damage, shall be protected with aluminium, galvanized steel stainless steel sheet.

8.2.2.2 Refrigerant Charge

The refrigerant shall be either R410a or R407. The Contractor shall charge the system free of cost to the Client for the first year of plant operation, i.e. any leak will be rectified and the system shall be charged by the Contractor during the defects liability period at no extra cost. The pipework shall include a refrigerant charge point in the plant room, where the system can be filled if required.

8.2.2.3 Refrigerant Piping

Please refer to standard specifications.

1. Materials & Installation: Strictly as per Manufacturers specifications; the Contractor shall submit routing drawings / sketches to the Engineer for approval.
2. Sizing of refrigerant: Strictly as per Manufacturers specifications lines.
3. Factory charged systems shall first be pressure tested and thereafter be vacuum tested. Field charged systems shall only be pressure tested.
4. Refrigerant pipes and equipment shall be tested under vacuum and indications of leaks shall not be permitted at a pressure of 0, 68 kPa absolute, maintained for a period of one hour with the vacuum pump uncoupled.
5. Refrigerant pipes and equipment shall be tested with clean dry nitrogen with a small quantity of refrigerant for a period of 24 hours at a test pressure of 1.1 times the appropriate maximum working pressure in terms of SABS 0147 – 1978: code of Practice for Refrigeration and Air-Conditioning Installations.
6. All connections shall be inspected for leaks by mean of a sensitive leak detector and soap bubble test.
7. Flexible metal vibration absorbers shall be fitted at the compressor discharge and suction connections.
8. Refrigerant tubing shall be secured in fittings padded with at least 13 mm thick felt strip, to prevent transmission of vibration.

8.2.2.4 Pipe supports

Piping and cables against outside walls shall be covered with adequately sized "Instruct" channels, which shall be painted after installation. Hangers and supports to allow adjustment of slope of piping and removal without dismantling pipes. Hangers and supports to be complete with all necessary structural steel, rods, bolts, nuts, turnbuckles and other components including clamps, rods, bolts, nuts etc. to be painted with two coats of zinc chromate primer and where exposed to view with two additional coats of approved oil paint.

8.2.2.5 Installation

Installation of the units shall be strictly in accordance with the manufacturer's specifications and requirements. Aesthetics are considered to be of the utmost importance.

Variable Refrigerant Flow (VRF) Air-Conditioning System

A cooling and heating, proprietary designed centralized variable refrigerant flow (VRF) air-conditioning system shall be installed.

8.2.2.6 General

The installation shall comprise of VRF outdoor units installed in purpose-built plant rooms connected to indoor evaporators. The system shall be of the heat pump type with a heating and cooling cycle. The detailing of the installation in accordance with the basic layout and details specified in these documents is an inherent part of the contract. It is a requirement of the tender that all equipment offered shall be of similar make.
The system shall consist of the following:

Air cooled condensers /compressor package units (HEAT PUMP)	
Make	**Gree GMVIV or Samsung DVMS or similar and approved by Engineer**
Type of system	Main offer : Heat pump Alternative offer : Heat Recovery
Cooling Capacities	See table below. **NB** *(Ratings represent the effective design requirements adjusted / derated capacities for site conditions- not nominal capacities- tenderer to ensure to offer accordingly)*
Electrical Connection	400VAC/50Hz/3phase; All control circuitry shall be suitability protected and guarded against adverse electrical quality, Protection shall be as per Manufacturer recommendations and as agreed with the Engineer at the time of ordering
Installation	Strictly as per Manufacturer's specifications

Control Requirements	◆ Each room shall be separately controlled by means of a remote control module, wall mounted where specified by Engineer. ◆ The electrical / control circuitry must be such to stop the evaporator, each time a power outage is experienced, viz on power restoration, the indoor unit must be started by the operator. Outdoor units shall automatically start-up on power restoration ◆ The electrical/control circuitry must be provided with a variable built-in timer, which will stop each evaporator in the evening at a prescribed time in order to conserve power during the night.
Evaporators (Indoor Units)	
Type	As per drawings
Cooling capacities	As per drawings
Electrical Connection	230VAC/50Hz/1phase; an isolator will be provided within 1-meter from each evaporator by the Electrical Contractor; control circuitry of indoor units shall be suitably protected & guarded against adverse power quality. Protection shall be as per Manufacturer's recommendations as agreed with Engineer at the time of ordering.
Installation	strictly as per manufacturer specifications; aesthetics is of utmost importance.
Piping	
Materials & Installation	Strictly as per Manufacturers specifications; the Contractor contractor shall submit routing drawings/sketches to the Engineer for approval.
Sizing of refrigerant line.	Strictly as per Manufacturers specifications
Refrigerant	R 410a

8.2.2.7 Capacities

The capacities indicated in the table below are the de-rated effective capacities at ambient temperature and pressure. Any equipment offered by the Tenderer shall meet or exceed the requirements as set out below.

Passenger Terminal

ZONE 1							
TAG ID NO.	**DESCRIPTION**	**AREA (m2)**	**UNIT TAG**	**AC RATING(W/m2)**	**COOLING CAPACITY**	**AVAILABLE UNIT(kW)**	**PRODUCT**
WMU1.01	NAMRA OFFICE 1	12	WMU	0.2	2.4	3.6	-
WMU1.01	NAMRA OFFICE 2	16	WMU	0.2	3.2	3.6	-
WMU1.01	NAMRA OFFICE 3	12	WMU	0.2	2.4	3.6	-
WMU1.01	NAMRA OFFICE 4	12	WMU	0.2	2.4	3.6	-
WMU1.01	NAMRA OFFICE 5	12	WMU	0.2	2.4	3.6	-
WMU1.01	NAMRA OFFICE 6	12	WMU	0.2	2.4	3.6	-
CCU1.01	NAMRA MEETING RM	51.1	CCU	0.2	5.11	5.6	-
CCU1.01	NAMRA MEETING RM	51.1	CCU	0.2	5.11	5.6	-

WMU - Wall Mounted Split
CCU - Round Flow Ceiling Mounted Cassette

Compressor Plant							
Code	**Capacity (kW_R)** Effective at local conditions. Refer to Tender.				**Electrical Requirements**		
Z-1.1	32.8	kW			3Ø, 380V		
					Starting	85	
					Running	21.3	
					Circuit	31.5	

