TENDER DOCUMENT – NMISA (20-21) T0001C

PROCUREMENT OF A COMPLETE HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) SYSTEM AT GROUND FLOOR AND FIRST FLOOR OF BUILDING 4E (WEST WING) INCLUDING INSTALLATION AND COMMISSIONING.

CLIENT:

NATIONAL METROLOGY INSTITUTE OF SOUTH AFRICA
CSIR Campus, Building 5, Meiring Naude Road,
Brummeria,
Pretoria,
0182
TEL: (012) 841 2671
FAX: (012) 841 2131

PRINCIPAL AGENT:

QUANTUM BUILT & ENVIRONMENT
CONSULTANTS (PTY) LTD
Head office:
74 Stals Road,
Wilgehof,
Bloemfontein,
9301
TEL: (051) 430 8240
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MAY 2021

TENDER DOCUMENT

PROCUREMENT OF A COMPLETE HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) SYSTEM AT GROUND FLOOR AND FIRST FLOOR OF BUILDING 4E (WEST WING) INCLUDING INSTALLATION AND COMMISSIONING

STANDARD BID DOCUMENTATION AND PROJECT SPECIFICATIONS

QUANTUM BUILT AND ENVIRONMENT CONSULTANTS (PTY) LTD

INVITATION TO BID

BID NO:

NMISA (20-21) T0001C

BID DESCRIPTION:

PROCUREMENT OF A COMPLETE HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) SYSTEM AT GROUND FLOOR AND FIRST FLOOR BUILDING 4E (WEST WING) INCLUDING INSTALLATION AND COMMISSIONING.

Compulsory Briefing Session
Date: 25 MAY 2021
Time: 11h00
Venue: NMISA, CSIR Campus, Building 5, Reception

Closing date: 08 JUNE 2021

Closing time: 11h00

NB. On the last page of this document the bidder needs to declare and indicate that they have read and understood the document in full. The bidder is referred to acquaint themselves with all anexures to this bid document and drawings prior to pricing of the BoQ.

Faxed bids will not be accepted, only hand delivered, emailed and couriered proposals will be accepted on or before the closing date and time.

PART A
INVITATION TO BID

YOU ARE HEREBY INVITED TO BID FOR REQUIREMENTS OF THE (*NAME OF DEPARTMENT/ PUBLIC ENTITY*)					
BID NUMBER:	NMISA (20-21) T0001C	CLOSING DATE: 08 JUNE 2021		CLOSING TIME:	11H00
DESCRIPTION	**PROCUREMENT OF A COMPLETE HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) SYSTEM AT GROUND FLOOR AND REPLACEMENT OF TWO (2) AIR HANDLING UNITS FOR BUILDING 4W INCLUDING INSTALLATION AND COMMISSIONING.**				

BID RESPONSE DOCUMENTS MAY BE DEPOSITED IN THE BID BOX SITUATED AT *(STREET ADDRESS)*
National Metrology Institute of South Africa (NMISA) **CSIR Campus** **OR** **tenders@nmisa.org**
Building 5
Brummeria
0182

BIDDING PROCEDURE ENQUIRIES MAY BE DIRECTED TO		TECHNICAL ENQUIRIES MAY BE DIRECTED TO:	
CONTACT PERSON	**Nthabiseng Mokoni**	CONTACT PERSON	**Nthabiseng Mokoni**
TELEPHONE NUMBER	**012 841 2671**	TELEPHONE NUMBER	**012 841 2671**
FACSIMILE NUMBER	**N/A**	FACSIMILE NUMBER	**N/A**
E-MAIL ADDRESS	nmokoni@nmisa.org	E-MAIL ADDRESS	**scm@nmisa.org**

SUPPLIER INFORMATION				
NAME OF BIDDER				
POSTAL ADDRESS				
STREET ADDRESS				
TELEPHONE NUMBER	CODE		NUMBER	
CELLPHONE NUMBER				
FACSIMILE NUMBER	CODE		NUMBER	
E-MAIL ADDRESS				
VAT REGISTRATION NUMBER				
SUPPLIER COMPLIANCE STATUS	TAX COMPLIANCE SYSTEM PIN:		**OR** CENTRAL SUPPLIER DATABASE No: MAAA	
B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE	TICK APPLICABLE BOX] ☐ Yes ☐ No		B-BBEE STATUS LEVEL SWORN AFFIDAVIT	[TICK APPLICABLE BOX] ☐ Yes ☐ No

[A B-BBEE STATUS LEVEL VERIFICATION CERTIFICATE/ SWORN AFFIDAVIT (FOR EMES & QSEs) MUST BE SUBMITTED IN ORDER TO QUALIFY FOR PREFERENCE POINTS FOR B-BBEE]

1 ARE YOU THE ACCREDITED REPRESENTATIVE IN SOUTH AFRICA FOR THE GOODS /SERVICES /WORKS OFFERED?	☐Yes ☐No [IF YES ENCLOSE PROOF]	**2** ARE YOU A FOREIGN BASED SUPPLIER FOR **THE GOODS /SERVICES /WORKS OFFERED?**	☐Yes ☐No [IF YES, ANSWER THE QUESTIONNAIRE BELOW]

QUESTIONNAIRE TO BIDDING FOREIGN SUPPLIERS	
IS THE ENTITY A RESIDENT OF THE REPUBLIC OF SOUTH AFRICA (RSA)?	☐ YES ☐ NO
DOES THE ENTITY HAVE A BRANCH IN THE RSA?	☐ YES ☐ NO
DOES THE ENTITY HAVE A PERMANENT ESTABLISHMENT IN THE RSA?	☐ YES ☐ NO

DOES THE ENTITY HAVE ANY SOURCE OF INCOME IN THE RSA? ☐ YES ☐ NO

IS THE ENTITY LIABLE IN THE RSA FOR ANY FORM OF TAXATION? ☐ YES ☐ NO

IF THE ANSWER IS "NO" TO ALL OF THE ABOVE, THEN IT IS NOT A REQUIREMENT TO REGISTER FOR A TAX COMPLIANCE STATUS SYSTEM PIN CODE FROM THE SOUTH AFRICAN REVENUE SERVICE (SARS) AND IF NOT REGISTER AS PER 2.3 BELOW.

PART B
TERMS AND CONDITIONS FOR BIDDING

1. BID SUBMISSION:

1.1. BIDS MUST BE DELIVERED BY THE STIPULATED TIME TO THE CORRECT ADDRESS. LATE BIDS WILL NOT BE ACCEPTED FOR CONSIDERATION.

1.2. **ALL BIDS MUST BE SUBMITTED ON THE OFFICIAL FORMS PROVIDED–(NOT TO BE RE-TYPED) OR IN THE MANNER PRESCRIBED IN THE BID DOCUMENT.**

1.3. THIS BID IS SUBJECT TO THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT, 2000 AND THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017, THE GENERAL CONDITIONS OF CONTRACT (GCC) AND, IF APPLICABLE, ANY OTHER SPECIAL CONDITIONS OF CONTRACT.

1.4. **THE SUCCESSFUL BIDDER WILL BE REQUIRED TO FILL IN AND SIGN A WRITTEN CONTRACT FORM (SBD7).**

2. TAX COMPLIANCE REQUIREMENTS

2.1 BIDDERS MUST ENSURE COMPLIANCE WITH THEIR TAX OBLIGATIONS.

2.2 BIDDERS ARE REQUIRED TO SUBMIT THEIR UNIQUE PERSONAL IDENTIFICATION NUMBER (PIN) ISSUED BY SARS TO ENABLE THE ORGAN OF STATE TO VERIFY THE TAXPAYER'S PROFILE AND TAX STATUS.

2.3 APPLICATION FOR TAX COMPLIANCE STATUS (TCS) PIN MAY BE MADE VIA E-FILING THROUGH THE SARS WEBSITE WWW.SARS.GOV.ZA.

2.4 BIDDERS MAY ALSO SUBMIT A PRINTED TCS CERTIFICATE TOGETHER WITH THE BID.

2.5 IN BIDS WHERE CONSORTIA / JOINT VENTURES / SUB-CONTRACTORS ARE INVOLVED, EACH PARTY MUST SUBMIT A SEPARATE TCS CERTIFICATE / PIN / CSD NUMBER.

2.6 WHERE NO TCS PIN IS AVAILABLE BUT THE BIDDER IS REGISTERED ON THE CENTRAL SUPPLIER DATABASE (CSD), A CSD NUMBER MUST BE PROVIDED.

2.7 NO BIDS WILL BE CONSIDERED FROM PERSONS IN THE SERVICE OF THE STATE, COMPANIES WITH DIRECTORS WHO ARE PERSONS IN THE SERVICE OF THE STATE, OR CLOSE CORPORATIONS WITH MEMBERS PERSONS IN THE SERVICE OF THE STATE."

NB: FAILURE TO PROVIDE / OR COMPLY WITH ANY OF THE ABOVE PARTICULARS MAY RENDER THE BID INVALID.

SIGNATURE OF BIDDER:

……

CAPACITY UNDER WHICH THIS BID IS SIGNED:

……

(Proof of authority must be submitted e.g. company resolution)

DATE:

……...

PRICING SCHEDULE – FIRM PRICES (PURCHASES)

NOTE: **ONLY FIRM PRICES WILL BE ACCEPTED. NON-FIRM PRICES (INCLUDING PRICES SUBJECT TO RATES OF EXCHANGE VARIATIONS) WILL NOT BE CONSIDERED**

IN CASES WHERE DIFFERENT DELIVERY POINTS INFLUENCE THE PRICING, A SEPARATE PRICING SCHEDULE MUST BE SUBMITTED FOR EACH DELIVERY POINT

Name of bidder……..	Bid number…….....
Closing Time 11:00	Closing date……

OFFER TO BE VALID FOR **90** DAYS FROM THE CLOSING DATE OF BID.

ITEM NO.	QUANTITY	DESCRIPTION	BID PRICE IN RSA CURRENCY ** (ALL APPLICABLE TAXES INCLUDED)

- Required by: …….
- At: …….

  ……
- Brand and model …….
- Country of origin …….
- Does the offer comply with the specification(s)? *YES/NO
- If not to specification, indicate deviation(s) …….
- Period required for delivery …….

  *Delivery: Firm/not firm
- Delivery basis ……

Note: All delivery costs must be included in the bid price, for delivery at the prescribed destination.

** “all applicable taxes” includes value- added tax, pay as you earn, income tax, unemployment insurance fund contributions and skills development levies.

*Delete if not applicable

DECLARATION OF INTEREST

1. Any legal person, including persons employed by the state[1], or persons having a kinship with persons employed by the state, including a blood relationship, may make an offer or offers in terms of this invitation to bid (includes a price quotation, advertised competitive bid, limited bid or proposal). In view of possible allegations of favouritism, should the resulting bid, or part thereof, be awarded to persons employed by the state, or to persons connected with or related to them, it is required that the bidder or his/her authorised representative declare his/her position in relation to the evaluating/adjudicating authority where-

   - the bidder is employed by the state; and/or

   - the legal person on whose behalf the bidding document is signed, has a relationship with persons/a person who are/is involved in the evaluation and or adjudication of the bid(s), or where it is known that such a relationship exists between the person or persons for or on whose behalf the declarant acts and persons who are involved with the evaluation and or adjudication of the bid.

2. **In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.**

2.1 Full Name of bidder or his or her representative: ……

2.2 Identity Number: ……

2.3 Position occupied in the Company (director, trustee, shareholder[2]): ……

2.4 Company Registration Number: ……..

2.5 Tax Reference Number: ……

2.6 VAT Registration Number: ……

2.6.1 The names of all directors / trustees / shareholders / members, their individual identity numbers, tax reference numbers and, if applicable, employee / persal numbers must be indicated in paragraph 3 below.

[1]"State" means –

(a) any national or provincial department, national or provincial public entity or constitutional institution within the meaning of the Public Finance Management Act, 1999 (Act No. 1 of 1999);
(b) any municipality or municipal entity;
(c) provincial legislature;
(d) national Assembly or the national Council of provinces; or
(e) Parliament.

[2]"Shareholder" means a person who owns shares in the company and is actively involved in the management of the enterprise or business and exercises control over the enterprise.

2.7 Are you or any person connected with the bidder presently employed by the state? **YES / NO**

2.7.1 If so, furnish the following particulars:

Name of person / director / trustee / shareholder/ member:
……...……
Name of state institution at which you or the person connected to the bidder is employed :
……
Position occupied in the state institution:
……

Any other particulars:
……
……
……

2.7.2 If you are presently employed by the state, did you obtain the appropriate authority to undertake remunerative work outside employment in the public sector? **YES / NO**

2.7.2.1 If yes, did you attached proof of such authority to the bid document? **YES / NO**

(Note: Failure to submit proof of such authority, where applicable, may result in the disqualification of the bid.

2.7.2.2 If no, furnish reasons for non-submission of such proof:

……
……
……

2.8 Did you or your spouse, or any of the company's directors / trustees / shareholders / members or their spouses conduct business with the state in the previous twelve months? **YES / NO**

2.8.1 If so, furnish particulars:
……..
……..
……...

2.9 Do you, or any person connected with the bidder, have any relationship (family, friend, other) with a person employed by the state and who may be involved with the evaluation and or adjudication of this bid? **YES / NO**

2.9.1 If so, furnish particulars.
……...
……..….
……

2.10 Are you, or any person connected with the bidder, aware of any relationship (family, friend, other) between any other bidder and any person employed by the state who may be involved with the evaluation and or adjudication of this bid? **YES/NO**

2.10.1 If so, furnish particulars**.**

……
……
……

2.11 Do you or any of the directors / trustees / shareholders / members of the company have any interest in any other related companies whether or not they are bidding for this contract? **YES/NO**

2.11.1 If so, furnish particulars:

……
……
……

3 Full details of directors / trustees / members / shareholders.

Full Name	**Identity Number**	**Personal Tax Reference Number**	**State Employee Number / Persal Number**

4 DECLARATION

I, THE UNDERSIGNED (NAME)……

CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 2 and 3 ABOVE IS CORRECT.
I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME IN TERMS OF PARAGRAPH 23 OF THE GENERAL CONDITIONS OF CONTRACT SHOULD THIS DECLARATION PROVE TO BE FALSE.

…….. ..……
Signature Date

…… ……
Position Name of bidder

May 2011

PREFERENCE POINTS CLAIM FORM IN TERMS OF THE PREFERENTIAL PROCUREMENT REGULATIONS 2017

3.1.1.1

This preference form must form part of all bids invited. It contains general information and serves as a claim form for preference points for Broad-Based Black Economic Empowerment (B-BBEE) Status Level of Contribution

NB: BEFORE COMPLETING THIS FORM, BIDDERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF B-BBEE, AS PRESCRIBED IN THE PREFERENTIAL PROCUREMENT REGULATIONS, 2017.

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1. GENERAL CONDITIONS

1.1 The following preference point systems are applicable to all bids:

- the 80/20 system for requirements with a Rand value of up to R50 000 000 (all applicable taxes included); and
- the 90/10 system for requirements with a Rand value above R50 000 000 (all applicable taxes included).

1.2

a) The value of this bid is estimated to not exceed R50 000 000 (all applicable taxes included) and therefore the 80/20 preference point system shall be applicable; or

1.3 Points for this bid shall be awarded for:

(a) Price; and

(b) B-BBEE Status Level of Contributor.

1.4 The maximum points for this bid are allocated as follows:

	POINTS
PRICE	**80**
B-BBEE STATUS LEVEL OF CONTRIBUTOR	**20**
Total points for Price and B-BBEE must not exceed	**100**

1.5 Failure on the part of a bidder to submit proof of B-BBEE Status level of contributor together with the bid, will be interpreted to mean that preference points for B-BBEE status level of contribution are not claimed.

1.6 The purchaser reserves the right to require of a bidder, either before a bid is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the purchaser.

2. DEFINITIONS

(a) **"B-BBEE"** means broad-based black economic empowerment as defined in section 1 of the Broad-Based Black Economic Empowerment Act;

(b) "**B-BBEE status level of contributor"** means the B-BBEE status of an entity in terms of a code of good practice on black economic empowerment, issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act;

(c) **"bid"** means a written offer in a prescribed or stipulated form in response to an invitation by an organ of state for the provision of goods or services, through price quotations, advertised competitive bidding processes or proposals;

(d) **"Broad-Based Black Economic Empowerment Act"** means the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);

(e) "EME" means an Exempted Micro Enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9 (1) of the Broad-Based Black Economic Empowerment Act;

(f) **"functionality"** means the ability of a tenderer to provide goods or services in accordance with specifications as set out in the tender documents.

(g) **"prices"** includes all applicable taxes less all unconditional discounts;

(h) **"proof of B-BBEE status level of contributor"** means:

1) B-BBEE Status level certificate issued by an authorized body or person;

2) A sworn affidavit as prescribed by the B-BBEE Codes of Good Practice;

3) Any other requirement prescribed in terms of the B-BBEE Act;

(i) **"QSE"** means a qualifying small business enterprise in terms of a code of good practice on black economic empowerment issued in terms of section 9 (1) of the Broad-Based Black Economic Empowerment Act;

(j) **"rand value"** means the total estimated value of a contract in Rand, calculated at the time of bid invitation, and includes all applicable taxes;

3. POINTS AWARDED FOR PRICE

3.1 THE 80/20 OR 90/10 PREFERENCE POINT SYSTEMS

A maximum of 80 points is allocated for price on the following basis:

80/20

$$Ps = 80\left(1 - \frac{Pt - P\min}{P\min}\right)$$

Where

Ps = Points scored for price of bid under consideration

Pt = Price of bid under consideration

Pmin = Price of lowest acceptable bid

4. POINTS AWARDED FOR B-BBEE STATUS LEVEL OF CONTRIBUTOR

4.1 In terms of Regulation 6 (2) and 7 (2) of the Preferential Procurement Regulations, preference points must be awarded to a bidder for attaining the B-BBEE status level of contribution in accordance with the table below:

B-BBEE Status Level of Contributor	Number of points (80/20 system)
1	20
2	18
3	14
4	12
5	8
6	6
7	4
8	2
Non-compliant contributor	0

5. BID DECLARATION

5.1 Bidders who claim points in respect of B-BBEE Status Level of Contribution must complete the following:

6. B-BBEE STATUS LEVEL OF CONTRIBUTOR CLAIMED IN TERMS OF PARAGRAPHS 1.4 AND 4.1

6.1 B-BBEE Status Level of Contributor: . = ……(maximum of 10 or 20 points)

(Points claimed in respect of paragraph 7.1 must be in accordance with the table reflected in paragraph 4.1 and must be substantiated by relevant proof of B-BBEE status level of contributor.

7. SUB-CONTRACTING

7.1 Will any portion of the contract be sub-contracted?

(***Tick applicable box***)

YES		NO	

7.1.1 If yes, indicate:

i) What percentage of the contract will be subcontracted.....……%
ii) The name of the sub-contractor……..
iii) The B-BBEE status level of the sub-contractor.....……..
iv) Whether the sub-contractor is an EME or QSE

(Tick applicable box)

YES		NO	

i) Specify, by ticking the appropriate box, if subcontracting with an enterprise in terms of Preferential Procurement Regulations,2017:

Designated Group: An EME or QSE which is at last 51% owned by:	EME √	QSE √
Black people		
Black people who are youth		
Black people who are women		
Black people with disabilities		
Black people living in rural or underdeveloped areas or townships		
Cooperative owned by black people		
Black people who are military veterans		
OR		
Any EME		
Any QSE		

8. DECLARATION WITH REGARD TO COMPANY/FIRM

Name of company/firm:…….
VAT registration number:……
Company registration number:…….

8.1 TYPE OF COMPANY/ FIRM

- □ Partnership/Joint Venture / Consortium
- □ One person business/sole propriety
- □ Close corporation
- □ Company
- □ (Pty) Limited

[TICK APPLICABLE BOX]

8.2 DESCRIBE PRINCIPAL BUSINESS ACTIVITIES

……
……
……
……
……..

8.3 COMPANY CLASSIFICATION

- ☐ Manufacturer
- ☐ Supplier
- ☐ Professional service provider
- ☐ Other service providers, e.g. transporter, etc.

[*TICK APPLICABLE BOX*]

8.4 Total number of years the company/firm has been in business:……

8.5 I/we, the undersigned, who is / are duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the B-BBE status level of contributor indicated in paragraphs 1.4 and 6.1 of the foregoing certificate, qualifies the company/ firm for the preference(s) shown and I / we acknowledge that:

i) The information furnished is true and correct;

ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;

iii) In the event of a contract being awarded as a result of points claimed as shown in paragraphs 1.4 and 6.1, the contractor may be required to furnish documentary proof to the satisfaction of the purchaser that the claims are correct;

iv) If the B-BBEE status level of contributor has been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the purchaser may, in addition to any other remedy it may have –

(a) disqualify the person from the bidding process;

(b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;

(c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;

(d) recommend that the bidder or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted by the National Treasury from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and

(e) forward the matter for criminal prosecution.

WITNESSES 1. …….. 2. ……	…… SIGNATURE(S) OF BIDDERS(S) DATE: …….. ADDRESS …….. …….. ……..

1 DECLARATION OF BIDDER'S PAST SUPPLY CHAIN MANAGEMENT PRACTICES

2 This Standard Bidding Document must form part of all bids invited.

3 It serves as a declaration to be used by institutions in ensuring that when goods and services are being procured, all reasonable steps are taken to combat the abuse of the supply chain management system.

4 The bid of any bidder may be disregarded if that bidder, or any of its directors have-

a. abused the institution's supply chain management system;
b. committed fraud or any other improper conduct in relation to such system; or
c. failed to perform on any previous contract.

5 In order to give effect to the above, the following questionnaire must be completed and submitted with the bid.

Item	Question	Yes	No
4.1	Is the bidder or any of its directors listed on the National Treasury's Database of Restricted Suppliers as companies or persons prohibited from doing business with the public sector? **(Companies or persons who are listed on this Database were informed in writing of this restriction by the Accounting Officer/Authority of the institution that imposed the restriction after the *audi alteram partem* rule was applied).** The Database of Restricted Suppliers now resides on the National Treasury's website(**www.treasury.gov.za**) and can be accessed by clicking on its link at the bottom of the home page.	Yes ☐	No ☐
4.1.1	If so, furnish particulars:		
4.2	Is the bidder or any of its directors listed on the Register for Tender Defaulters in terms of section 29 of the Prevention and Combating of Corrupt Activities Act (No 12 of 2004)? **The Register for Tender Defaulters can be accessed on the National Treasury's website (www.treasury.gov.za) by clicking on its link at the bottom of the home page.**	Yes ☐	No ☐
4.2.1	If so, furnish particulars:		

4.3	Was the bidder or any of its directors convicted by a court of law (including a court outside of the Republic of South Africa) for fraud or corruption during the past five years?	Yes ☐	No ☐
4.3.1	If so, furnish particulars:		
4.4	Was any contract between the bidder and any organ of state terminated during the past five years on account of failure to perform on or comply with the contract?	Yes ☐	No ☐
4.4.1	If so, furnish particulars:		

SBD 8

CERTIFICATION

I, THE UNDERSIGNED (FULL NAME)……..

CERTIFY THAT THE INFORMATION FURNISHED ON THIS DECLARATION FORM IS TRUE AND CORRECT.

I ACCEPT THAT, IN ADDITION TO CANCELLATION OF A CONTRACT, ACTION MAY BE TAKEN AGAINST ME SHOULD THIS DECLARATION PROVE TO BE FALSE.

……..... **……**
Signature **Date**

…… **……**
Position **Name of Bidder**

Js365bW

CERTIFICATE OF INDEPENDENT BID DETERMINATION

1 This Standard Bidding Document (SBD) must form part of all bids[1] invited.

2 Section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, prohibits an agreement between, or concerted practice by, firms, or a decision by an association of firms, if it is between parties in a horizontal relationship and if it involves collusive bidding (or bid rigging).[2] Collusive bidding is a *pe se* prohibition meaning that it cannot be justified under any grounds.

3 Treasury Regulation 16A9 prescribes that accounting officers and accounting authorities must take all reasonable steps to prevent abuse of the supply chain management system and authorizes accounting officers and accounting authorities to:

a. disregard the bid of any bidder if that bidder, or any of its directors have abused the institution's supply chain management system and or committed fraud or any other improper conduct in relation to such system.

b. cancel a contract awarded to a supplier of goods and services if the supplier committed any corrupt or fraudulent act during the bidding process or the execution of that contract.

4 This SBD serves as a certificate of declaration that would be used by institutions to ensure that, when bids are considered, reasonable steps are taken to prevent any form of bid-rigging.

5 In order to give effect to the above, the attached Certificate of Bid Determination (SBD 9) must be completed and submitted with the bid:

[1] Includes price quotations, advertised competitive bids, limited bids and proposals.

[2] Bid rigging (or collusive bidding) occurs when businesses, that would otherwise be expected to compete, secretly conspire to raise prices or lower the quality of goods and / or services for purchasers who wish to acquire goods and / or services through a bidding process. Bid rigging is, therefore, an agreement between competitors not to compete.

CERTIFICATE OF INDEPENDENT BID DETERMINATION

I, the undersigned, in submitting the accompanying bid:

_____

(Bid Number and Description)

in response to the invitation for the bid made by:

_____

(Name of Institution)

do hereby make the following statements that I certify to be true and complete in every respect:

I certify, on behalf of: _____that:

(Name of Bidder)

1. I have read and I understand the contents of this Certificate;
2. I understand that the accompanying bid will be disqualified if this Certificate is found not to be true and complete in every respect;
3. I am authorized by the bidder to sign this Certificate, and to submit the accompanying bid, on behalf of the bidder;
4. Each person whose signature appears on the accompanying bid has been authorized by the bidder to determine the terms of, and to sign the bid, on behalf of the bidder;
5. For the purposes of this Certificate and the accompanying bid, I understand that the word “competitor” shall include any individual or organization, other than the bidder, whether or not affiliated with the bidder, who:

    (a) has been requested to submit a bid in response to this bid invitation;

    (b) could potentially submit a bid in response to this bid invitation, based on their qualifications, abilities or experience; and

    (c) provides the same goods and services as the bidder and/or is in the same line of business as the bidder

6. The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However communication between partners in a joint venture or consortium[3] will not be construed as collusive bidding.
7. In particular, without limiting the generality of paragraphs 6 above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:
    (a) prices;
    (b) geographical area where product or service will be rendered (market allocation)
    (c) methods, factors or formulas used to calculate prices;
    (d) the intention or decision to submit or not to submit, a bid;
    (e) the submission of a bid which does not meet the specifications and conditions of the bid; or
    (f) bidding with the intention not to win the bid.
8. In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the products or services to which this bid invitation relates.
9. The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.

[3] Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.

10. I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

…… ……

Signature Date

…… ……

Position Name of Bidder

Js914w 2

THE NATIONAL TREASURY

Republic of South Africa

GOVERNMENT PROCUREMENT:

GENERAL CONDITIONS OF CONTRACT

July 2010

GOVERNMENT PROCUREMENT

GENERAL CONDITIONS OF CONTRACT
July 2010

NOTES

The purpose of this document is to:

(i) Draw special attention to certain general conditions applicable to government bids, contracts and orders; and
(ii) To ensure that clients be familiar with regard to the rights and obligations of all parties involved in doing business with government.

In this document words in the singular also mean in the plural and vice versa and words in the masculine also mean in the feminine and neuter.

- The General Conditions of Contract will form part of all bid documents and may not be amended.

- Special Conditions of Contract (SCC) relevant to a specific bid, should be compiled separately for every bid (if (applicable) and will supplement the General Conditions

TABLE OF CLAUSES

General Conditions of Contract

1. Definitions

1. The following terms shall be interpreted as indicated:

1.1 “Closing time” means the date and hour specified in the bidding documents for the receipt of bids.

1.2 “Contract” means the written agreement entered into between the purchaser and the supplier, as recorded in the contract form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

1.3 “Contract price” means the price payable to the supplier under the contract for the full and proper performance of his contractual obligations.

1.4 “Corrupt practice” means the offering, giving, receiving, or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution.

1.5 "Countervailing duties" are imposed in cases where an enterprise abroad is subsidized by its government and encouraged to market its products internationally.

1.6 “Country of origin” means the place where the goods were mined, grown or produced or from which the services are supplied. Goods are produced when, through manufacturing, processing or substantial and major assembly of components, a commercially recognized new product results that is substantially different in basic characteristics or in purpose or utility from its components.

1.7 “Day” means calendar day.

1.8 “Delivery” means delivery in compliance of the conditions of the contract or order.

1.9 “Delivery ex stock” means immediate delivery directly from stock actually on hand.

1.10 “Delivery into consignees store or to his site” means delivered and unloaded in the specified store or depot or on the specified site in compliance with the conditions of the contract or order, the supplier bearing all risks and charges involved until the supplies are so delivered and a valid receipt is obtained.

1.11 "Dumping" occurs when a private enterprise abroad market its goods on own initiative in the RSA at lower prices than that of the country of origin and which have the potential to harm the local industries in the

RSA.

1.12 ”Force majeure” means an event beyond the control of the supplier and not involving the supplier’s fault or negligence and not foreseeable. Such events may include, but is not restricted to, acts of the purchaser in its sovereign capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.

1.13 “Fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of any bidder, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the bidder of the benefits of free and open competition.

1.14 “GCC” means the General Conditions of Contract.

1.15 “Goods” means all of the equipment, machinery, and/or other materials that the supplier is required to supply to the purchaser under the contract.

1.16 “Imported content” means that portion of the bidding price represented by the cost of components, parts or materials which have been or are still to be imported (whether by the supplier or his subcontractors) and which costs are inclusive of the costs abroad, plus freight and other direct importation costs such as landing costs, dock dues, import duty, sales duty or other similar tax or duty at the South African place of entry as well as transportation and handling charges to the factory in the Republic where the supplies covered by the bid will be manufactured.

1.17 “Local content” means that portion of the bidding price which is not included in the imported content provided that local manufacture does take place.

1.18 “Manufacture” means the production of products in a factory using labour, materials, components and machinery and includes other related value-adding activities.

1.19 “Order” means an official written order issued for the supply of goods or works or the rendering of a service.

1.20 “Project site,” where applicable, means the place indicated in bidding documents.