ZONE 2							
TAG ID NO.	**DESCRIPTION**	**AREA (m2)**	**UNIT TYPE**	**AC RATING(W/m2)**	**COOLING CAPACITY**	**AVAILABLE UNIT(kW)**	**PRODUCT**
WMU2.02	NAMRA OFFICE 1	12	WMU	0.2	2.4	3.6	
WMU2.02	NAMRA OFFICE 2	12	WMU	0.2	2.4	3.6	
WMU2.02	NAMRA OFFICE 3	12	WMU	0.2	2.4	3.6	
WMU2.02	NAMRA OFFICE 4	12	WMU	0.2	2.4	3.6	
WMU2.02	NAMRA OFFICE 5	16.4	WMU	0.2	3.28	3.6	
WMU2.02	NAMRA OFFICE 6	14	WMU	0.2	2.8	3.6	
WMU2.02	NAMRA OFFICE 7	12	WMU	0.2	2.4	3.6	

WMU - Wall Mounted Split
CCU - Round Flow Ceiling Mounted Cassette

Compressor Plant							
Code	**Capacity (kW_R)** Effective at local conditions. Refer to Tender.				**Electrical Requirements**		
Z-1.2	25.2	kW			3Ø, 380V		
					Starting	85	
					Running	21.3	
					Circuit	31.5	

ZONE 3						
TAG ID NO.	**DESCRIPTION**	**AREA (m2)**	**UNIT TYPE**	**AC RATING(W/m2)**	**COOLING CAPACITY**	**AVAILABLE UNIT(kW)**
WMU3.03	OFFICE 3.1	12	WMU	0.2	2.4	3.6
WMU3.03	OFFICE 3.2	12	WMU	0.2	2.4	3.6
WMU3.03	OFFICE 3.2	12	WMU	0.2	2.4	3.6
WMU3.03	OFFICE 3.3	12	WMU	0.2	2.4	3.6
WMU3.03	OFFICE 3.4	16	WMU	0.2	3.2	3.6
WMU3.03	OFFICE 3.5	12	WMU	0.2	2.4	3.6

WMU - Wall Mounted Split
CCU - Round Flow Ceiling Mounted Cassette

Compressor Plant							
Code	**Capacity (kW_R)** Effective at local conditions. Refer to Tender.				**Electrical Requirements**		
Z-1.3	15.2	kW			3Ø, 380V		
					Starting	85	
					Running	21.3	
					Circuit	31.5	

ZONE 4							
TAG ID NO.	**DESCRIPTION**	**AREA (m2)**	**UNIT TAG**	**AC RATING(W/m2)**	**COOLING CAPACITY**	**AVAILABLE UNIT(kW)**	**PRODUCT**
CCU4.04	NAMPOL	14.1	CCU	0.2	2.82	3.6	
CCU4.04	FIRST AID RM	11.7	CCU	0.2	2.34	3.6	
WMU4.04	RFA	7.6	CCU	0.2	1.52	3.6	
CCU4.04	CUSTOMS	15.4	CCU	0.2	3.08	3.6	
CCU4.04	IMMIGRATION	31	CCU	0.2	3.1	3.6	
CCU4.05	IMMIGRATION	31	CCU	0.2	3.1	3.6	
WMU4.05	CONSULTATION	11.5	CCU	1.2	4.6	3.6	
WMU - Wall Mounted Split							
CCU - Round Flow Ceiling Mounted Cassette							
Compressor Plant							
Code	**Capacity (kW_R)** Effective at local conditions. Refer to Tender.				**Electrical Requirements**		
Z-1.1	21.6	kW			3Ø, 380V		
					Starting	85	
					Running	21.3	
					Circuit	31.5	

ZONE 5							
TAG ID NO.	**DESCRIPTION**	**AREA (m2)**	**UNIT TYPE**	**AC RATING(W/m2)**	**COOLING CAPACITY**	**AVAILABLE UNIT(kW)**	**PRODUCT**
WMU5.05	CASHIER	7.6	WMU	0.2	1.52	3.6	
CCU5.05	CUSTOMS	15.4	CCU	0.2	3.08	3.6	
CCU5.05	IMMIGRATION	31	CCU	0.2	3.1	3.6	
CCU5.05	IMMIGRATION	31	CCU	0.2	3.1	3.6	
WMU5.05	CONSULTATION	10.5	CCU	0.2	2.1	3.6	
WMU - Wall Mounted Split							
CCU - Round Flow Ceiling Mounted Cassette							
Compressor Plant							
Code	**Capacity (kW_R)** Effective at local conditions. Refer to Tender.				**Electrical Requirements**		
Z-1.2	18.0	kW			3Ø, 380V		
					Starting	85	
					Running	21.3	
					Circuit	31.5	

Commercial Terminal

ZONE 1							
TAG ID NO.	DESCRIPTION	AREA (m2)	UNIT TAG	AC RATING(W/m2)	COOLING CAPACITY	AVAILABLE UNIT(kW)	PRODUCT
CCU1.01	CUSTOMS	28.1	CCU	0.2	5.62	12.1	
WMU1.01	CASHIER	6.3	WMU	0.2	1.26	2.8	
CCU1.01	IMMIGRATION	14.5	CCU	0.2	2.9	5.7	
CCU1.01	RFA	9.6	CCU	0.2	1.92	3.6	
CCU1.01	NAB	9.6	CCU	0.2	1.92	3.6	
CCU1.01	NMB	9.6	CCU	0.2	1.92	3.6	
CCU1.01	MoAWF	9.6	CCU	0.2	1.92	3.6	
CCU1.01	MEETING ROOM	18.7	CCU	0.2	3.74	6.8	
CCU4.06	OFFICE NAB	14	WMU1.01	0.2	2.8	6	
CCU4.07	OFFICE RFA	14	WMU1.01	0.2	2.8	6	
WMU4.04	OFFICE MoAWF	14	CCU	0.2	2.8	6	
WMU4.04	OFFICE NMB	14	CCU	0.2	2.8	6	
WMU1.01	OFFICE IMMIGRATION	13.5	WMU	0.2	1.35	5	
WMU1.01	OFFICE CUSTONS	13	WMU	0.2	1.3	5	
WMU4.05	TEA	26.6	CCU	1.2	10.64	6.8	
WMU - Wall Mounted Split							
CCU - Round Flow Ceiling Mounted Cassette							
Compressor Plant							
Code	**Capacity (kW_R)** Effective at local conditions. Refer to Tender.				**Electrical Requirements**		
Z-1.1	75.8	kW			3Ø, 380V		
					Starting	85	
					Running	21.3	
					Circuit	31.5	
ZONE 2							
TAG ID NO.	**DESCRIPTION**	**AREA (m2)**	**UNIT TYPE**	**AC RATING(W/m2)**	**COOLING CAPACITY**	**AVAILABLE UNIT(kW)**	**PRODUCT**
WMU2.01	OFFICE IMMIGRATION	12.1	WMU	0.2	2.42	5	
WMU2.01	OFFICE BURS	15.4	WMU	0.2	3.08	6	
CCU2.01	OFFICE AGRICULTIRE	16.5	WMU	0.2	1.65	6	
CCU1.01	OFFICE AGRICULTIRE	31	CCU	0.2	3.1	3.6	
WMU1.01	CASHIER	10.5	WMU	0.2	2.1	3.6	
CCU1.01	CUSTOM	17.1	CCU	0.2	3.42	6.8	
CCU1.01	IMMIGRATION	17.1	CCU	0.2	3.42	6.8	
WMU - Wall Mounted Split							
CCU - Round Flow Ceiling Mounted Cassette							
Compressor Plant							
Code	**Capacity (kW_R)** Effective at local conditions. Refer to Tender.				**Electrical Requirements**		
Z-1.2	37.8	kW			3Ø, 380V		
					Starting	85	
					Running	21.3	
					Circuit	31.5	