1.21 “Purchaser” means the organization purchasing the goods.

1.22 “Republic” means the Republic of South Africa.

1.23 “SCC” means the Special Conditions of Contract.

1.24 “Services” means those functional services ancillary to the supply of the goods, such as transportation and any other incidental services, such as installation, commissioning, provision of technical assistance, training, catering, gardening, security, maintenance and other such

obligations of the supplier covered under the contract.

1.25 "Written" or "in writing" means handwritten in ink or any form of electronic or mechanical writing.

2. Application

2.1 These general conditions are applicable to all bids, contracts and orders including bids for functional and professional services, sales, hiring, letting and the granting or acquiring of rights, but excluding immovable property, unless otherwise indicated in the bidding documents.

2.2 Where applicable, special conditions of contract are also laid down to cover specific supplies, services or works.

2.3 Where such special conditions of contract are in conflict with these general conditions, the special conditions shall apply.

3. General

3.1 Unless otherwise indicated in the bidding documents, the purchaser shall not be liable for any expense incurred in the preparation and submission of a bid. Where applicable a non-refundable fee for documents may be charged.

3.2 With certain exceptions, invitations to bid are only published in the Government Tender Bulletin. The Government Tender Bulletin may be obtained directly from the Government Printer, Private Bag X85, Pretoria 0001, or accessed electronically from www.treasury.gov.za

4. Standards

4.1 The goods supplied shall conform to the standards mentioned in the bidding documents and specifications.

5. Use of contract documents and information; inspection.

5.1 The supplier shall not, without the purchaser's prior written consent, disclose the contract, or any provision thereof, or any specification, plan, drawing, pattern, sample, or information furnished by or on behalf of the purchaser in connection therewith, to any person other than a person employed by the supplier in the performance of the contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.

5.2 The supplier shall not, without the purchaser's prior written consent, make use of any document or information mentioned in GCC clause 5.1 except for purposes of performing the contract.

5.3 Any document, other than the contract itself mentioned in GCC clause 5.1 shall remain the property of the purchaser and shall be returned (all copies) to the purchaser on completion of the supplier's performance under the contract if so required by the purchaser.

5.4 The supplier shall permit the purchaser to inspect the supplier's records relating to the performance of the supplier and to have them audited by auditors appointed by the purchaser, if so required by the purchaser.

6. Patent rights

6.1 The supplier shall indemnify the purchaser against all third-party claims of infringement of patent, trademark, or industrial design rights arising from use of the goods or any part thereof by the purchaser.

7. Performance security

7.1 Within thirty (30) days of receipt of the notification of contract award, the successful bidder shall furnish to the purchaser the performance security of the amount specified in SCC.

7.2 The proceeds of the performance security shall be payable to the purchaser as compensation for any loss resulting from the supplier's failure to complete his obligations under the contract.

7.3 The performance security shall be denominated in the currency of the contract, or in a freely convertible currency acceptable to the purchaser and shall be in one of the following forms:

(a) a bank guarantee or an irrevocable letter of credit issued by a reputable bank located in the purchaser's country or abroad, acceptable to the purchaser, in the form provided in the bidding documents or another form acceptable to the purchaser; or
(b) a cashier's or certified cheque

7.4 The performance security will be discharged by the purchaser and returned to the supplier not later than thirty (30) days following the date of completion of the supplier's performance obligations under the contract, including any warranty obligations, unless otherwise specified in SCC.

8. Inspections, tests and analyses

8.1 All pre-bidding testing will be for the account of the bidder.

8.2 If it is a bid condition that supplies to be produced or services to be rendered should at any stage during production or execution or on completion be subject to inspection, the premises of the bidder or contractor shall be open, at all reasonable hours, for inspection by a representative of the Department or an organization acting on behalf of the Department.

8.3 If there are no inspection requirements indicated in the bidding documents and no mention is made in the contract, but during the contract period it is decided that inspections shall be carried out, the purchaser shall itself make the necessary arrangements, including payment arrangements with the testing authority concerned.

8.4 If the inspections, tests and analyses referred to in clauses 8.2 and 8.3 show the supplies to be in accordance with the contract requirements, the cost of the inspections, tests and analyses shall be defrayed by the purchaser.

8.5 Where the supplies or services referred to in clauses 8.2 and 8.3 do not comply with the contract requirements, irrespective of whether such supplies or services are accepted or not, the cost in connection with these inspections, tests or analyses shall be defrayed by the supplier.

8.6 Supplies and services which are referred to in clauses 8.2 and 8.3 and which do not comply with the contract requirements may be rejected.

8.7 Any contract supplies may on or after delivery be inspected, tested or

analyzed and may be rejected if found not to comply with the requirements of the contract. Such rejected supplies shall be held at the cost and risk of the supplier who shall, when called upon, remove them immediately at his own cost and forthwith substitute them with supplies which do comply with the requirements of the contract. Failing such removal the rejected supplies shall be returned at the suppliers cost and risk. Should the supplier fail to provide the substitute supplies forthwith, the purchaser may, without giving the supplier further opportunity to substitute the rejected supplies, purchase such supplies as may be necessary at the expense of the supplier.

8.8 The provisions of clauses 8.4 to 8.7 shall not prejudice the right of the purchaser to cancel the contract on account of a breach of the conditions thereof, or to act in terms of Clause 23 of GCC.

9. Packing

9.1 The supplier shall provide such packing of the goods as is required to prevent their damage or deterioration during transit to their final destination, as indicated in the contract. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packing, case size and weights shall take into consideration, where appropriate, the remoteness of the goods' final destination and the absence of heavy handling facilities at all points in transit.

9.2 The packing, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the contract, including additional requirements, if any, specified in SCC, and in any subsequent instructions ordered by the purchaser.

10. Delivery and documents

10.1 Delivery of the goods shall be made by the supplier in accordance with the terms specified in the contract. The details of shipping and/or other documents to be furnished by the supplier are specified in SCC.

10.2 Documents to be submitted by the supplier are specified in SCC.

11. Insurance

11.1 The goods supplied under the contract shall be fully insured in a freely convertible currency against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery in the manner specified in the SCC.

12. Transportation

12.1 Should a price other than an all-inclusive delivered price be required, this shall be specified in the SCC.

13. Incidental services

13.1 The supplier may be required to provide any or all of the following services, including additional services, if any, specified in SCC:

(a) performance or supervision of on-site assembly and/or commissioning of the supplied goods;
(b) furnishing of tools required for assembly and/or maintenance of the supplied goods;
(c) furnishing of a detailed operations and maintenance manual for each appropriate unit of the supplied goods;

(d) performance or supervision or maintenance and/or repair of the supplied goods, for a period of time agreed by the parties, provided that this service shall not relieve the supplier of any warranty obligations under this contract; and

(e) training of the purchaser's personnel, at the supplier's plant and/or on-site, in assembly, start-up, operation, maintenance, and/or repair of the supplied goods.

13.2 Prices charged by the supplier for incidental services, if not included in the contract price for the goods, shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged to other parties by the supplier for similar services.

14. Spare parts

14.1 As specified in SCC, the supplier may be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured or distributed by the supplier:

(a) such spare parts as the purchaser may elect to purchase from the supplier, provided that this election shall not relieve the supplier of any warranty obligations under the contract; and

(b) in the event of termination of production of the spare parts:

(i) Advance notification to the purchaser of the pending termination, in sufficient time to permit the purchaser to procure needed requirements; and

(ii) following such termination, furnishing at no cost to the purchaser, the blueprints, drawings, and specifications of the spare parts, if requested.

15. Warranty

15.1 The supplier warrants that the goods supplied under the contract are new, unused, of the most recent or current models, and that they incorporate all recent improvements in design and materials unless provided otherwise in the contract. The supplier further warrants that all goods supplied under this contract shall have no defect, arising from design, materials, or workmanship (except when the design and/or material is required by the purchaser's specifications) or from any act or omission of the supplier, that may develop under normal use of the supplied goods in the conditions prevailing in the country of final destination.

15.2 This warranty shall remain valid for twelve (12) months after the goods, or any portion thereof as the case may be, have been delivered to and accepted at the final destination indicated in the contract, or for eighteen (18) months after the date of shipment from the port or place of loading in the source country, whichever period concludes earlier, unless specified otherwise in SCC.

15.3 The purchaser shall promptly notify the supplier in writing of any claims arising under this warranty.

15.4 Upon receipt of such notice, the supplier shall, within the period specified in SCC and with all reasonable speed, repair or replace the defective goods or parts thereof, without costs to the purchaser.

15.5 If the supplier, having been notified, fails to remedy the defect(s) within the period specified in SCC, the purchaser may proceed to take

such remedial action as may be necessary, at the supplier's risk and expense and without prejudice to any other rights which the purchaser may have against the supplier under the contract.

16. Payment

16.1 The method and conditions of payment to be made to the supplier under this contract shall be specified in SCC.

16.2 The supplier shall furnish the purchaser with an invoice accompanied by a copy of the delivery note and upon fulfillment of other obligations stipulated in the contract.

16.3 Payments shall be made promptly by the purchaser, but in no case later than thirty (30) days after submission of an invoice or claim by the supplier.

16.4 Payment will be made in Rand unless otherwise stipulated in SCC.

17. Prices

17.1 Prices charged by the supplier for goods delivered and services performed under the contract shall not vary from the prices quoted by the supplier in his bid, with the exception of any price adjustments authorized in SCC or in the purchaser's request for bid validity extension, as the case may be.

18. Contract amendments

18.1 No variation in or modification of the terms of the contract shall be made except by written amendment signed by the parties concerned.

19. Assignment

19.1 The supplier shall not assign, in whole or in part, its obligations to perform under the contract, except with the purchaser's prior written consent.

20. Subcontracts

20.1 The supplier shall notify the purchaser in writing of all subcontracts awarded under this contracts if not already specified in the bid. Such notification, in the original bid or later, shall not relieve the supplier from any liability or obligation under the contract.

21. Delays in the supplier's performance

21.1 Delivery of the goods and performance of services shall be made by the supplier in accordance with the time schedule prescribed by the purchaser in the contract.

21.2 If at any time during performance of the contract, the supplier or its subcontractor(s) should encounter conditions impeding timely delivery of the goods and performance of services, the supplier shall promptly notify the purchaser in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the supplier's notice, the purchaser shall evaluate the situation and may at his discretion extend the supplier's time for performance, with or without the imposition of penalties, in which case the extension shall be ratified by the parties by amendment of contract.

21.3 No provision in a contract shall be deemed to prohibit the obtaining of supplies or services from a national department, provincial department, or a local authority.

21.4 The right is reserved to procure outside of the contract small quantities or to have minor essential services executed if an emergency arises, the

supplier's point of supply is not situated at or near the place where the supplies are required, or the supplier's services are not readily available.

21.5 Except as provided under GCC Clause 25, a delay by the supplier in the performance of its delivery obligations shall render the supplier liable to the imposition of penalties, pursuant to GCC Clause 22, unless an extension of time is agreed upon pursuant to GCC Clause 21.2 without the application of penalties.

21.6 Upon any delay beyond the delivery period in the case of a supplies contract, the purchaser shall, without canceling the contract, be entitled to purchase supplies of a similar quality and up to the same quantity in substitution of the goods not supplied in conformity with the contract and to return any goods delivered later at the supplier's expense and risk, or to cancel the contract and buy such goods as may be required to complete the contract and without prejudice to his other rights, be entitled to claim damages from the supplier.

22. Penalties

22.1 Subject to GCC Clause 25, if the supplier fails to deliver any or all of the goods or to perform the services within the period(s) specified in the contract, the purchaser shall, without prejudice to its other remedies under the contract, deduct from the contract price, as a penalty, a sum calculated on the delivered price of the delayed goods or unperformed services using the current prime interest rate calculated for each day of the delay until actual delivery or performance. The purchaser may also consider termination of the contract pursuant to GCC Clause 23.

23. Termination for default

23.1 The purchaser, without prejudice to any other remedy for breach of contract, by written notice of default sent to the supplier, may terminate this contract in whole or in part:

(a) if the supplier fails to deliver any or all of the goods within the period(s) specified in the contract, or within any extension thereof granted by the purchaser pursuant to GCC Clause 21.2;

(b) if the Supplier fails to perform any other obligation(s) under the contract; or

(c) if the supplier, in the judgment of the purchaser, has engaged in corrupt or fraudulent practices in competing for or in executing the contract.

23.2 In the event the purchaser terminates the contract in whole or in part, the purchaser may procure, upon such terms and in such manner as it deems appropriate, goods, works or services similar to those undelivered, and the supplier shall be liable to the purchaser for any excess costs for such similar goods, works or services. However, the supplier shall continue performance of the contract to the extent not terminated.

23.3 Where the purchaser terminates the contract in whole or in part, the purchaser may decide to impose a restriction penalty on the supplier by prohibiting such supplier from doing business with the public sector for a period not exceeding 10 years.

23.4 If a purchaser intends imposing a restriction on a supplier or any

person associated with the supplier, the supplier will be allowed a time period of not more than fourteen (14) days to provide reasons why the envisaged restriction should not be imposed. Should the supplier fail to respond within the stipulated fourteen (14) days the purchaser may regard the intended penalty as not objected against and may impose it on the supplier.

23.5 Any restriction imposed on any person by the Accounting Officer / Authority will, at the discretion of the Accounting Officer / Authority, also be applicable to any other enterprise or any partner, manager, director or other person who wholly or partly exercises or exercised or may exercise control over the enterprise of the first-mentioned person, and with which enterprise or person the first-mentioned person, is or was in the opinion of the Accounting Officer / Authority actively associated.

23.6 If a restriction is imposed, the purchaser must, within five (5) working days of such imposition, furnish the National Treasury, with the following information:

(i) the name and address of the supplier and / or person restricted by the purchaser;
(ii) the date of commencement of the restriction
(iii) the period of restriction; and
(iv) the reasons for the restriction.

These details will be loaded in the National Treasury's central database of suppliers or persons prohibited from doing business with the public sector.

23.7 If a court of law convicts a person of an offence as contemplated in sections 12 or 13 of the Prevention and Combating of Corrupt Activities Act, No. 12 of 2004, the court may also rule that such person's name be endorsed on the Register for Tender Defaulters. When a person's name has been endorsed on the Register, the person will be prohibited from doing business with the public sector for a period not less than five years and not more than 10 years. The National Treasury is empowered to determine the period of restriction and each case will be dealt with on its own merits. According to section 32 of the Act the Register must be open to the public. The Register can be perused on the National Treasury website.

24. Anti-dumping and countervailing duties and rights

24.1 When, after the date of bid, provisional payments are required, or anti-dumping or countervailing duties are imposed, or the amount of a provisional payment or anti-dumping or countervailing right is increased in respect of any dumped or subsidized import, the State is not liable for any amount so required or imposed, or for the amount of any such increase. When, after the said date, such a provisional payment is no longer required or any such anti-dumping or countervailing right is abolished, or where the amount of such provisional payment or any such right is reduced, any such favourable difference shall on demand be paid forthwith by the contractor to the State or the State may deduct such amounts from moneys (if any) which may otherwise be due to the contractor in regard to supplies or services which he delivered or rendered, or is to deliver or render in terms of the contract or any other contract or any other amount which

may be due to him

25. Force Majeure

25.1 Notwithstanding the provisions of GCC Clauses 22 and 23, the supplier shall not be liable for forfeiture of its performance security, damages, or termination for default if and to the extent that his delay in performance or other failure to perform his obligations under the contract is the result of an event of force majeure.

25.2 If a force majeure situation arises, the supplier shall promptly notify the purchaser in writing of such condition and the cause thereof. Unless otherwise directed by the purchaser in writing, the supplier shall continue to perform its obligations under the contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the force majeure event.

26. Termination for insolvency

26.1 The purchaser may at any time terminate the contract by giving written notice to the supplier if the supplier becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the supplier, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the purchaser.

27. Settlement of Disputes

27.1 If any dispute or difference of any kind whatsoever arises between the purchaser and the supplier in connection with or arising out of the contract, the parties shall make every effort to resolve amicably such dispute or difference by mutual consultation.

27.2 If, after thirty (30) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the purchaser or the supplier may give notice to the other party of his intention to commence with mediation. No mediation in respect of this matter may be commenced unless such notice is given to the other party.

27.3 Should it not be possible to settle a dispute by means of mediation, it may be settled in a South African court of law.

27.4 Mediation proceedings shall be conducted in accordance with the rules of procedure specified in the SCC.

27.5 Notwithstanding any reference to mediation and/or court proceedings herein,

(a) the parties shall continue to perform their respective obligations under the contract unless they otherwise agree; and
(b) the purchaser shall pay the supplier any monies due the supplier.

28. Limitation of liability

28.1 Except in cases of criminal negligence or willful misconduct, and in the case of infringement pursuant to Clause 6;

(a) the supplier shall not be liable to the purchaser, whether in contract, tort, or otherwise, for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the supplier to pay penalties and/or damages to the purchaser; and

(b) the aggregate liability of the supplier to the purchaser, whether under the contract, in tort or otherwise, shall not exceed the total contract price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment.

29. Governing language

29.1 The contract shall be written in English. All correspondence and other documents pertaining to the contract that is exchanged by the parties shall also be written in English.

30. Applicable law

30.1 The contract shall be interpreted in accordance with South African laws, unless otherwise specified in SCC.

31. Notices

31.1 Every written acceptance of a bid shall be posted to the supplier concerned by registered or certified mail and any other notice to him shall be posted by ordinary mail to the address furnished in his bid or to the address notified later by him in writing and such posting shall be deemed to be proper service of such notice

31.2 The time mentioned in the contract documents for performing any act after such aforesaid notice has been given, shall be reckoned from the date of posting of such notice.

32. Taxes and duties

32.1 A foreign supplier shall be entirely responsible for all taxes, stamp duties, license fees, and other such levies imposed outside the purchaser's country.

32.2 A local supplier shall be entirely responsible for all taxes, duties, license fees, etc., incurred until delivery of the contracted goods to the purchaser.

32.3 No contract shall be concluded with any bidder whose tax matters are not in order. Prior to the award of a bid the Department must be in possession of a tax clearance certificate, submitted by the bidder. This certificate must be an original issued by the South African Revenue Services.

33. National Industrial Participation (NIP) Programme

33.1 The NIP Programme administered by the Department of Trade and Industry shall be applicable to all contracts that are subject to the NIP obligation.

34 Prohibition of Restrictive practices

34.1 In terms of section 4 (1) (b) (iii) of the Competition Act No. 89 of 1998, as amended, an agreement between, or concerted practice by, firms, or a decision by an association of firms, is prohibited if it is between parties in a horizontal relationship and if a bidder (s) is / are or a contractor(s) was / were involved in collusive bidding (or bid rigging).

34.2 If a bidder(s) or contractor(s), based on reasonable grounds or evidence obtained by the purchaser, has / have engaged in the restrictive practice referred to above, the purchaser may refer the matter to the Competition Commission for investigation and possible imposition of administrative penalties as contemplated in the Competition Act No. 89 of 1998.

34.3 If a bidder(s) or contractor(s), has / have been found guilty by the Competition Commission of the restrictive practice referred to above, the purchaser may, in addition and without prejudice to any other remedy provided for, invalidate the bid(s) for such item(s) offered, and / or terminate the contract in whole or part, and / or restrict the bidder(s) or contractor(s) from conducting business with the public sector for a period not exceeding ten (10) years and / or claim damages from the bidder(s) or contractor(s) concerned.

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SPECIFICATION DOCUMENT

BID NO: **NMISA (20/21) T0001C**

BID DESCRIPTION: **PROCUREMENT OF A COMPLETE HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) SYSTEM AT GROUND FLOOR AND FIRST FLOOR BUILDING 4E (WEST WING) INCLUDING INSTALLATION AND COMMISSIONING.**

Closing date:	08 JUNE 2021
Compulsory Briefing session:	25 MAY 2021
Time:	11:00 am
Venue:	Building 5, CSIR Campus, Meiring Naude Road

NB. On the last page of this document, the bidder needs to declare and indicate that they have read and understood the document in full.

Faxed bids will not be accepted, only hand delivered, e-mailed and couriered original proposals will be accepted.

INTRODUCTION

NMISA is a Type 3A Public Entity established in accordance with the Measurement Unit and Measurement Standards Act, No. 18 of 2006 (the Act). NMISA is mandated by the Act to provide for the use of the international system of units (the SI) and other measurement units in South Africa, to maintain national measurement standards (NMS) and to determine and ensure the comparability of the NMS. More information can be obtained from www.nmisa.org.

1. PURPOSE

NMISA wishes procure a complete heating, ventilation and air-conditioning system for building 4 ground floor West which will supply twenty-four (24) laboratory rooms in ground floor and one (1) laboratory on the first floor of building 4E (West Wing). The activities will include delivery, installation, testing and commissioning.

2. BID DOCUMENT

Bid documents are available on the website (www.nmisa.org) at no cost. Bidders are advised not to ask a NMISA staff member to download the bid documentation from the website on their behalf. Serious action will be taken against the staff member and the offending supplier may be disqualified to do business with NMISA in future.

3. VALIDITY PERIOD

The proposal submitted by the supplier must be valid for a period of 90 days from the closing date for the submission of proposals.

4. ENQUIRIES

All enquiries regarding this bid must be directed to the Supply Chain Management Office:
E-mail address: scm@nmisa.org.
Telephone numbers: (012) 841 2840/ 3652/ 2671

5. NON-COMPULSORY BRIEFING SESSION

Compulsory Briefing session:	25 MAY 2021
Time:	11:00 am
Venue:	Building 5, CSIR Campus, Meiring Naude Road

6. SUBMISSION OF PROPOSALS

Proposals must be submitted in three (3) sealed envelopes clearly marked with the tender number, description and address together **with a soft copy on a disk (CD) or memory stick**. The first envelope must contain the originals of the bid proposal, the second envelope a copy of the original and the third envelope needs to contain the itemised quotation whereby they will be deposited in the tender box situated at the reception of NMISA at the below address:

National Metrology Institute of South Africa (NMISA), Building no 5: CSIR Scientia Campus, Meiring Naudé Road, Brummeria, Pretoria, Gauteng Province, South Africa.

Or,

Via email at tenders@nmisa.org

Bidders must submit their proposals at the above address by 11:00 on the closing date or between 09:00 and 16:00 before the closing date.

7. PRICING

- A firm ZAR pricing schedule as per SBD 3.1.
- The quoted price must be valid for a period of 90 days from the closing date of the bid.
- The final price must be inclusive of VAT.
- Delivery should be within 12 weeks after issuing a purchase order.
- Invoice will only be accepted after installation, commissioning and training has been completed.
- Payment will be made within 30 days after receipt of the final Original Tax Invoice(s).
- All tender submissions are subject to the Government Procurement General Conditions of Contract.

8. MANDATORY/ LEGISLATIVE REQUIREMENT

This stage checks and validates the bidders' compliance to the legal requirements to conduct business in South Africa, as well as to the industry requirement for the supply of goods and services.

NB: No points will be allocated at this stage; however, bidders' that do not comply with the pre-qualification requirements below will be disqualified and will not advance to the next stage of evaluation.

Pre-Qualification Requirements		**Check list** ✓ **Tick each box**
SBD 1:	Completed, attached and signed	
SBD 3.1	Completed, attached and signed	
SBD 4:	Completed, attached and signed	
SBD 6.1:	Completed, attached and signed	
SBD 8:	Completed, attached and signed	
SBD 9:	Completed, attached and signed	
Specification document	Completed, attached and signed	
General Condition of contract:	Initialled and attached	
Provide Tax TCS Pin to verify Tax Status:	Attached	
Registered on the Central Supplier Database of National Treasury. (For registration information, go to https://secure.csd.gov.za/)		
COIDA		
Workman's compensation from Department of Labor		

Note: Some requirements may not be applicable to International suppliers/ bidders and only those suppliers/ bidders will be exempted from these mandatory/ legislative requirements. All SBDs must be submitted (signed) noting where it is not applicable. If any specific SBD is not submitted, documentary proof, clearly stating the reason must be attached.

Bidders must also supply the documents below (where applicable).

Other Requirements	Check list ✓ Tick each box
Valid B-BBEE Certificate attached	

9. EVALUATION PROCESS

9.1 AIM OF EVALUATION

To ensure that all bids/ proposals received are afforded the opportunity to compete equally and enable NMISA a chance to evaluate the bid received in a fair and unbiased manner as per the pre-determined evaluation criteria.

9.2 EVALUATION CRITERIA

The evaluation criteria as set out hereunder will assist NMISA to ensure conformity to all tender requirements. NMISA evaluation team shall use the evaluation criteria, applicable values and/or minimum qualifying scores as indicated in the bid specification document.

The following are the stages that will be used to evaluate all bid/s received.

10. COMPULSORY TECHNICAL SPECIFICATIONS

Please complete the table below by indicating "yes" or "no" to confirm whether this requirement is met and provide explanations/ comments to support your answers. Supporting documentation or evidence should be attached to this document, if no evidence is provided, it will be assumed that the specification cannot be met. Supporting documentation should take the form of technical specifications, datasheets, technical drawings, brochures, etc. Supporting documents should have page numbers for ease of reference.

NB: Bids that score NO for any items in the compulsory technical specification section will be disqualified and will not advance to the next stage of evaluation.

No.	Compulsory Technical Requirements	Yes or No	Comments (please reference page no.)
1. Complete HVAC system			
1	Detailed Bills of Quantities (all items priced and totaled) for the complete HVAC system		
2	AHU1 and AHU2 ground floor • Relative humidity 50% (+/- 15%) • Ambient temperature 23 °C (+/- 2 Degrees)		
3	AHU3 first floor • Environmental conditions: 25 °C ± 2 °C, 50 %RH ± 15 %RH • And air movement less than 0,25 m/s		
4	The bidder must propose a project specific plan which will detail the activities, schedules, cost and procurement plan of executing the project		
5	The bidder must have an active Construction Industry Development Board (CIDB) grading of 4MEPE/5ME or higher		
6	Joint ventures must be fully commissioned as a single entity (Joint BBBEE certificate must be provided, single company certificate cannot be evaluated)		

11. FUNCTIONALITY

The evaluation criteria for functionality aim to assess the bidder's capability, reliability and ability to execute and maintain a bid and/ or contract. The minimum number of points that bidders' have to obtain in order to progress to the next stage of evaluation is **85**.

NB: Bids that scored less than 85 on functionality will be disqualified and will not progress to the next stage of evaluation.

FUNCTIONALITY CRITERIA	ALLOCATED POINTS
Qualifications and experience of key project team (Evidence must clearly indicate who is the Project Manager and who is the Project Engineer) **1. Project Manager** CV with Professional registration minimum experience of 10 years and a minimum relevant qualification at NQF level 7 attached = 20 points CV with a Degree and minimum experience of 10 years = 15 points CV with national diploma and minimum 10 years = 10 points CV and/or qualification not attached or not met = 0 points **2. Project Engineer** CV with Professional registration minimum experience of 6 years and a minimum relevant qualification at NQF level 7 attached = 20 points CV with a Degree and minimum experience of 10 years = 15 points CV with national diploma and minimum 10 years = 10 points CV and/or qualification not attached or not met = 0 points	**40**
Detailed Project Specific Programme Schedule Detailed Project Specific Programme Schedule attached = 15 points Detailed Project Specific Programme Schedule not attached = 0 points	**15**
Project Specific SHEQ PLAN. Project Specific SHEQ PLAN attached = 10 points Project Specific SHEQ PLAN not attached = 0 points	**10**
Plant and Equipment Plant and Equipment schedule attached = 5 points Plant and Equipment schedule not attached = 0 points	**5**
Company experience The company should have experience in the successful completion of laboratory renovation/ construction as detailed in the BOQ. **Provide completion certificate/s (reference letters will not be accepted).** Three or more supplied = 30 points Two supplied = 20 points One supplied = 10 points No completion certificate attached = 0 points	**30**
Total	**100**

To enable the NMISA to score the functionality, kindly complete the below table and attach proof where applicable.

Description	Action required	Comments
Qualifications and experience of key project team	Attach CVs and qualifications	
Detailed Project Specific Programme Schedule	Attach document	
Project Specific SHEQ PLAN.	Attach document	
Plant and Equipment	Attach document	
Company experience	Provide completion certificates	

12. PRICE AND B-BBEE POINTS

Bidders that met the requirements of the previous stages will be evaluated further in accordance with the 80/20 preferential points system. The 80 points will be allocated for price whilst, 20 points will be allocated for B-BBEE both totalling 100 points.

The formula below will be used in calculating points scored for the Preference points system.

Step 1: Calculation of points for price

Points awarded for price

The following formula would be applied:

$$P_s = 80\left(1 - \frac{P_t - P_{min}}{P_{min}}\right)$$

Where
Ps = Points scored for comparative price of bid or offer under consideration
Pt = Comparative price of bid or offer under consideration
Pmin = Comparative price of lowest acceptable bid or offer.

Step 2: Points allocated for B-BBEE status level of contributor

A maximum of 20 points will be awarded for B-BBEE Status Level 1 of Contributor.

B-BBEE Status Level Of Contributor	Number of Points
1	20
2	18
3	14
4	12
5	8
6	6
7	4
8	2
Non-compliant contributor	0

Note: Both points will be added together to obtain a final score out of 100 points in total.

13. DISCLAIMER

NMISA reserves the right not to appoint a service provider and is also not obliged to provide reasons for the rejection of any proposal. NMISA reserves the right to:

- Award the contract or any part thereof to one or more service providers.
- Reject all bids.
- Decline to consider any bids that do not conform to any aspect of the bidding process.
- Request further information from any service provider after the closing date, for clarification purposes.

14. NOTES TO BIDDERS

This section outlines basic requirements that must be met. Failure to accept these conditions or part thereof may result in your proposal being excluded from the evaluation process.

- Proposal documents should be submitted to NMISA.
- NMISA will not be liable to reimburse any costs incurred by the bidder during the proposal process.
- Evaluation of proposals will be carried out by NMISA. The Bid Evaluation Committee will, if necessary, contact bidders to seek clarification on any aspect of the proposals.

- Suppliers must sign the register at the reception when the proposal is submitted.

NB: Please note that to clear CSIR security to get to NMISA's reception may take more than 30 minutes.