8.2.2.8 VRF System Outdoor Units

Static Height of Compressors to Highest Indoor Unit: 2m

8.2.2.9 Split Air conditioners

General requirements

- The units shall be completely protected against over pressure in the system and improper operation by the user.
- The temperature to be gradually adjustable and automatically controlled within 2°C by a thermostat.
- The indoor unit to have three selectable fan speeds.
- The indoor unit shall be quiet running with an average sound pressure level measured at a distance of 2m not exceeding 28 dB(A) at the low setting and 30 dB(A) at the high setting respectively, and the centrifugal fan shall be completely balanced.
- Air filters to be easily accessible for cleaning.
- The controller shall be mounted as indicated on the drawing.
- The electrical contractor will provide a 100 x 100 outlet with a 25-mm conduit to above ceiling for the controls.
- The room temperature shall be sensed at the return air inlet of the indoor unit.
- Condensate water to be discharged as indicated on the drawing.
- The gas and liquid piping to be insulated to prevent moisture condensation. All piping to be installed on galvanised mild steel cable trays provided by the sub-contractor.
- The outdoor units shall be mounted on suitable heavy-duty angle iron wall mounted brackets painted same colour as wall and provided by the sub-contractor.
- Wired control panels are preferred for this type of unit.

Corrosion protetcion requirements

- All air-handling equipment cassings are fabricated from galvanised sheet steel that is epxoy couted including all divider panels and motor mountings.
- All bolts, screws and fitings shall be stainless steel.
- Air cooled condensor/evaporator coils should a have a spray applied or dipped corrosion protection coating.
- The coating used should be specifically designed for the the coating of heat exhange coils that are situated in corrosive areas. (No generic coating products to be used)
- Coating should be a metal based impregnated product that is resistant to most common chemical vapours.(chemical resistant chart to be made avaialable)
- A certificate of coating must be issued clearly indicating the unit serial number and warranty period.
- The coating should be water based, solvent free and low volatile organic compounds.
- Bluchem coating or equivalent when verified by written specifactions.

All split units shall be of the inverter controlled compressor type.

8.2.2.10 Round Flow Ceiling Cassette Units

The following round flow ceiling mounted cassette unit air-conditioners, complete as specified on the relevant drawings, shall be provided. The air-conditioner shall conform to the following detail requirements and shall be provided with a:

Make :Samsung, Daikin, Midea or equivalent and approved by the Engineer

Type:	Round flow ceiling mounted cassette unit
Locations & capacities:	As per drawing
Heating/cooling:	Cooling only
Installation:	Strictly in accordance with Manufacturer's
specifications;	Aesthetics of the installation is of utmost importance
Electrical:	230VAC/50Hz/3phase or

- Ceiling cassette type cooling cycle only air-conditioner shall be installed in position as indicated on the drawings.
- The units shall be completely protected against over pressure in the system and improper operation by the user.
- The temperature to be gradually adjustable and automatically controlled within 2°C by a thermostat.
- The indoor unit to have three selectable fan speeds.
- The indoor unit shall be quiet running with an average sound pressure level measured at a distance of 2m not exceeding 35 dB(A) at the low setting and 43 dB(A) at the high setting respectively, and the centrifugal fan shall be completely balanced.
- Air filters to be easily accessible for cleaning.
- The controller shall be mounted as indicated on the drawing. The electrical sub-contractor will provide a 100 x 100 outlet with a 25-mm conduit to above ceiling for the controls.
- The room temperature shall be sensed at the return air inlet of the indoor unit.
- Condensate water to be discharged as indicated on the drawing.
- The gas and liquid piping to be insulated to prevent moisture condensation. All piping to be installed on galvanised mild steel cable trays provided by the sub-contractor.
- The outdoor units shall be mounted on suitable heavy-duty angle iron wall mounted brackets painted same colour as wall and provided by the sub-contractor.
- Wired control panels are preferred for this type of unit.

8.2.2.11 Installation Details for outdoor unit

Outdoor units for the high wall split air conditioners shall be bolted to an approved supporting structure manufactured from 40 x 40 x 4 S/S angle iron sections. The framework shall be adequately bolted to the wall and thoroughly cleaned.

The indoor units shall be installed according to manufacturer's instructions. Piping between the indoor and outdoor units shall be chased in walls or installed above the ceiling. Making good afterwards will be done by the principle contractor.

The outdoor unit shall always be selected in such a manner that the connected indoor units require the full capacity of the outdoor unit. The outdoor units shall preferably be selected for the least total number of units.

All outdoor units must be installed on the roof slab on top of the line shops. The outdoor units shall be installed according to manufacturer's instructions.

8.2.2.12 Remote Control Panels (RCPs)

RCP's shall be installed next to the door of the room

8.2.2.13 Capacities

The capacities indicated in the table below are the de-rated effective capacities at ambient temperature and pressure. Any equipment offered by the Bidder shall meet or exceed the requirements as set out below.

PASSENGER TERMINAL			
Unit	Qty	Type	Required Capacity (kW)
Server Room Namra	2	HWSU	5
Network Room Nam.	2	HWSU	5
Network Room Bot.	2	HWSU	5
COMMERCIAL TERMINAL			
Server Room	2	HWSU	5
Server Room	2	HWSU	3.6

HWSU – High Wall Split Unit

8.2.3 VENTILATION EQUIPMENT

8.2.3.1 Ductwork Material

Ductworks shall be fabricated from prime quality galvanised sheet steel, except where otherwise called for.

8.2.3.2 Fabrication Standards

Ductwork shall be fabricated and installed in accordance with the following specification which shall be read in conjunction with the standards laid down by the Sheet Metal and Refrigeration Contractors National Association (of America) (SMACNA) which standards shall be adhered to in detail excepting only as hereinafter specified.