15. DECLARATION

I, the undersigned (full name)……

Certify that the information provided is true and correct, and understood the above document in full.

---------- ----------

SIGNATURE DATE

TENDER DOCUMENT

PROCUREMENT OF A COMPLETE HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) SYSTEM AT GROUND FLOOR AND FIRST FLOOR OF BUILDING 4E (WEST WING) INCLUDING INSTALLATION AND COMMISSIONING

BILLS OF QUANTITIES

QUANTUM BUILT AND ENVIRONMENT CONSULTANTS (PTY) LTD

Item No			Quantity	Rate	Amount
	Bill 1: Preliminary and General				
1	Technical Submissions			SUM	
2	Allow fully for compliance with the Conditions of Contract as is applicable to the Main Contract.			SUM	
3	Allow for compliance with general matters relating to these specifications.			SUM	
4	Allow for compliance with Occupational Health & Safety Act and Regulations and other statutory requirements.			SUM	
5	Operating and maintenance manuals including as-built drawings. 3 sets.			SUM	
6	Allow for the guarantee of the complete installation for a period of 12 months.			SUM	
7	Allow for the full maintenance of the installation for a period of 12 months.	No	1.00		
8	Allow for the provision of electrical certificate of compliance for all			SUM	
9	Mechanical related electrical work.			SUM	
10	Site Establishment			SUM	
11	Rigging of new equipment			SUM	
12	Protection Against Damage			SUM	
13	Transport			SUM	
	Carried Forward to Summary of Section No. 1			R	

Item No			Quantity	Rate	Amount
	Bill 2: Chiller Plant & AHUs				
	Supply, Deliver, Install and commision the following Air cooled, energy efficient, 122kW cooling capacity (York YMPA 130 or similar approved) Chiller, complete with inverter compressors, sound attenuation, soft start, controls and low noise fuetures, Tracer summit, temprature in/out 12/7 degrees C, mounted on I-beams and Hail gaurds for protection as per Specifications				
1	CH1	No	1.00		
2	Commissioning by Supplier			SUM	
3	Anti Vibration Mountings			SUM	
	Supply, Deliver, Install and commision the Primary Chilled Water Circulating pumps 1 & 2 constant speed, fluid water c/w, frame, anti vibration, mounts and stainless steel drip tray 5.5 l/s at 220 kPA head pressure, high pressure seals One (1) operational & one (1) standby.				
4	P1 & P2	No	2.00		
	Supply, Deliver, Install and commision the following air handling units c/w brackets, heater banks, filters, EC fans, controls to complete the AHU installation,				
5	AHU01 (TC - 48,9kW)	No	1.00		
6	AHU 2 (TC - 60kW)	No	1.00		
7	AHU 3 (TC - 17kW)	No	1.00		
8	Electronic Controllers with all sensors, relays, selector switches and warning lights	No	3.00		
	Carried to Collection			R	

9	Canvas Collars and transformation pieces to connect to supply and return ducts	No	6.00			
10	Anti Vibration Mountings			SUM		
11	I-beam base frame			SUM		
12	AHU03 Hanger fixing to slab			SUM		
	Supply, Deliver, Install and commision the following Carel (or similar approved) Humidifiers complete with intergrated controls to connect to main Johnsons HVAC controls and in duct diffusers					
13	HM1 (Carel UE025)	No	2.00			
14	HM2 (Carel UE005)	No	1.00			
	Supply, Deliver, Install and commision complete automatic water treatment system that is integrated with the HVAC main control system for management alerts etc.					
15	Water treatment system			SUM		
	Miscellaneous					
	Any items not specified mentioned and not covered in the items above - specify					
16	….....			SUM		
17	….....			SUM		
18	….....			SUM		
	Carried to Collection			R		

Section No. 1

Bill No. 2

CHILLER PLANTS AND AIR HANDLING UNITS

COLLECTION

	Page No		Amount
Total Brought Forward from Page No.	2		
	3		
Carried Forward to Summary of Section No. 1		R	

Item No			Quantity	Rate	Amount
	Bill 3: Controls				
	Supply, deliver, install and comission complete as per specifications:				
1	Weather proof powder coated metal DB boards to house Electronic Controller with all sensors, relays, selector switches and pilot lights for CHW pumps switch over and pressure control.All breakers and isolators to be included in this item. DB to have filtered forced ventilation to protect controls.			SUM	
2	Weather proof powder coated metal DB boards to house Electronic Controller with all sensors, relays, selector switches and pilot lights for AHUs & Humidifier, switch over and pressure/airflow controls.All breakers and isolators to be included in this item. DB to have filtered forced ventilation to protect controls.			SUM	
3	T89 wall thermostat type Room Controllers or similar approved c/w duel room temprature and humidity sensors for each lab and cabeling	No	30.00		
	Supply, deliver and install HVAC Controls System with the following Components.				
4	HVAC Intergrated into DB Workstation/front end with modem/sms notifications			SUM	
5	HVAC Software Graphics & Engineering			SUM	
6	HVAC Controls Programming			SUM	
7	AHU Controller integration with SAG Controls. (Hardware and software)			SUM	
8	Chiller integration with HVAC Central main controller (Hardware and Software)			SUM	
	Carried to Collection			R	

9	Fresh air integration with HVAC Central main controller (Hardware and Software)		SUM		
10	AHUs integration with HVAC Central main controller (Hardware and Software)		SUM		
11	Humidifier integration with HVAC Central main controller (Hardware and Software)		SUM		
12	Commissioning of all HVAC Controls, hardware and software by supplier		SUM		
13	Supply, deliver and install control wiring between SAG/controllers/sensors/controllers complete. Wiring to be fixed to ducting with light duty cable trays.		SUM		
	Miscellaneous				
	Any items not specified mentioned and not covered in the items above - specify				
14	….....		SUM		
15	….....		SUM		
16	….....		SUM		
	Carried to Collection		R		

Section No. 1

Bill No. 3

CONTROLS

COLLECTION

	Page No		Amount
Total Brought Forward from Page No.	5		
	6		
Carried Forward to Summary of Section No. 1		R	

Item No			Quantity	Rate	Amount
	Bill 4: Chilled Water Piping				
	Supply, deliver, install and commision c/w welded, support wire mesh tray/rack fixed to structure and pipework lifted into possition joints weld and flanges where required, bolts nuts, etc, c/w all necessary fittings/assembly for complete installation as per specification:				
	PPR PN16 Pipe				
1	Ø65	m	34.00		
2	Ø50	m	14.00		
3	Ø40	m	25.00		
4	Ø32	m	60.00		
5	Ø25	m	35.00		
	Equal tee				
6	Ø65	No	24.00		
7	Ø50	No	12.00		
8	Ø40	No	14.00		
9	Ø32	No	6.00		
10	Ø25	No	12.00		
	Bend (90°)				
11	Ø65	No	20.00		
12	Ø50	No	16.00		
	Carried to Collection			R	

13	Ø40	No	16.00		
14	Ø32	No	20.00		
15	Ø25	No	20.00		
	Concentric Reducers				
16	Ø65	No	26.00		
17	Ø50	No	14.00		
18	Ø40	No	14.00		
19	Ø32	No	6.00		
20	Ø25	No	14.00		
	Coupling				
21	Ø65	No	22.00		
22	Ø50	No	8.00		
23	Ø40	No	10.00		
24	Ø32	No	32.00		
25	Ø25	No	15.00		
	Supply delivery and install and commision the following c/w all necessary fittings /assembly for the complete installation:				
	Flexible Connections c/w Installed, including matching flanges where required, bolts, nuts, ens				
26	Ø65	No	4.00		
27	Ø50	No	2.00		
	Carried to Collection			R	

28	Ø40	No	2.00		
29	Ø25	No	6.00		
	Strainers: c/w Installed, including matching flanges where required, bolts, nuts, etc				
30	Ø65	No	2.00		
31	Ø25	No	2.00		
	Butterfly Valves: c/w Installed, including matching flanges where required, bolts, nuts, etc				
32	Ø65	No	6.00		
	Ball Valves:				
33	Ø50	No	8.00		
34	Ø40	No	10.00		
35	Ø25	No	24.00		
	Miscellaneous Equipment				
36	Dial type glycerine-filled pressure gauges (c/w cock+syphon tube)	No	12.00		
37	Flow switch	No	4.00		
38	Pipe thermometer and well	No	16.00		
39	Air vent valve (Automatic)	No	12.00		
40	Pressure reducing/regulating valve Ø25	No	2.00		
41	Binder point	No	14.00		
42	3L Expantion tank	No	1.00		
	Carried to Collection			R	

43	Tico pads			SUM	
	Balancing (STA-T) Valves: c/w Installed, including matching flanges where required, bolts, nuts, etc				
44	Ø50	No	1.00		
45	Ø40	No	1.00		
46	Ø25	No	4.00		
	Non-Return (check) Valves: c/w Installed, including matching flanges where required, bolts, nuts, etc				
47	Ø65	No	2.00		
48	Ø25	No	4.00		
	Motorised valve c/w Installed, including matching flanges where required, bolts, nuts, ens, 24V				
49	Ø50	No	1.00		
50	Ø40	No	1.00		
51	Ø25	No	2.00		
	Screw Flanges (AHU and Chiller) where required, bolts, nuts, ens				
52	Ø65	No	2.00		
53	Ø50	No	2.00		
54	Ø40	No	2.00		
55	Ø25	No	4.00		
56	Dosing pot arrangement.	No	1.00		
	Carried to Collection			R	

	Chilled Water Insulation K-Flex Elastomeric Foam Insulation				
57	Ø65	m	34.00		
58	Ø50	m	14.00		
59	Ø40	m	25.00		
60	Ø32	m	60.00		
61	Ø25	m	35.00		
	Fittings				
62	K-Flex Elastomeric Foam Isulation for all above fittings for the complete installation			SUM	
63	All extrnal pipe to be galv gladed for the complete installation			SUM	
	Miscellaneous				
	Any items not specified mentioned and not covered in the items above - specify				
64	….....			SUM	
65	….....			SUM	
66	….....			SUM	
	Carried to Collection			R	

Section No. 1

Bill No. 4

CHILLED WATER PIPES

COLLECTION

	Page No		Amount
Total Brought Forward from Page No.	8		
	9		
	10		
	11		
	12		
Carried Forward to Summary of Section No. 1		R	

Item No			Quantity	Rate	Amount
	Bill 5: Ducting				
	Ground Floor				
	Air Distribution System				
	Supply, deliver, install and commision c/w supporting hangers, seal, etc for complete installation as per specification:				
1	A1 - Straight duct 850x550	m	140.00		
2	A2 - Bend90 850x550	No	10.00		
3	A3 - Equal taper 850x550 to 550x450	No	2.00		
4	A4 - Straight duct 550x450	m	93.00		
5	A5 - Straight duct 400x400	m	11.00		
6	A10 - Bend90 400x400	No	1.00		
	(Internal Insulated Ducting 25mm Sonic)				
7	A6 - Straight duct 850x450 c/w 25mm sonic	m	146.00		
8	A7 - Bend 90° 850 450 c/w 25mm Sonic	No	10.00		
9	A8 - Equal Taper c/w 25mm Sonic 850x550 to 550x450	No	2.00		
10	A9 - Straight Duct c/w 25mm Sonic 550x450	No	94.00		
11	C1 - Endcap 550x450	No	2.00		
12	C2- Spigot 400x400	No	2.00		
13	C3 - Endcap 550x450	No	2.00		
	Carried to Collection			R	

14	C4 - Plenum 550x300	No	24.00			
15	FD1 - Fire damper 850x450	No	1.00			
16	FD2 - Fire damper 850x550	No	1.00			
17	HB 1 - Heater Bank 6kW c/w matching OBD and actuator (3 step) 400x400 (Belimo type Actuators)	No	2.00			
18	RA 1 - Return Air Grille c/w lockable quadrant 500x250	No	24.00			
19	SAG 1 - Side Wall Variable Volume Diffuser c/w Matching OBD, actuator and Heater bank (2.5kW) 500x250 (Belimo type Actuators)	No	24.00			
20	WL 1 -Hinged Weather Louvre c/w matching OBD 400x400	No	2.00			
	Stripping					
21	Strip and remove from site existing ducting, dampers, fittings, grilles, etc,			SUM		
	First Floor Ducting					
	Air Distribution System					
	Supply, deliver, install and commision c/w supporting hangers, seal, etc for complete installation as per specification:					
22	A1 - Straight duct 650x400	m	2.00			
23	A2 - Straight duct 300x300	m	10.00			
24	A3 - Bend90 300x300	No	6.00			
25	A4 - Straight duct 400x400	m	15.00			
26	A5 - Straight duct 400x400	m	4.00			
	Carried to Collection			R		

	(Internal Insulated Ducting 25mm Sonic)					
27	A5 - Straight duct 650x450 c/w sonic 25mm	m	4.00			
28	A6 - Straight duct 300x300 c/w sonic 25mm	m	15.00			
29	A7 - Bend 90 c/w sonic 25mm	No	4.00			
30	A8 - Straight duct 400x400 c/w sonic 25mm	m	13.00			
31	A9 - Straight duct 150x150 c/w sonic 25mm	m	6.00			
32	C1 - Endcap 650x400	No	1.00			
33	C2 - Spigot 300x300	No	3.00			
34	C3 - Endcap 300x300	No	2.00			
35	C4 - Spigot 400x400	No	3.00			
36	C5 - Endcap 400x400	No	3.00			
37	C6 - Endcap 650x400	No	1.00			
38	C7 - Spigot 150x150	No	1.00			
39	C8 - Endcap 150x150	No	1.00			
40	C9 - Plenum 550x300	No	7.00			
41	HB1 - Heater Bank 2.5kW c/w matching OBD and actuator (3 step) (Belimo type Actuators)	No	1.00			
42	RA 1 - Return Air Grille c/w lockable quadrant 500x250	No	8.00			
43	SAG 1 - Side Wall Variable Volume Diffuser c/w Matching OBD, actuator and Heater bank (2.5kW) 500x250 (Belimo type Actuators)	No	8.00			
	Carried to Collection			R		

44	SAG 2 - Side Wall Variable Volume Diffuser c/w Matching OBD, actuator and Heater bank (2.5kW) 300x150 (Belimo type Actuators)	No	1.00			
45	WL 1 - Hinged Weather Louvre c/w matching OBD 300x300	No	1.00			
	Stripping					
46	Strip and remove from site existing ducting, dampers, fittings, grilles, etc,			SUM		
47	Balancing of the entire ducting system			SUM		
	Fire Damper with spring return actuator c/w limit switch integration to HVAC main controls to switch off					
48	850x450	No	4.00			
49	850x550	No	4.00			
	Miscellaneous					
	Any items not specified mentioned and not covered in the items above - specify					
50	….....			SUM		
51	….....			SUM		
52	….....			SUM		
	Carried to Collection			R		

Section No. 1

Bill No. 5

DUCTING

COLLECTION

	Page No		Amount
Total Brought Forward from Page No.	14		
	15		
	16		
	17		
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Item No		Quantity	Rate	Amount
	Bill 6: Builders Work & Existing Equipment			
1	Removal of existing HVAC equipment in room 050 with the condenser unit and as per specification		SUM	
2	Making of openings for ducting as per project drawings and making good		SUM	
3	Making of openings for louvres as per project drawings with sleeves and making good		SUM	
4	Allowing for painting of plantroom walls, floor and piping bands for the complete finish as per specifications		SUM	
	Miscellaneous			
	Any items not specified mentioned and not covered in the items above - specify			
5	….....		SUM	
6	….....		SUM	
7	….....		SUM	
	Carried Forward to Summary of Section No. 1		R	

Item No			Quantity	Rate	Amount
	BILL No.7				
	WORK GROUP NUMBER 160				
	EXISTING INSTALLATION				
	Allow of removing the existing electrical installation infrastructure:				
1	CSIR Building (Electrical Aircon Section Only)		Item		
	LT CABLES				
	600/1000 volt PVC/PVC/SWA/PVC copper cable pulled through sleeves, laid in trenches. (trenching and backfilling measured elsewhere)				
2	240mm² x 4-core ECC	m	30.00		
3	50mm² x 4-core ECC	m	35.00		
4	16mm² x 4-core ECC	m	70.00		
5	10mm² x 4-core ECC	m	20.00		
6	6mm² x 4-core ECC	m	36.00		
7	2.5mm² x 4-core ECC	m	70.00		
8	2.5mm² x 3-core surflex	m	1,620.00		
	LT CABLE TERMINATIONS				
	Termination for 600/1000 volt PVC/PVC/SWA/PVC copper cables.				
9	240mm² x 4-core ECC	No	4.00		
	Carried to Collection			R	

10	50mm² x 4-core ECC	No	2.00		
11	16mm² x 4-core ECC	No	6.00		
12	10mm² x 4-core ECC	No	2.00		
13	6mm² x 4-core ECC	No	4.00		
14	2.5mm² x 4-core ECC	No	4.00		
15	2.5mm² x 3-core ECC	No	29.00		
	EARTH WIRES				
	Bare copper earth conductors strapped to cables				
16	240mm² conductor	m	30.00		
17	50mm² conductor	m	35.00		
18	16mm² conductor	m	70.00		
19	6mm² conductor	m	20.00		
20	2.5mm² conductor	m	1,620.00		
	EARTH WIRE TERMINATIONS				
	Bare copper earth conductor terminations includings lugs etc:				
21	240mm² conductor	No	4.00		
22	50mm² conductor	No	2.00		
23	16mm² conductor	No	6.00		
24	6mm² conductor	No	2.00		
25	2.5mm² conductor	No	6.00		
	Carried to Collection			R	

	SUNDRIES				
26	Test and commission the complete reticulation installation		Item		
27	Issue Electrical Consultant with As-Builts" dwg. for all cables"		Item		
	ELECTRICAL DISTRIBUTION BOARDS				
	DISTRIBUTION BOARDS				
	Distribution boards complete with sheet metal tray, frames, sub frames, bus bars, contactors, time switches, switches, 50% provision for future circuit breakers and a typed legend card as shown on the wiring schedules.				
28	DB-A1 : Semi Resecced board with lockable doors	No	1.00		
	Equipment: DB-A1 NORMAL SECTION				
29	400 Amp triple pole on load isolator	No	1.00		
30	125 Amp triple pole 15 kA circuit breaker Curve 1	No	1.00		
31	80 Amp triple pole 6 kA circuit breaker Curve 1	No	1.00		
32	60 Amp triple pole 6 kA circuit breaker Curve 1	No	2.00		
33	10 Amp triple pole 6 kA circuit breaker Curve 1	No	3.00		
34	20 Amp single pole 6 kA circuit breaker Curve 1	No	23.00		
35	Class II Lightning Arrestors with fault indication	No	4.00		
36	DB-A2 : Semi Resecced board with lockable doors	No	1.00		
	Equipment: DB-A2 NORMAL SECTION				
37	60 Amp triple pole on load isolator	No	1.00		
	Carried to Collection			R	

38	60 Amp triple pole 6 kA circuit breaker Curve 1	No	1.00		
39	20 Amp single pole 6 kA circuit breaker Curve 1	No	5.00		
40	Class II Lightning Arrestors with fault indication	No	4.00		
	Drawings				
	Submit to the Consulting Engineer three (3) sets of the Manufacturer's drawings each for approval of the following distribution boards complete:				
41	DB. A1	No	1.00		
42	DB. A2	No	1.00		
	LIGHTING AND SMALL POWER				
	ISOLATORS				
	Isolator outlets complete with cover plate fixed in flush box or surface mounted.				
43	30A double pole + earth mounted weatherproof isolator	No	28.00		
	CABLE TRAY				
	Galvanised cable tray mounted in ceiling voids or fixed surface against concrete floors/walls				
	The rates for cable tray shall include for hangers, splices, jointing, drilling, etc				
44	300mm wire mesh	m	20.00		
	Extra over 300mm wire mesh accessories				
45	External bends	No	2.00		
46	90 Degree bends	No	1.00		
	Carried to Collection			R	

47	"T joints"	No	1.00			
	Carried to Collection				R	

	SUNDRIES				
	Provide a Certificate of Compliance by an Accredited person for each of the following:				
48	DB A1	No	1.00		
49	DB A2	No	1.00		
	CIRCUIT LABELLING & TESTING				
	Allow for circuit labelling, testing, balancing and commissioning of the complete electrical installations in the following areas:				
50	DB A1	No	1.00		
51	DB A2	No	1.00		
	Carried to Collection			R	

Section No. 1

Bill No. 7

ELECTRICAL POWER SUPPLY

COLLECTION

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SECTION SUMMARY - HVAC INSTALLATION COMPETE WITH ELECTRICAL

FINAL SUMMARY

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	Sub-total		R	
	Add: Value Added Tax (VAT) @ 15%		R	
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Bills of Quantities for Tender
Quantum Built and Environment Consultants (Pty) Ltd

TENDER DOCUMENT

PROCUREMENT OF A COMPLETE HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) SYSTEM AT GROUND FLOOR AND FIRST FLOOR OF BUILDING 4E (WEST WING) INCLUDING INSTALLATION AND COMMISSIONING

CONTRACT DATA, SCOPE OF WORKS & MECHANICAL SPECIFICATIONS

QUANTUM BUILT AND ENVIRONMENT CONSULTANTS (PTY) LTD

Contract Data
The Conditions of Contract are the JBCC Principal Building Agreement (Edition 5.0 of July 2007) prepared by the Joint Building Contracts Committee Inc.

Copies of these documents may be obtained from the Association of South African Quantity Surveyors (011-315 4140), _the Master Builders Association (011-205 9000), the South African Association of Consulting Engineers (011-463 2022) or the South African Institute of Architects (011-486 06841).

Each item of data given below is cross-referenced to the clause in the JBCC Principal Building Agreement and the Contract Data Addenda EC and CE to which it mainly applies

Data provided by the Employer

Item	Data
A	**TENDER INFORMATION**
A2	Works Description: See Part 3
A3	Site Description: See Section C4
A4	Employer NMISA Postal address Private Bag X34, Lynnwood Ridge Pretoria Code: 0040 Tel 012 841 2671 Fax 012 841 2131 E-mail MLTemba@nmisa.org Tax/VAT Registration No Physical address: CSIR Campus, Building 5, Meiring Naude Road, Brummeria, Pretoria, 0182
A5	Principal Agent Name : Kelebogile Thahetse Name of Business : Quantum Built and Environment Consultants (Pty) Ltd Business Reg. Number : 2012/198108/07 VAT Reg. Number : 4050265646 Contact Person : DA Kapp Contact Person Cell Number : 082 940 7068 Tel. Number : 082 940 7068
A6	Agent 1 Name : Name of Business : Business Reg. Number : VAT Reg. Number : Contact Person : Contact Person Cell Number : Tel. Number :

B	**CONTRACT DATA**
2.0	The law applicable to this agreement: **RSA**
3.0 *[3.2]*	**OFFER, ACCEPTANCE AND ASSIGNMENT** The contract period extends from the date of acceptance of offer and continue to be of force and effect until the end of the latent defects liability period.
4.0	**CONTRACT DOCUMENTS**
4.1	Original signed documents to be held by: **Principal Agent** **No** **Employer** **Yes**
4.2	The priced documents shall be used as a specification **No**

	of materials and goods

8.3	**INSURANCES AND SECURITIES**	
8.3.1	Contract works insurance to be effected by *(Employer/Contractor)*	Employer
	For the sum of *(amount)*	
	Policy deductible	Contractor
8.3.2	Supplementary/Special insurance to be effected by *(Employer/Contractor)*	N/A
	For the sum of *(amount)*	
	Policy deductible	Contractor
8.3.3	Public liability insurance to be effected by *(Employer/Contractor)*	Contractor
	For the sum of *(amount)*	R5 000 000-00
	Policy deductible	Contractor
9	**SECURITY**	
9.2	The contractor shall waive his lien *Yes / No*	**Yes**
9.3	The contractor chooses to provide the following security:	
9.3.1	Construction guarantee (variable) initially 6% of contract value *Yes / No*	
9.3.2	Payment Reduction equal to 10% of each payment up to maximum of 5% of contract value *Yes / No*	

1. Execution

10.0	**EMPLOYER**		
10.1.3	Premises will be occupied	*Yes / No*	**No**
10.1.5	Shall provide access to water, sewer and/or electricity connections to site	*Yes / No*	**Yes**
10.1.6	Shall define restrictions to the site or areas that the contractor may not occupy.	*Yes / No*	**Yes**
10.1.8	Shall give possession of site on		Date to be determined
10.2.1	May employ direct contractors	*Yes / No*	**Yes**
11	**CONTRACTOR**		
11.1	Shall submit to Principle Agent within 15 (fifteen) working days:		
11.1.1	Security where selected	*Yes / No*	**Yes**
11.1.4	Submit detailed construction program	*Yes / No*	**Yes**
11.2.6	Shall commence work on site within **7 Working days** after receiving possession of site or as agreed between parties		
11.1.3	**Priced document: To be submitted with tender**		
17	**REVISION OF DATE FOR PRACTICAL COMPLETION**		
17.4.1	The principal agent shall determine the revised date for practical completion by granting, reducing or refusing each extension claimed at intervals no greater than ten (10) working days, **with prior written approval by the Employer**		

15/18	**PRACTICAL COMPLETION DATES AND PENALTIES**		
18.2	For the works as a whole: The date for completion and the penalty per calendar day	Date: To be determined	Penalty amount: R5 000-00
19	**PAYMENT**		
	Interim payment certificate to be issued by	*(day of month)*	**20**
	The contract value shall be adjusted according to CPAP	*(Yes/No)*	**No**

Part Two : Data provided by the Contractor

1.0	CONTRACTING AND OTHER PARTIES
1.1	**Contractor :** …….. Postal address …….. …….. Code : …….. Tel ……. Fax …… E-mail …….. Tax/VAT Registration No | | | | | | | | | | |
[1.2]	Physical address …… …… ……

SCOPE OF WORK

General Description of Project

The NMISA Building No.4 is situated on the CSIR PTA campus. The works will consist of the removal of the existing chiller plantroom equipment and new installations of 3 Air Handling Units with humidification and a central chiller with controls complete.

1.1 Air Conditioning

1.1.1 Supply, delivery, install and commission 3 new AHUs complete with all controls, piping and supporting equipment and all associated electrical and control services, sensors, etc.

1.1.2 Supply, delivery, install and commission new chiller for the above AHUs complete with pumps and associated electrical and control services, sensors, etc.

1.1.3 Removal of existing chiller/HVAC equipment on site Room 050 and other services indicated on site by client.

1.2 Ventilation

1.2.4 Supply, delivery, install and commission fresh air system, complete with weather louvres, heater banks and air balancing for all the system branches where required and all associated electrical and control services, sensors, etc.

1.3 Humidifiers

1.3.5 Supply, delivery, install and commission 3 new humidifiers per each AHU system, complete with in duct supply system configuration and all associated electrical and control services, sensors, etc.

All the installations shall be complete in all respects, and the contractor shall allow for the completion and successful operation of the complete systems, irrespective of whether every separate item is specified or not. In certain cases, the position of equipment is shown schematically on the drawings. In these instances, the exact positions will be determined on site.

Attendance of Compulsory Briefing Session

Project Number	**: NMISA (20-21) T0001C**
Project Description	**:** NMISA, HVAC INSTALLATION, BUILDING No. 4
Date of Session	**:** 25 MAY 2021
Time	**:** 11:00 am
Venue	**:** CSIR Campus, Building No. 4, NMISA
Meeting conducted by	**:** KBC Thahetse (Quantum Built and Environment Consultants) and DA Kapp, (BVI Engineers)

CONTRACTOR DETAILS

Name of Company: ……

Represented by (Name & Surname): ……

Capacity: ……..…….

Contact Number of Representative: ……

Signature of Representative: ……..

Signature of Session Conductor: ……..

SPECIFICATION FOR HEATING, VENTILATION AND AIR CONDITIONING INSTALLATIONS

1. General

The project and standard drawings form part of the project specification and shall be read in conjunction with the project specification.

Conflicts, errors or discrepancies found in this specification or drawings shall be brought to the Engineer's attention for resolution at tender stage.

Any deviations from the specifications, drawings and/or equipment specified shall be listed together with the alternatives offered and shall be submitted as part of the tender. If no deviations are listed, it will be assumed that the Tenderer complies with all the relevant technical parts of this specification.

All installations shall be complete in all respects and the Contractor shall allow for the completion and successful operation of the complete installation, irrespective of whether every separate item is specified or not.

2. SITE AND SITE INSPECTION

The site is situated in Pretoria on the CSIR Campus, Building No.4 for the National Metrology Institute of South Africa.

Tenderers are advised to visit the site and acquaint themselves with the nature and extent of the work involved before submitting their tenders.

3. COMPLETION DATE

Completion dates are stipulated in the preliminaries included in this document. The Contractor will be required to keep up with the main contract in accordance with the main contractor's program and to complete the mechanical installation concurrently with the main contract.

4. PROGRAM

Directly after acceptance of his tender, the Contractor shall submit time schedules for each activity for which he is responsible to the main contractor's program, for the inclusion thereof in the main contractor's program planning.

A copy of the program (and revisions thereto) shall be submitted to the Engineer well within time and at regular intervals.

The following items shall be programmed in consultation with the Main Contractor:

- Working drawings
- Approval of working drawings
- Equipment detail submission for approval
- Ordering of material
- Piping and ducting installation
- Approval of first fix
- Plant equipment installation

- Second fix
- Commissioning and testing
- Final inspection

5. FINISHING AND TIDYING

In view of the intense concentration of construction activities likely to be experienced during the contract period, progressive and systematic finishing and tidying will form an essential part of this contract. On no account must spoil, rubble, materials, equipment or unfinished operations be allowed to accumulate in such a manner as to unnecessarily impede the activities of other and in the event of this occurring, the Employer shall have the right to withhold payment for as long as may be necessary in respect of the relevant works in the area(s) concerned without prejudicing the rights of others to institute claims against the Contractor on the ground of unnecessary obstruction.

Finishing and tidying must be done on a daily basis and not simply be left to the end of the contract. All finishing and tidying shall be carried out to the best advantage of the project as a whole.

6. SCAFFOLDING AND PLANT

All plant required for the execution of the contract shall be supplied by the Contractor under this contract.