8.2.3.3 Circular Ductwork

Duct Size Long Side - mm	Up to 750 mm	751 to 1370	1371 to 2130	2131 upwards
Sheet Steel Thickness - mm				
0,6	0,8	1,0	1,2	
Cross Bracing Length - mm				
	2400	2400	2400	2400
Longitudinal Seams	Pittsburgh Lock for all Duct Sizes			
Cross Joints	At Maximum Centres of 2400mm / 1220mm			
Long Side S'Slip	25mm Slip	38mm Slip		38mm Bar Slip Reinforced or

Short Side	Drive Slip	Drive Slip If under 450 mm otherwise 38mm Bar Slip L Flanges		38 x 2mm L. Reinforced Standing seam or 38 x 3 mm
ALTERNATIVELY on all sides	Pocket Lock 25 mm	Pocket Lock 38 mm		Pocket Lock 38mm L.RFD
Supports	Minimum			
Angles - mm	38 x 3	38 x 5	38 x 6	50 x 6
Rods. Dia. mm	6	10	12	12
Spacing, maximum - mm	3600	3000	2400	1800

NOTE: SHEET METAL STRAPS WILL NOT BE ACCEPTED FOR SUSPENSION OF DUCTWORK

Rectangular ductwork shall be regarded as low velocity ductwork suitable for pressures up to 50mm wg and velocities up to 10 meters per second. It shall accordingly be fabricated and installed in compliance with the above requirements and the "Low Velocity Duct Construction Standard" manual published by SMACNA.

8.2.3.4 Circular Ductwork

Circular ducting of approved size shall be installed in all exposed areas, i.e. Trading Areas.

8.2.3.5 Fans

General

Fans shall be statically and dynamically balanced and shall be free of any objectionable vibrations. Fan bearings shall be selected for a minimum of 200 000 hours average life.
Lubrication points for fan bearings shall be readily accessible and shall where necessary be extended to the outside of the fan casing. The shafts and bearings are to be properly protected from rust and corrosion by means of suitable wrapping and protective grease coatings prior to commissioning

Fan openings shall be provided with protective wire guards in accordance with the Manpower and Occupational Safety Act, 1983. The unit shall be supplied with a safety harness or weather cab complete with a back draught shutter

Fans shall be selected highest possible efficiency with lowest possible blade tip speed.

Axial Fans

Unless otherwise specified, axial flow fans shall be in-line, direct driven type, with motor mounted inside the fan housing. The fan rotor assembly shall be attached directly to the motor shaft.

The fan casings shall be spun from mild steel with integral pre-drilled and radiuses inlet flange, hot dipped galvanized after manufacture. Vibration isolators shall be installed if required.

Fans shall be provided with adjustable pitch blades. Fans installed under free intake conditions shall be fitted with an inlet cone supplied by the fan manufacturer.

Fan motors shall be totally enclosed, rated for continuous operations of the squirrel cage induction type suitable for vertical and horizontal installation and Class F insulation. Motor protection shall be to IP55 with a temperature range between –40°C to +50°C. DONKIN or WOODS fans will be preferred for this type of fan.

Capacities
The capacities indicated in the table below are the effective capacities. Any equipment offered by the Tenderer shall meet or exceed the requirements as set out below.

EF – In-line Ducted axial flow Fan

Unit	Qty	Type	Required Capacity (m3/s)
EF 1	2	EF	1940 L/s @150 Pa (435 W, 220–240Volt axial flow fan)
EF 2	2	EF	1160 L/s @150 Pa (400 W, 220–240Volt axial flow fan)
EF 3	2	EF	2230 L/s @150 Pa (600 W, 220–240Volt axial flow

Type of fan ***EF1***	Axial Flow
Make	Donkin Majax or Woods
Location	Foyer Passenger Terminal
Duty Points *(ratings represent adjusted capacities for site conditions)*	1940 l/s @ 150 Pa static,,
Inlet temperature	Ambient
Maximum Impeller speed	1440 RPM
Mechanical Efficiency	(at duty point) : more than 78.1 %
Motor	3 Phase, 50 Hz
Maximum allowable noise level	86 dBa (1m from discharge attenuator)
Accessories required :	1.5 x Ø Cylindrical sound attenuator with Melinex Lined on discharge Flexible canvas couplings

	Adaptor ducting to fit ducting as indicated on drawings Mild steel mounting frame

Type of fan ***EF2***	Axial Flow
Make	Donkin Majax or Woods
Location	Foyer Botswana Terminal
Duty Points *(ratings represent adjusted capacities for site conditions)*	1160 l/s @ 150 Pa $_{static,,}$
Inlet temperature	Ambient
Maximum Impeller speed	1440 RPM
Mechanical Efficiency	(at duty point) : more than 64.2 %
Motor	3 phase, 50 Hz
Maximum allowable noise level	87 dBa (1m from discharge attenuator)
Accessories required :	1.5 x Ø Cylindrical sound attenuator with Melinex Lined on discharge Flexible canvas couplings Adaptor ducting to fit ducting as indicated on drawings Mild steel mounting frame

Type of fan ***EF3***	Axial Flow
Make	Donkin Majax or Woods
Location	Foyer Namibia Terminal
Duty Points *(ratings represent adjusted capacities for site conditions)*	2230 l/s @ 150 Pa $_{static,,}$
Inlet temperature	Ambient
Maximum Impeller speed	960 RPM
Mechanical Efficiency	(at duty point) : more than 73.2 %

Motor	3 phase, 50 Hz
Maximum allowable noise level	87 dBa (1m from discharge attenuator)
Accessories required :	1.5 x Ø Cylindrical sound attenuator with Melinex Lined on discharge Flexible canvas couplings Adaptor ducting to fit ducting as indicated on drawings Mild steel mounting frame

Electrical Supply
Fan motors shall be totally enclosed, rated for continuous operation with sealed life bearings and with Class F insulation. Motor protection shall be to IP55 with a temperature range between –10ºC to +50ºC. Electrical supply will be provided by the electrical sub-contractor.

8.2.3.6 SOUND ATTENUATORS

Sound attenuators shall be provided and installed where necessary and shall be selected to provide the Noise Criteria levels specified in Part Three hereof. Sound attenuators shall be the factory fabricated product of an accredited manufacturer of such equipment such as SOUND ATTENUATORS LIMITED or TROX, who publish selection data on their products which data shall be submitted to the Engineers for approval of each sound attenuator offered.

Metalwork on sound attenuators shall be galvanised steel or aluminium and acoustic insulation shall be non-combustible material, properly bonded and covered as so not to permit insulation particles being eroded by air movement over them.

Sound absorbing lining material of sound attenuators in low velocity ductwork shall have a density of not less than 24 kg/ms and a thickness of not less than 25 mm and in medium pressure ductwork the thickness shall not be less than 50 mm with a minimum density of 48 kg/ms. Material for cell type sound absorbers shall be of the rigid type. The sound absorbing efficiency at each frequency shall not be less than:-

Frequency-cycles per second	250	500	1000	2000
Percentage Absorption		45	65	70	80

Lining which is damaged in shipment or due to exposure or any other cause shall not be installed and any material, which may be damaged prior to the final acceptance, shall be replaced as directed by the Engineer.