The Contractor shall provide his own scaffolding. For installation purposes the Tenderer shall allow for his own lifting equipment, cranes etc. which may be necessary to complete the installation as none of these facilities will be available on site.

7. SUPERVISORY STAFF AND IDENTIFICATION

At all times while on the premises, all artisans and labour members of the mechanical contractors and subcontractor's staff will wear clothing adequately marked with the relevant contractor's name.

The work shall be done by, or at all times be under the personal supervision of a qualified artisan (or qualified technician) in the respective trade. Details of this operation and prospective work shall be given at the time of tendering in a covering letter.

8. QUALITY OF MATERIALS AND WORKMANSHIP

All materials shall be new, undamaged and free from rust or other defects. Only material of the best quality, which has been approved by the Engineer, shall be used.

The Contractor shall, upon the request of the Engineer, furnish him with documentary proof to his satisfaction that the material is of the quality specified. Samples of materials for testing, if required, shall be supplied by the Contractor, free of charge.

Where applicable, all material shall be in accordance with the relevant standard specifications of the South African Bureau of Standards and the British Standard Specifications.

The installation shall be carried out according to the latest modern engineering practices.

The Engineer reserves the right to reject any work or part thereof that, according to his judgement, does not meet the highest standards of material and workmanship and to enforce replacement of the work at the expense of the Contractor.

9. RATING OF EQUIPMENT

- All equipment shall be selected to be operated well within the manufacturer's ratings. Equipment offered for use beyond these limits will not be considered.

- The contractor shall supply a schedule of ALL equipment offered by him detailing the make, model, size/capacity/rating, electrical requirements and material of construction where applicable to the Engineer for approval before his installation commences or equipment is ordered. Any deviations from the specification shall be clearly highlighted.

10. SPACE REQUIREMENTS AND ACCESS

Tenderers shall ensure that the equipment offered by them can be installed in the available space as shown on the drawings. Should it be found at a later stage that the equipment offered does not fit, all costs arising from the rectification of this problem shall be for the Contractor's account.

The equipment shall be installed in such a manner that complete access is provided for operating and maintenance purposes.

Tenderers shall also ensure that the equipment offered by them will pass through available building openings. Large equipment shall be made up in sections and each section shall be small enough for access through doors and other building openings. All additional costs involved for the modification of equipment or to change the make of equipment in order to allow access shall be for the account of the Contractor.

11. REGULATIONS AND STANDARDS

The equipment, installation, commissioning and maintenance shall in all respects comply with the following authorities and regulations:

a) SANS 10400: The application of the National Building Regulations.

b) SANS 1125: Room air conditioners and heat pumps

c) SANS 10147: Code of Practice for Refrigeration systems, including plants associated with air conditioning systems

d) SANS 60335-2-40: Household and similar electrical appliances – Safety. Part 2 – 40: Particular requirements for electrical heat pumps, air conditioners and dehumidifiers

e) SANS 10142-1-2003: The wiring of premises Part 1: Low-voltage installations

f) SABS 1453: Copper tubes for medical gas and vacuum services

g) SANS 1424-1987: Filters for use in air-conditioning and general ventilation

h) SANS 1238:2005: Air-conditioning ductwork

i) SANS 10173:2003: The installation, testing and balancing of air-conditioning ductwork

j) SANS 60335-2-80: Household and similar electrical appliances – Safety Part 2-80: Particular requirements for fans

k) SANS 10108: The classification of hazardous locations and the selection of apparatus for use in such locations

l) SABS 0147: Refrigerating systems including plants associated with air-conditioning systems

m) The Occupational Health and Safety Act, Act No. 85 of 1993

n) Mine and Industrial Regulations, Government notices

o) Local Municipal Regulations and Ordinances

p) Fire Department Regulations

q) All special conditions, specifications or codes of practice specified hereinafter.

All losses, costs or expenditures, which may arise as a result of negligence to comply with any regulation applicable to this service as specified above, shall be for the account of the Contractor.

Where trade names and references to catalogues are found in the specification, the intention is to set a particular standard of equipment. Where "other approved" equipment is specified, the Tenderer shall obtain written approval from the Engineer before he may deviate from the specified equipment. This approval must be obtained at tender stage.

The Contractor shall work strictly according to this specification and shall ensure that only the best quality material is used, and that the installation is handed over as a complete working system.

12. DRAWINGS

The dimensions and positions of equipment shown on the Engineer's drawings are schematic and for tender purposes only. The drawings are not suitable for manufacturing purposes. The responsibility for dimensional and layout accuracy remains with the Contractor. The exact positions will be pointed out on site where necessary.

The following drawings shall be submitted by the Contractor to the Engineer for approval, within two (2) weeks of acceptance of the tender:

a) **Builder's work drawings**

All building requirements are to be indicated on these drawings to meet the dimensional requirements of the equipment and materials to be installed by the Contractor.

b) **Mechanical drawings**

These are workshop and equipment layout drawings required for the manufacture and installation of equipment, showing detailed dimensions.

c) **Electrical drawings**

These include switchboard layouts, circuit diagrams, interconnection diagrams, and cable and equipment schedules.

Any work done by the Contractor without an approved drawing shall be at the Contractor's own risk, and any changes required to conform with the contract documents or co-ordinate his work with other trades, shall be for the account of the Contractor.

The approval of drawings by the Engineer shall not relieve the Contractor of his responsibilities to carry out the work in terms of the contract documents.

The mechanical and electrical drawings shall be updated during the contract period and shall be included in the operation manual at the end of the contract period as "as built" drawings.

13. OPERATION MANUALS AND MAINTENANCE INSTRUCTIONS

The Contractor shall submit three (3) copies of operation and maintenance manuals to the Engineer.

Manuals shall consist of:

a) Comprehensive literature of the different components of the installation.

b) Paper prints and soft copies of all approved drawings and diagrams where applicable.

c) Start-up and shutdown procedures.

d) Commissioning data of all equipment in tabulated form.

e) Prescriptions for routine tests, which shall be performed by the user together with the time when such tests shall be, performed (e.g. pressure tests).

f) Schedule of apparatus and equipment complete with model numbers, optional extras, modifications, electrical requirements, serial numbers, etc.

g) Detailed daily, weekly, monthly, quarterly, bi-annual or annual preventative maintenance procedures where applicable.

h) Manufacturer's catalogues.

i) List of spares for all equipment.

j) Suppliers telephone numbers and addresses.

k) Wiring diagrams.

l) Test certificates.

The operation manuals shall be sturdily bound in a strong hard cover. Material in the manual shall be clear, legible and well arranged and provided with an index.

The above manuals shall be available three weeks before first handover / practical completion of the installation and no handover shall be considered without these manuals.

14. MAINTENANCE AND GUARANTEE

All equipment supplied and work done as part of this contract shall be maintained and guaranteed for a period of one year from date of practical completion.

The Contractor is responsible for all material and labour during this period.

The Contractor shall visit the installation uninterrupted and do the scheduled maintenance as prescribed in the operating instructions. On completion of the monthly visit a full report shall be prepared and submitted to the Engineer within seven (7) days from the visit.

In case of a breakdown, the Contractor shall react within reasonable time and repair the installation to the satisfaction of the Engineer. Should the Contractor, in the discretion of the Engineer, not react within reasonable time, the Engineer shall commission another Contractor and the cost thereof shall be recovered from the defaulting Contractor.

15. PAYMENT CLAIMS

In addition to the conditions of contract, the Contractor shall attach to his application for payment an explanation of material cost and labour cost. The following information is required with respect to material and labour:

- Estimated percentage delivered/completed at date of the previous claim.
- Estimated percentage delivered/completed at date of current claim.
- Total cost claimed at date of previous claim.

16. PAINTING

Where applicable the following painting specifications shall apply:

Iron and steel surfaces shall be properly cleaned by removing all dirt, oil, scale and rust by brushing and sanding until a clean shiny surface is obtained. Hereafter a metal primer shall be applied.

Galvanized surfaces shall be cleaned with a galvanizing cleaning agent and then washed with clean water to remove the factory applied protection against white rust. Hereafter a calcium plumbate primer shall be applied, followed by an undercoat between 24 and 72 hours after application of the primer.

Other surfaces shall be cleaned by removing all dirt and a primer as specified by the paint supplier for the particular surface shall be applied.

The primer coat shall be followed by a matt undercoat and a final topcoat of high gloss enamel of an approved colour. Each layer of paint shall be clearly distinguishable from each other by means of different colours and each layer shall be properly sanded before the following coat is applied.

All paint shall at least be of SANS quality for industrial use and shall be approved by the Engineer. Equipment shall be painted according to the National Colour Standards, SANS 1091.

17. DAMAGE AND PROTECTION OF WORKS

The Contractor shall take all precautions necessary for the protection of life, equipment and property in connection with the works during installation.

The Contractor shall be held completely responsible for any damage of equipment during transport and installation, as well as any damage to the building and shall repair any such damage at his own expense. Where equipment cannot be repaired to an “as new” condition, it will be completely replaced at the expense of the Contractor.

Equipment delivered to site shall be stored in a well-protected area where it cannot be damaged by either the weather or other trades.

18. WELDING

Welding shall be carried out in accordance with the current edition of SANS 10044 Parts 1 to 2 where applicable. All welding shall be performed according to the latest technology and where exposed, it shall be smoothly finished off.

19. BUILDING WORK AND REMOVAL OF EQUIPMENT

The following work shall be carried out by the builder/main Contractor.

a) Drilling and cutting of necessary holes in the concrete, brickwork, ceilings and wooden doors, including making good to match finish.

b) Concrete plinths for installation of equipment.

c) Waterproofing of roof penetrations and plinths.

d) Provide drain points where required.

20. TESTING

The plant shall be tested and operated to meet the performance figures and duties specified. All safety features and interlocks shall be tested.

Pressure tests for water and piping shall be done at a test pressure of 1.5 times the maximum working pressure at the lowest point in the system, but not less than 700 kPa. All instrumentation, which could be damaged during the test, shall be removed from the pipe system.

The relevant system shall be filled with water and all high points shall be vented at least 24 hours before the test. The duration of the pressure test shall be 2 hours, after which no water leaks shall be visible and no pressure drop shall occur after corrections have been made for changes in ambient temperature during the test period.

Pressure tests shall be completed prior to insulating or covering piping. If leaks are found, welded connections shall be cut out and re-welded. Rectified piping shall be retested.

21. COMMISSIONING

The installation shall be commissioned in accordance with the relevant codes and recognised commissioning procedure or code approved by the consulting engineer:

The Contractor shall submit a commissioning program to the Consulting engineer at least two weeks prior to the commencement of commissioning and at the same time shall notify the consulting engineer of the code or procedure to which the plant will be commissioned.

The results of all checks and measurements shall be recorded in writing during the commissioning period. Commissioning records shall be handed over to the Consulting engineer prior to the first acceptance of the plant. The commissioning records shall also be included in the operation manuals.

22. STAFF TRAINING

The Contractor shall be responsible for the training of the Client's site staff after the commissioning has been completed. The site staff shall receive enough instruction to ensure that they are fully conversant with the equipment concerned. The operating manuals shall be used during training. Upon completion of the training exercise the contractor is to obtain the client's representative's written acceptance of this handover tuition, thus acknowledging his complete understanding of the operational procedures for this installation. Site staff shall be instructed on:

a) the general operating method of the plant;

b) starting and stopping instructions;

c) stopping the plant in an emergency and warning against restarting after an emergency;

d) positions and normal settings of control equipment;

e) safety measures;

f) operational checks on gauges, flow switches, indicator lights, etc.;

g) name, address and telephone number of competent person responsible for the maintenance of the plant.

23. DESIGN CRITERIA

DESIGN DATA	
Outdoor summer temperatures	31.7 °C Db/ 17.8 °C Wb
Outdoor winter temperatures	3.9 °C Db/ 1.5°C Wb
Indoor conditions GF Labs	23 °C ±2 ºC Db/ 50 % RH
Indoor conditions FF Lab	20 °C ±2 ºC Db/ 50 % RH
Altitude above sea level	1321m

24. Chiller

The Chiller shall be a 2-pipe system of the heat pump air cooled inverter Scroll, cooling only type. The chiller will need to consist of the following chiller YORK YMMA 130 or similar approved:

The chiller shall have the following properties:

1. Use R410A refrigerant
2. Have Inverter Scroll Compressors
3. A Plate Heat Exchanger
4. Support BACnet over IP or Modbus protocol via a RS-485 interface for integration with HVAC Specified controls / BMS system.

The chiller shall have the following capacities:

Description	Parameters
Cooling Capacity (Chiller Mode)	122 kW
Maximum Power Input	44 kW, 3-Phase, 400V, 50Hz
Ambient Summer	35ºC
Ambient Winter	3ºC

25. VARIABLE VOLUME AIR CHILLED WATER AIR HANDLING UNIT

The chilled water air handling unit shall consist of supply and return air plenums complete with supply, return and fresh air dampers, primary and secondary filters, electrical heater elements, humidification, cooling coil, drain pans and supply air fan.

Panel finish shall be 0,5mm stainless steel 316L steel on the inside of the plenum and 0,6mm galvanised sheet steel with an epoxy finish for exterior installations and with a chromadek finish for interior installations.

Panels shall be fastened to each other in an airtight and watertight manner by means of an efficient and suitable locking arrangement and the use of a suitable sealing compound.

Junctions between the floor and side panels, and the roof and side panels shall be rigid, strong, watertight and airtight. If necessary, provide structural reinforcement to ensure the required rigidity.

Provide plenum casing panels with 40mm polyurethane insulation between the double walls. Panel edges shall be fitted with insulation in such a manner that no un-insulated gaps will occur. The insulation shall have

a minimum density of 48kg/m^3 and a conductivity of 0,033 W/m^2 ºC at 23,8 ºC average temperature. The insulation shall not settle, tear loose or produce dust.

Fire retardant polystyrene insulation to be used instead of polyurethane. Provide all compartments of plenums with bulkhead type light fittings to IP55 standard.

Floors for plenums shall be one of the following:

- Cement-sand topping with steel trowelled finish, or
- Panels constructed as for walls (galvanised finish both sides) reinforced on top with 5mm thick aluminium checker plating.

The entire plenum section shall be completely airtight and suitably reinforced/braced to withstand all possible pressure differentials across the walls and roof sections.

Provide detachable sections for the removal or replacement of components such as fans, motors, coils, etc.

All air-handling units shall be mounted on plinths and on mounting feet.

Provide all access doors to all the compartments of the plenums with micro switches to stop the fans and switch on the lights when the doors are opened.

Provide access doors to electric heater banks with safety micro switches so as to isolate all heater banks when the doors are opened.

Paint the following notice on the access doors in clear red lettering at least 50mm high:

“DANGER – ELECTRICAL HEATERS”

Access doors shall be of the double wall construction with insulation similar to that of the wall panels. Doors shall be factory installed in panels provided with door openings, and shall hinge on sturdy hinges. Doors shall be provided with two door handles operating with a cam mechanism, and shall be operated from inside and from outside the plenum. Doors shall hinge against the system air pressure and shall be air tight. Access doors shall be at least 600mm wide and 1m high. Access doors fastened with screws will not be acceptable.

Provide plenum casings with removable sections with a width of 1,5 times coil width and full coil height plus clearance to provide access to each coil. Provide such removable sections for each coil or both sides of the plenum.