Casings shall be manufactured of galvanised sheet steel not lighter than the thickness previously specified herein for ductwork of the same dimensions.

8.3 AMBIENT OPERATING CONDITIONS

- Altitude: 15m a.s.l.

- Minimum ambient temperature: -4 Degrees Celsius
- Maximum ambient temperature: +38 Degrees Celsius
- Humidity: Up to saturation point

9 TEST CERTIFICATES AND TESTS

Where test certificates are required for individual pieces of equipment, these shall be submitted to the Engineer for approval immediately on receipt of such certificates.

Where witnessing of tests is required by the Engineer, arrangements shall be made by the Contractor for the Engineer to witness such tests.

10 INFORMATION, DIAGRAMS, DRAWINGS AND MANUALS TO BE SUBMITTED

As part of his Bid and subsequent contract, it will be required from the Bidder/Contractor to submit certain documents, in accordance with the following programme:

10.1 With the Bid (at Closing Date):

- Marked-up copies of all drawings indicating in red all required alterations to the concrete, brickwork or whatever other aspect falling outside the scope of his contract;
- Manufacturer's pamphlets and/or brochures illustrating all equipment offered;
- Sketches/rough drawings showing the principle of the design in general and specifically where it deviates from the proposed layout and details given by the Engineer. Attention should be given to space requirements, ease of maintenance, practical problems during installation, etc. in drawing up sketches. If no such sketches are submitted or if any aspect of the design is not specifically detailed or highlighted, it will be assumed that the Engineer's proposal is acceptable, practical and economical;
- Any other information that the Bidder regards necessary to clarify his offer.

10.2 Within 30 days after Award of the Contract:

- A work programme as specified herein.

10.3 On Completion:

- A complete set of "As-Built" drawings;
- Testing certificates if applicable;
- Commissioning certificates;
- A certificate of acceptance by the Employer;
- Complete set of maintenance/operating manuals.

All certificates shall be completed in an orderly and logical manner, and shall be bound in booklet form with a protective cover. The text of instructions, diagrams and drawings shall be "English".

11 APPROVED MATERIAL

In the Bill of Quantities, the material is set out in detail to assist the contractor. If the materials of other manufacturers are offered, these materials have to be approved by the engineer.

All inferior work or work containing inferior material, shall be rejected by the Engineer at his discretion, where upon the Mechanical Contractor shall immediately remove and rectify the works as required and bear all costs in connection therewith.

12 COMPLETENESS OF BID

The Bidder shall allow in his Bid price for all material, labour, supervision, transport, tests and all other items necessary to complete the contract in its entirety and to the satisfaction of the Engineer.

In the event where the supply and/or installation of any item, material or equipment does not form part of this Contract, it will be specifically indicated as such in his specification and/or on the accompanying drawings.

13 VALUE ADDED TAX, IMPORT TAXES AND DUTIES

Bidders shall allow in their Bid for all VAT, Import Taxes and Duties, to be paid in respect of all items of material, labour and equipment to be supplied in terms of this Contract where relevant. The successful Bidder will be liable and responsible for paying any and all VAT, Import Taxes and Duties.

14 EQUIVALENCY OF STANDARDS AND CODES

Wherever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract.

B. SCHEDULE OF EQUIPMENT OFFERED

It is a requirement of this document that, in addition to the information of the equipment listed below to be furnished, the bidder shall attach the relevant pamphlets, brochures, etc. Quotations without these shall be regarded as incomplete. The Bidder is required to complete the following schedule, stating where appropriate, the size or capacity of equipment, type or catalogue number, country of origin and any other detail he considers in full to enable the Engineer to evaluate tenders on a fair basis.

In addition, Bidders are requested to adhere to the following general guidelines in completing the schedules:

- Please use the SI system in the units given in the schedules
- Bidders should state clearly any deviations from the specifications on the given space. If the offered equipment does not deviate, he/she should write "NIL" in the space allowed.
- Bidders are requested to supply pamphlets, brochures, drawings, photographs and/or graphs of the offered equipment.

1 SPLIT TYPE AIR CONDITIONERS

Please fill in the following details.

3.6 kW Design Capacity (HWSU)	
Type of Unit Offered	
Manufacturer	
Nominal Capacity (kW)	
Effective Capacity (kW)	
Wire Remote Controller (Yes / No)	
Indoor Unit Electrical Specifications (Φ, V, kW)	
Outdoor Unit Electrical Specifications (Φ, V, kW)	

5.0 kW Design Capacity (HWSU)	
Type of Unit Offered	
Manufacturer	
Nominal Capacity (kW)	
Effective Capacity (kW)	
Wire Remote Controller (Yes / No)	
Indoor Unit Electrical Specifications (Φ, V, kW)	
Outdoor Unit Electrical Specifications (Φ, V, kW)	

2 DOOR GRILLE

DOOR GRILLES	
Trade name and model no.	
Material	
Finish	
Dimensions	

3 WALL GRILLE

DOOR GRILLES	
Trade name and model no.	
Material	
Finish	
Dimensions	

4 PROGRAM

PROGRAMMING	
Manufacturing period	*weeks*
Delivery period	*weeks*
Installation period	*weeks*

Prospective bidder s shall submit proof that they have previous experience with similar installation. Failure may lead to disqualification.

5 SUPERVISOR/TECHNICIAN

TECHNICIAN: NAME:		
Qualification: ..... Experience with systems of similar nature		
Project	**Client** **DATE**	**Project Value N$**

6 SCHEDULE OF WORK SATISFACTORILY CARRIED OUT BY BIDDER

NAME OF PRODUCT	CONSULTING ENGINEER	TOTAL PROJECT VALUE	DATE COMPLETED

7 AFTER SALES SERVICE

AFTER SALES SERVICE:	
SUPPLIER	
Spare parts kept in stock in Windhoek, please list	
Spare parts available in RSA, please list.	
Delivery period - RSA parts	
Technical assistance capability of local supplier	
Technical assistance response time	
Extended warranty period on selected components (please list)	
…… Signed: Local supplier / agent	

8 DEPARTURES FROM SPECIFICATION AND REMARKS

C. DRAWINGS

The following Mechanical Engineer's Drawings will be applicable, namely:

1. D0121/M7-01: Passenger Terminal: HVAC Layout
2. D0121/M7-01A: Passenger Terminal: HVAC Layout
3. D0121/M7-02: Commercial Terminal: HVAC Layout
4. D0121/M7-03: Technical Notes and General Drawings

SECTION III: PRICED ACTIVITY SCHEDULE

Procurement Reference Number: _____

Priced Activity Schedule Authorised By:

Name:		Signature:	
Position:		Date:	
Authorised for and on behalf of:		Company	

ITEM	DESCRIPTION	Qty A	Unit	LABOUR RATE B	MATERIAL RATE C	TOTAL RATE D = B + C	TOTAL AMOUNT E = D x A
1	**Part 1: Preliminary & General**						
1.1	**Fixed Charged Items**:						
	Contractual requirements establish facilities on site.						
1.1.1	Office & Storage facilities	1	Item				
1.1.2	Workshops	1	Item				
1.1.3	Living Accommodation	1	Item				
1.1.4	Ablution & Latrine facilities	1	Item				
1.1.5	Tools & Equipment	1	Item				
1.1.6	Water supplies, Electrical Power Communications and Access.	1	Item				
1.1.7	Remove Site establishment upon completion.	1	Item				
1.1.8	Public liability insurance.	1	Item				
1.1.9	Works risks, insurance & reinstatement.	1	Item				
1.1.10	Programe & Practical completion.	1	Item				
1.1.11	Certificates & Payment.	1	Item				
1.1.12	Attendance at site meetings.	1	Item				
1.1.13	Supervision: during operations the contractor shall have on site a suitably experienced and qualified technician who shall supervise the works. Details of the site supervisor shall be submitted to the Engineer for approval prior to his assumption.	1	Item				
Total Carried Forward to Next Page							

Total Carried Over From Previous Page							
1.1.14	Crainage & Plant needed for erection	1	Item				
1.1.15	Scaffolding needed for erection	1	Item				
1.1.16	Delivery of material and equipment to site	1	Item				
1.1.17	Implementing Quality Control Plan and testing	1	sum				
1.1.18	Forward exchange coverage on imported items (when applicable)	1	sum				
1.2	**Time Related Items:**						
	Contractual Requirements operate & maintain facilities on site.						
1.2.1	Office & Storage facilities.	1	Mths				R/O
1.2.2	Workshops	1	Mths				R/O
1.2.3	Living Accommodation	1	Mths				R/O
1.2.4	Ablution & Latrine	1	Mths				R/O
1.2.5	Tools & Equipment	1	Sum				R/O
1.2.6	Water supplies, Electrical Power, Communications & access.	1	Mths				R/O
1.2.7	Supervision	1	Mths				R/O
1.2.8	Company & Office overhead costs	1	Sum				R/O
1.2.9	Other obligations, please specify	1	Sum				R/O
1.2.10	Transport	1	Km				R/O
1.2.11	Crainage & Plant needed for erection, installation & dismantling	1	sum				R/O
1.2.12	Scaffolding needed for erection.	1	sum				R/O
Total Carried Forward To Summary							

Item	Description	Minimum Effective Capacity (Kw)	Qty A	Unit	LABOUR RATE B	MATERIAL RATE C	TOTAL RATE D = B + C	TOTAL AMOUNT E = D x A
2	**Part 2: Passenger Terminal**							
	Multi split VRF type system *(eq. To **GREE** VRV IV OR similar). Air Conditioners shall be supplied complete with mounting brackets refrigerant piping, insulation, drain piping, drain pipe insulation (as required), control gear and trunking for positions & route (rate shall include installation and commissioning.* ***Air Conditioning*** *Air Conditioners shall be supplied complete with mounting brackets refrigerant piping, insulation, drain piping, condensate drain (if required)control gear, conduit and trunking for positions & routes as indicated on the relevant drawings.* ***Refrigerant piping:*** *inclusive of liquid and gas lines, insulation, all fittings, hangers, designed and installed strictly in accordance with the Supplier's specifications* ***Condensate drain piping*** *installed in ceiling voids and services shafts, complete with all fittings, P-traps when connecting to the sewer network, hangers and sloping at a gradient not less than 1:100, but strictly in accordance with Suppliers specifications*							
	NOTE: WMU = High Wall Mounted Split Unit & CCU = Round Flow Ceiling Mounted Cassette Unit & Concealed Unit = CU							
	Air Conditioning							
2.1	**Indoor Units for Zone 1**							
2.1.1	WMU 1.01 High Wall Split Unit Unit, 3.6kW effective derated capacity with heat pump and remote control.	3.6	6	no				
2.1.2	CCU - 01 Ceiling Cassette Unit, 5.6kW effective derated capacity with heat pump and wired remote control.	5.6	2	no				
2.1.4	**Wireless Remote Controllers. Please see drawing for QTY**		8	no				
2.2	**Indoor Units for Zone 2**							
2.2.1	WMU 02.01 High Wall Split Unit Unit, 3.6kW effective derated capacity with heat pump and remote control.	3.6	7	no				
2.2.3	**Wireless Remote Controllers. Please see drawing for QTY**		7	no				
2.3	**Indoor Units for Zone 3**						-	-
2.3.1	WMU 3.01 High Wall Split Unit Unit, 3.6kW effective derated capacity with heat pump and remote control.	3.6	6	no				
2.3.2	**Wired Remote Controllers. Please see drawing for QTY**		6	no				
Total Carried Forward to Next Page								

Total Carried Over From Previous Page								
2.4	**Indoor Units for Zone 4**							
2.4.1	WMU 4.01 High Wall Split Unit Unit, 3.6kW effective derated capacity with heat pump and remote control.	3.6	2	no				
2.4.2	CCU 4.04 Ceiling Cassette Unit, 3.6kW effective derated capacity with heat pump and wired remote control.	3.6	5	no				
2.4.4	**Wired Remote Controllers. Please see drawing for QTY**		7	no				
2.5	**Indoor Units for Zone 5**							
2.5.1	WMU 5.05 High Wall Split Unit Unit, 3.6kW effective derated capacity with heat pump and remote control.	3.6	2	no				
2.5.2	CCU 5.05 Ceiling Cassette Unit, 3.6kW effective derated capacity with heat pump and wired remote control.	3.6	3	no				
2.5.3	**Wired Remote Controllers. Please see drawing for QTY**		5	no				
2.6	**Server Rooms**							
2.6.1	HWSU - 03 High Wall Split Unit, 5.0kW effective derated capacity with heat pump and wireless remote control. Complete with contact interface	5	6	no				
2.6.2	**Wired Remote Controllers. Please see drawing for QTY**		6	no				
2.7	**Outdoor Plant**							
2.7.1	Variable Refrigerant flow condensor plant 32.8kW heat pump for Building excluding server room and staff common room.		1	no				
2.7.2	Variable Refrigerant flow condensor plant 25.2kW heat pump for Building excluding server room and staff common room.		2	no				
2.7.3	Variable Refrigerant flow condensor plant 21.6kW heat pump for Building excluding server room and staff common room.		1	no				
2.7.4	Variable Refrigerant flow condensor plant 18.0kW heat pump for Building excluding server room and staff common room.		1	no				
Total Carried Forward to Next Page								

Total Carried Over From Previous Page								
2.8	**Refrigerant Piping**							
	Inclusive of all fittings, hangers insulation, refnet joints, designed and installed strictly in accordance with the Supplier's specifications.							
2.8.1	Ø 6,4		1	sum				
2.8.2	Ø 9,5		1	sum				
2.8.3	Ø 12,7		0	m				Rate Only
2.8.4	Ø 15,9		1	sum				
2.8.5	Ø 19,1		0	m				Rate Only
2.8.6	Ø 22,2		0	m				Rate Only
2.8.7	Ø 28,6		0	m				Rate Only
2.8.8	Ø 34,9		0	m				Rate Only
2.8.9	Ø 41.3		0	m				Rate Only
2.8.10	extra over: 400x100mm GMS trunking.		1	sum				
2.8.11	extra over: 400mm GMS wire basket c/w cover and spacer channels suitable for wall mounted installation similar to "cabstrut".		1	sum				
2.8.12	Pipe supports and hangars as required.		1	sum				
2.90	**Additional Accessories**							
2.9.1.	Decoration panel. Please see drawing for QTY		1	sum				
Total Carried Forward to Next Page								

Total Carried Over From Previous Page								
2.10	**Condensate Drain Piping**							
	Installed in ceiling voids and services shafts, complete with all fittings, hangers and insulation as required sloping at a gradient not less than 1:100 where specified, but strictly in accordance with Suppliers specifications.							
2.10.1	Ø20 uPVC		1	sum				
2.10.2	Ø25 uPVC		1	sum				
2.10.3	Ducting as per drawings		0	m				
2.10.4	**Diffusers, Grilles & Louvres**							
2.10.5	Diffusers. Please see drawing for QTY		12	no				
2.10.6	Extraction Fans. Please see drawing for QTY		1	no				
2.10.7	Supply Fans. Please see drawing for QTY		1	no				
2.10.8	Wall Grilles		2	no				
2.10.9	Door Gilles, 500 x 250, anodized aluminium.		8	no				
Total Carried Forward To Summary								

Item	Description	Minimum Effective Capacity (Kw)	Qty A	Unit	LABOUR RATE B	MATERIAL RATE C	TOTAL RATE D = B + C	TOTAL AMOUNT E = D x A
3	**Part 3: Commercial Terminal**							
	Multi split VRF type system *(eq. To **GREE** VRV IV OR similar). Air Conditioners shall be supplied complete with mounting brackets refrigerant piping, insulation, drain piping, drain pipe insulation (as required), control gear and trunking for positions & route (rate shall include installation and commissioning.* ***Air Conditioning*** *Air Conditioners shall be supplied complete with mounting brackets refrigerant piping, insulation, drain piping, condensate drain (if required)control gear, conduit and trunking for positions & routes as indicated on the relevant drawings.* ***Refrigerant piping:*** *inclusive of liquid and gas lines, insulation, all fittings, hangers, designed and installed strictly in accordance with the Supplier's specifications* ***Condensate drain piping*** *installed in ceiling voids and services shafts, complete with all fittings, P-traps when connecting to the sewer network, hangers and sloping at a gradient not less than 1:100, but strictly in accordance with Suppliers specifications*							
	NOTE: WMU = High Wall Mounted Split Unit & CCU = Round Flow Ceiling Mounted Cassette Unit & Concealed Unit = CU							
	Air Conditioning							
3.1	**Indoor Units for Zone 1**							
3.1.1	HWSU - 01 High Wall Split Unit, 2.5kW effective derated capacity with heat pump and remote control.	2.5	1	no				
3.1.2	HWSU - 03 High Wall Split Unit, 5.0kW effective derated capacity with heat pump and remote control.	5	2	no				
3.1.3	HWSU - 04 High Wall Split Unit, 6.0kW effective derated capacity with heat pump and remote control.	6	4	no				
3.1.4	CCU - 01 Ceiling Cassette Unit, 3.6kW effective derated capacity with heat pump and wired remote control.	3.6	4	no				
3.1.5	CCU - 02 Ceiling Cassette Unit, 5.7kW effective derated capacity with heat pump and wired remote control.	1	1	no				
3.1.6	CCU - 03 Ceiling Cassette Unit, 6.8kW effective derated capacity with heat pump and wired remote control.	6.8	2	no				
3.1.7	CCU - 04 Ceiling Cassette Unit, 12.1kW effective derated capacity with heat pump and wired remote control.	12.1	1	no				
3.1.8	**Wireless Remote Controllers. Please see drawing for QTY**		15	no				
Total Carried Forward to Next Page								

Total Carried Over From Previous Page								
3.2	**Indoor Units for Zone 2**							
3.2.1	HWSU - 01 High Wall Split Unit, 2.5kW effective derated capacity with heat pump and remote control.	2.5	1	no				
3.2.2	HWSU - 03 High Wall Split Unit, 5.0kW effective derated capacity with heat pump and remote control.	5	2	no				
3.2.3	HWSU - 04 High Wall Split Unit, 6.0kW effective derated capacity with heat pump and remote control.	6	2	no				
3.2.4	CCU - 01 Ceiling Cassette Unit, 3.5kW effective derated capacity with heat pump and wired remote control.	3.5	1	no				
3.2.5	CCU - 03 Ceiling Cassette Unit, 6.8kW effective derated capacity with heat pump and wired remote control.	6.8	2	no				
3.2.6	**Wireless Remote Controllers. Please see drawing for QTY**		8	no				
3.3	**Server Rooms**							
3.3.1	HWSU - 02 High Wall Split Unit, 3.5kW effective derated capacity with heat pump and wireless remote control. Complete with contact interface	3.5	2	no				
3.3.2	HWSU - 04 High Wall Split Unit, 6.0kW effective derated capacity with heat pump and wireless remote control. Complete with contact interface	6	2	no				
3.3.3	**Wired Remote Controllers. Please see drawing for QTY**		4	no				
3.4	**Outdoor Plant**							
3.4.1	Variable Refrigerant flow condensor plant 36.6kW heat pump for Building excluding server room and staff common room.		1	no				
3.4.2	Variable Refrigerant flow condensor plant 82.3kW heat pump for Building excluding server room and staff common room.		1	no				
Total Carried Forward to Next Page								

Total Carried Over From Previous Page								
3.5	**Refrigerant Piping**							
	Inclusive of all fittings, hangers insulation, refnet joints, designed and installed strictly in accordance with the Supplier's specifications.							
3.5.1	Ø 6,4		1	sum				
3.5.2	Ø 9,5		1	sum				
3.5.3	Ø 12,7		0	m				Rate Only
3.5.4	Ø 15,9		1	sum				
3.5.5	Ø 19,1		0	m				Rate Only
3.5.6	Ø 22,2		0	m				Rate Only
3.5.7	Ø 28,6		0	m				Rate Only
3.5.8	Ø 34,9		0	m				Rate Only
3.5.9	Ø 41.3		0	m				Rate Only
3.5.10	extra over: 400x100mm GMS trunking.		1	sum				
3.5.11	extra over: 400mm GMS wire basket c/w cover and spacer channels suitable for wall mounted installation similar to "cabstrut".		1	sum				
3.5.12	Pipe supports and hangars as required.		1	sum				
3.60	**Additional Accessories**							
3.6.1	Decoration panel. Please see drawing for QTY		1	sum				
Total Carried Forward to Next Page								

Total Carried Over From Previous Page								
3.7	**Condensate Drain Piping**							
	Installed in ceiling voids and services shafts, complete with all fittings, hangers and insulation as required sloping at a gradient not less than 1:100 where specified, but strictly in accordance with Suppliers specifications.							
3.7.1	Ø20 uPVC		1	sum				
3.7.2	Ø25 uPVC		1	sum				
3.7.3	Ducting as per drawings		0	m				
3.7.4	**Diffusers, Grilles & Louvres**							
3.7.5	Diffusers. Please see drawing for QTY		24	no				
3.7.6	Extraction Fans. Please see drawing for QTY		2	no				
3.7.7	Supply Fans. Please see drawing for QTY		2	no				
3.7.8	Wall Grilles		4	no				
3.7.9	Door Gilles, 500 x 250, anodized aluminium.		6	no				
Total Carried Forward To Summary								

Item	Description	Qty A	Unit	Labour Rate (N$) B	Material Rate (N$) C	Total Rate (N$) D = C+ B	Total Amount (N$) E = D x A
4	**Part 4 -Ventilation**						
4.1.1	1940 L/s @150 Pa 435 W, 220–240Volt axial flow fancomplete with accessories as specified and control wires	2	no				
4.1.2	1160 L/s @150 Pa, 400 W, 220–240Volt axial flow fan complete with accessories as specified and control wires	2	no				
4.1.3	2230 L/s @150 Pa (600 W, 220–240Volt axial flow complete with accessories as specified and control wires	2	no				
4.2	**Ducting**						
	Supply, deliver, install, test and commission the following equipment: All Ducting Galvanized Mild Steel TO SABS 1238-1979. Pricing to include Duct Hangars, wall brackets and all materials needed for installation.						
4.2.1	**Straight Duct**						
4.2.1.1	Ø150 - GMS circular ducting.	22	m				
4.2.1.2	Ø175 - GMS circular ducting.	22	m				
4.2.1.3	Ø200 - GMS circular ducting.	40	m				
4.2.1.4	Ø250 - GMS circular ducting.	8	m				
4.2.1.5	Ø275 - GMS circular ducting.	8	m				
4.2.1.6	Ø300 - GMS circular ducting.	8	m				
4.2.1.7	Ø350 - GMS circular ducting.	13	m				
4.2.1.8	Ø400 - GMS circular ducting.	15	m				
4.2.1.9	Ø425 - GMS circular ducting.	8	m				
4.2.1.10	Ø500 - GMS circular ducting.	20	m				
4.2.1.11	Ø575 - GMS circular ducting.	18	m				
4.2.2	**Duct Transitions, Fittings & Bends**						
4.2.1.1	Ø350 to Ø250 - GMS circular ducting transition, insulated.	4	no				
4.2.1.2	Ø425 to Ø350- GMS circular ducting transition, insulated.	4	no				
4.2.1.3	Ø500 to Ø425- GMS circular ducting transition, insulated.	4	no				
4.2.1.4	Ø275 to Ø200- GMS circular ducting transition, insulated.	2	no				
4.2.1.5	Ø350 to Ø275- GMS circular ducting transition, insulated.	2	no				
4.2.1.6	Ø400 to Ø350- GMS circular ducting transition, insulated.	2	no				
TOTAL CARRIED OVER TO SUMMARY							

Item	Description	Qty A	Unit	Labour Rate B	Material Rate C	Total Rate D = C + B	Total Amount E = D x A
5	**Part 5: Miscellaneous**						
5.1	**Maintenance**						
5.1.1	Maintenance and guarantee for 12 months of the complete installation.	sum	1				
5.1.2	Replacement parts required for the 1 year maintenance period (as per supplier's recommendation /guideline) (incl. air filter, oil etc.)	sum	1				
5.1.3	Recommended spares and tools. For evaluation purposes the costs of such items offered are deducted from the Tender Price to arrive at a Comparative Tender Price.	sum	1				
5.2	**Testing and Commissioning**						
5.2.1	Testing, balancing and adjusting the complete installation. By certified technician. (incl. provision for all tools and measuring devices required).	sum	1				
5.2.2	Welding under inert conditions	sum	1				
5.2.3	Flushing of system (Nitrogen)	sum	1				
5.2.4	Gas tightness test complete as specified for complete installation.	sum	1				
5.2.5	Commissioning the installation. By certified technician. Commissioning cert/report.	sum	1				
Total Carried Forward to Next Page							

Total Carried Over From Previous Page							
5.3	**Pre-implementation technical dossier, which includes :-**						
5.3.1	Equipment Data Schedules.	sum	1				
5.3.2	Contractor's Drawings : Shop drawings on complete installation.	sum	1				
5.3.3	Contractor's Drawings : Builders Requirements Sketches (where plinths, openings in walls etc. are needed)	sum	1				
5.3.4	Contractor's Drawings : Electrical wiring diagrams from suplliers.	sum	1				
5.4	**Post-implementation technical dossier, which includes :-**						
5.4.1	Provide 1 set of mark-up As-Built drawings in hardcopy.	sum	1				
5.4.2	3 Sets of Operating and Maintenance Manuals.	sum	1				
5.4.3	Issuing of test / commissioning certificate as specified.	sum	1				
5.5	**Labelling**						
5.5.1	Labelling of complete installation (Electric equipment, piping etc.). Complete as specified.	sum	1				
5.6	**Painting**						
5.6.1	Painting of complete installation (exposed piping, trunking trays etc.).	sum	1				
5.7	**Training**						
5.7.1	Demonstrate and train representative of Client for a minimum of 2 hours.	sum	1				
Total Carried Forward To Summary							

Section	Description	Amount (excl VAT) N$
1	Part 1: Preliminary & General	
2	Part 2: Passenger Terminal	
3	Part 3: Commercial Terminal	
4	Part 4 -Ventilation	
5	Part 5: Miscellaneous	
	Sub Total	
	Contingencies (10%)	
	Sub Total	
	VAT (15 %)	
	Grand Total	