Seal water pipes passing through plenum panels with split collar plates and bitumastic rubber gaskets to affect a watertight seal.

Where pipes and conduits pass through plenum casings, seal off the spaces between panels and pipes or conduits by means of rubber packing rings and steel flanges, which are bolted to the casing panel on both sides. Packing rings shall fit tightly around pipes or conduits and the flanges must pull the packing rings tight against plenum casing panels. Fill the space between each pipe or conduit and the inside of the hole in the panel with polyurethane foam insulation.

Supply the unit complete with weatherproof switchboard, housing all starting gear, safeties and controls.

The sump shall be manufactured in 1,2mm stainless steel 316L and shall be of sufficient size to prevent loose droplets splashing onto the unit floor.

Dampers, filters, electrical heaters fans, etc. shall comply with the relevant sections elsewhere in this specification.

25.1 **COOLING COIL**

Cooling coils shall be of the extended surface type, constructed or copper tubing with a minimum outside diameter of 13mm, with plate fins of copper, extending at right angles to the tubes.

Fins shall be spaced not closer than 8 per 25mm. Plate fins may be flat or formed. Plate fins shall be provided with integral spacing collars at least 3mm wide on full width of space between fins. Tubes shall be tightly and permanently expanded into spacing collars.

Allow for one additional row on the cooling coils over and above that calculated as being necessary to satisfy the specified cooling capacity/de humidification requirements.

A minimum number of 6 rows shall, however, be provided for cooling coils.

Provide coils with inlet, outlet, vent and drain connections for each section. Install pressure gauges and thermometer wells as shown on the drawings.

Coils shall be designed and constructed for a test pressure of 1400kPa or 1,5 times the system working pressure, whichever is the greatest.

Coil face velocity shall be low enough to ensure that no water is carried over in the air stream, generally not more than 2,5m/s.

Coils shall be held in position with stainless steel 316L bolts at a pitch of 500mm maximum.

25.2 **HUMIDIFICATION**

The humidifier shall be of the electrode humidifiers in line duct type designed to be used in air handling unit set ups. The humi Steam UE series, Carel systems are to be used or similar approved units.

The humidifier shall consist of cleanable cylinder to eliminate the need of disposable plastic cylinders. Scale build up collectors would preferably considered over retro systems.

The system should be able to operate with RO water supply to eliminate scale build up if necessary due to water main supplies. It will have a +-3% RH humidity control with main cold-water supply by others.

The system will come complete with its own approved manufacturer evaporation system for in line duct steam manifold and mounting rack for the installation.

Drain water temperature reduction to be reduced below 60 degrees Celsius by mixing with the supply water and protecting of existing sanitation lines in the building.

The system should be able to operate automatically with interconnection of a BMs / HVAC main controllable system via Bacnet over IP/Modbus controls.

25.3 **CONTROLS**

Diagnostic functions shall be displayed for each air handling unit on:

- BMS interfaces for each AHU installation where a AHU is installed, with
- Control panel with digital indication as per specifications.

The functions as listed below shall be displayed:

- Supply air pressure
- Supply air temperature
- Coil air entering temperature

- Chilled water supply temperature
- Chilled water return temperature
- RH in ducting return and supply lines
- Ambient temperature
- Fresh air temperature
- Heater bank operation indication
- Dirty filter indication
- Fan operation
- Space or return air temperature

Both heating and cooling shall be controlled by a return air sensor with the integration of the HVAC main/BMS room controllers.

A control range of approximately 18ºC to 26ºC is required with a dead zone of approximately 0,5ºC between cooling off and heating on and vice versa.

The controls shall maintain the specified temperature ±2ºC by controlling the control valves on the cooling coils. Electric heaters shall be controlled in steps as specified.

The control circuit shall be interlocked with the supply air fan and shall only be in operation if the fan is running.

Where three-way valves are used it shall be in the full by-pass position when the system is off.

Three-way valves shall be fitted with balancing valves in the by-pass leg with the valve adjusted to ensure that the flow resistance across the by-pass leg shall equal the coil resistance at full flow.

Control valves shall be selected at the design flow rate for a pressure drop of 300kPa.

The following interlocks shall be provided for electrical heaters where used:

- Heaters shall not be on unless the fan is on.
- A fire protection high temperature thermostat shall be provided in the supply air duct to stop the fan if the air temperature exceeds 65ºC and to switch all heaters off.
- A pressure switch or flap type mercury switch shall be fitted in the supply air duct to ensure that the heaters cannot be on unless air flow is established.
- Provision to ensure that heating and cooling cannot be on simultaneously.

A variable speed drive/EC fans shall be installed to allow the supply of variable air flow rates. Required air flow rates shall be determined via static pressure sensors in the supply air ducting.

26. PIPE & FITTINGS INSTALLATIONS

26.1 **GENERAL**

Pipe sizes and positions are as shown on the project drawings. Valves, strainers, etc., must be suitable for the system. Valves, strainers, pressure gauges and other fittings must be of a manufacture approved by the Engineer.

Pipes, strainers and other fittings up to 50mm may be screwed or flanged.

Valves, strainers and other fittings larger than 50mm must be flanged.

Thread must be in accordance with BS 21 and flanges to ASA standard or BS 4504 unless otherwise specified.

Pipes larger than 50mm diameter connected to equipment or fittings, or where specifically indicated, must be flanged to ASA Standards or BS 4504.

All other piping with a diameter larger than 50mm must be welded, except where galvanised pipes are used.

Galvanised piping must be screwed when smaller than 50 mm and flanged above 50 mm. All PPR piping to be fused joints as far as possible to eliminate the chances of any leaks.

Pressure and temperature ratings of valves and other pipeline equipment shall be suitable for the system into which installed and shall be selected according to ratings given by the manufacturer.

Matched flanges shall correspond in construction and dimensions to flanges on equipment. Matched flanges shall be provided with the correct bolts, nuts and packing rings.

Clean all piping before connecting.

All equipment piping/fittings of one type installed under this contract shall be of the same manufacture, supported by a well-established South African organisation.

Other makes may only be used on the Engineers written approval.

Welding to galvanised piping or other fittings is not permitted.

Where welding for whatever purpose is unavoidable the complete section must be hot dip galvanised after manufacture and approved by the engineer. No CU galvanised sections/installations will be allowed.

Cold galvanising is not acceptable.

Use full radius bends and sweep fittings wherever possible. Use elbows only under exceptional conditions and only with written permission from the Engineer.

Where it is necessary to reduce pipes in size, use only reducing sockets and not bushes.

Use eccentric fittings in horizontal runs of piping, where there is only a slight fall.

Where pipes pass through walls etc., provide sleeves that will not foul against any piping due to the natural expansions and contraction of the piping.

Provide all pipelines with 15mm drain cocks at all low points in the system so that the pipe work can be drained of liquid without dismantling.

Make provision to have one in every twenty welded joints cut out for inspection and testing and for making good afterwards. All welds on the installation shall be X-rayed and examined, at the contractor's own expense, by an approved Inspection Authority. Should any of the test welds prove unsatisfactory the welds must be re-done and re-tested. The contractor shall submit written test and inspection reports by the Inspection Authority before the installation shall be accepted.

Install horizontal pipes with a slope of at least 1 in 500 to allow venting of air to the expansion tank wherever possible. Fit all pipes in such a manner as to prevent the formation of air locks and air pockets. Provide high points with automatic air vent valves or air bottles. Air vents or bottles must be designed for at least 1,5 times the working pressure of the system.

Arrange piping in plant rooms so that normal inspection and servicing of equipment is not obstructed.

Size pipes which are not dimensioned on drawings using the following criteria:

The velocity must not exceed 2,5 m/s.

The friction rate must not exceed 60 kPA per 100m length.

The pressure drop through all circuits shall be approximately the same. If this cannot be achieved by pipe sizing alone due to excessive resultant velocities, provide throttling or balancing type valves where required.

Pipe supports and the positions of anchors shall be such as to allow for movement due to either pipe expansion and contraction or expansion joints in the building structure as applicable.

Pipe expansion joints, where required, shall be of the bellows type manufactured from stainless steel or may be of the Viking Johnson pipe coupling or equal where moderate expansion movements are to be accommodated.

Pipe expansion joints shall be rated at not less than 1,5 times the maximum working pressure in the system. Expansion joints in hot water piping shall be suitable for water temperatures up to 120 ° C.

Pipework, pipe fittings, valves and associated fittings for chilled water, hot water, and condenser water services is to be supplied and installed in accordance with the drawings.

Chilled water piping shall be PPR fusion type, conforming to SABS 62-1971. Screwed joints may be used for piping of diameter up to and including 50mm diameter whereas all piping in excess of this diameter shall be jointed by the welded/fusion process, using flanges where stated below.

Pipes of diameter in excess of 150mm shall be constructed of seamless PPR piping in accordance with SABS 62-1971 with welded/fusion joints only.

All PPR pipe fittings shall conform with SABS 509-1955.

Condenser water piping is to be PPR/uPVC after manufacture throughout.

Welding of pipework shall be carried out only by qualified welders/PPR certified installers and the Engineer reserves the right to have cut for examination a reasonable number of welds on the basis that:

1. the weld is re-executed free of charge by the sub-contractor should unsatisfactory welding have been carried out or

2. that the weld be re-executed as a variation item extra to the sub-contractor.

Connections to air handling units, pumps, chillers and other major equipment shall be flanged in the case of piping of diameter 65mm and over and shall be joined using cone face unions in the case of piping of diameter less than 65mm, to enable sections of the air conditioning system to be removed and replaced.

Flange gaskets shall be of the “full face” type.

In all piping installations due allowance shall be made for the thermal expansion and contraction of the piping material.

All bends or elbows used in the installation shall be of medium radius type. Short radius elbows shall not be permitted.

The chilled water system shall be supplied with an expansion tank of a steel or copper type and water volume of 3 litres, complete with ball valve, air vent, quick-fill and drain connections.

Automatic air release valves shall be fitted at the top of the riser pipe stacks, and in any other positions in the chilled water and condenser water systems where necessary to prevent airlocks and to facilitate commissioning of the pumping systems.

26.2 **PIPES FOR WATER UP TO 65 ° C**

Pipes shall comply with BS 1387 and SANS 719 specifications and shall be of PPR type. Wall thickness for pipes above 150mm diameter shall be suitable for the pressure and temperature of the water.

Fittings shall be of PPR Polypropylene to confirm with SABS specifications. Flanges shall be of steel to BS 4504. Flange packing shall be of the reinforced rubber type.

Support or hang piping and isolate from the building structure. \

26.3 **HANGERS AND SUPPORTS**

Spring hanger mountings for vibration damping shall be used in all plant rooms.

Select spring hanger mountings in accordance with the supplier's recommendations. Springs must not be compressed fully due to pipe mass, but there shall be a minimum deflection in accordance with the supplier's recommendations.

Provide spring hanger mountings with acoustical neoprene washers.

Space hangers so that the pipe mass is distributed evenly over all the hangers.

Hangers shall be constructed to allow for the expansion and contraction of pipes except where an anchor point is used.

Pipe hangers shall be adjustable in height to set the pipe gradient.

Pipe hangers shall be designed to prevent pipe movement on starting and stopping pumps.

Before manufacture or installation details shall be submitted of anchors, supports, expansion loops, guides, load calculations and a statement that the work has been reviewed by the manufacturers of such equipment.

The material of hanger rods, hangers, clamps and all other support devices shall be compatible with the supported pipe and supporting structure.

Horizontal and vertical; pipe guides shall be installed where required.

All flexibly supported piping shall be sway braced without interfering with proper thermal movement of the piping.

Anchors and guides for all horizontal and vertical piping (for proper control of thermal movement) shall be included. These shall be designed to prevent undue strain on branches, to provide proper performance of expansion joints and expansion loops and to avoid overloading of hangers and supports.

The maximum horizontal support spacing and hanger rod diameters shall be as follows for PPR, steel chilled water, condenser water, hot water, compressed air and vacuum pipes.

Normal Pipe size (mm)	Hanger Rod ø (mm)	Span (m)
12-32	10	1.5
40-65	10	1.8

The maximum horizontal spacing for steam and condensate pipes are as follows:

Nominal Pipe Size		Span (m)	
Gradient	1:120	1:240	1:480
20	2.5		
25	3.5		
32	4.5	3.0	1.5
40	5.5	4.0	2.0

The maximum horizontal support spacing for condensate (from AC units) pipes shall be as follows:

Nominal Pipe Size (mm)	Span (m)
12-20	1.0
25-40	2.0
50 and over	2.5

Hangers shall be provided at a maximum spacing of 1 metre from each elbow or pipe fitting.

Hanger rod dimensions for steam and condensate piping shall be not less than that specified in specification.

26.4 PIPING INSTALLATION

Install pipe work in accordance with the service drawings issued with the Project Specification.

The tender drawings are schematic and do not purport to show exact positions of pipes or specific details of construction of the latter. Check all final dimensions on site before preparation of manufacturing drawings and the fabrication of piping.

Provide suitable offsets or alternatively changes in the section of the particular pipe where beams, stanchions or other obstructions interfere with the straight running of pipes.

Allow sufficient off-sets or alternatively expansion bellows in piping installations to allow for expansion and contraction.

Study all the drawings of the particular building in order to determine the number of such offsets or changes in section and the positions in which they will be required.

26.4 VALVES FOR WATER, AIR OR GAS UP TO 65 ° AND 1000 KPA WORKING PRESSURE

Valve materials shall be selected for the particular application.

Saunder's type valves are accepted.

Gate valves up to 50 mm ø shall consist of bronze valve bodies with screwed bonnets and screwed alloy stems and solid tapered wedge type discs of bronze.

Gate valves of 65 mm ø and over shall have cast iron valve bodies with flanged ends. Bonnets and yokes shall be bolted. Rising brass or bronze stems with outside screw and yolk shall be utilized. Wedge discs shall be solid cast seat rings on body and disc. Trim shall be bronze.

Gate valves shall only be used as isolating or shut off valves.

Gate valves shall be provided with back-seating on stems to facilitate repacking under pressure.

Globe and angle valves up to 50mm ø shall have bronze bodies with screwed bonnets and screwed ends. Stems shall be rising copper alloy with inside screw. Trim shall be bronze. Bronze seat rings and replaceable composition or bronze discs shall be with compressed air of liquid oxygen.

Globe and angle valves over 65 mm ø shall have cast iron bodies with flanged ends, bolted bonnets and yokes, rising bronze stems with outside screw and yoke, replaceable bronze seals, replaceable discs and bronze trim.

Globe valves shall be used for throttling or balancing purposes.

Butterfly valves of a diameter over 50mm shall have cast iron bodies with suitable rubber lining inside and flanged ends, or water type fitting between flanges. Lever operation is acceptable but gearbox operation shall be provided above 500m size or with a pressure above 350kPa. Both lever and gearbox operation shall have position indication and locking mechanism.

Butterfly valves shall be used for throttling or balancing purposes.

Diaphragm valves up to 50 mm ø shall have screwed ends and above 65 mm flanged ends. Cast iron bodies are acceptable.

Diaphragm valves shall only be used as shut-off valves unless otherwise specified in specification.

Check valves for water or non-pulsating air or gas shall have cast iron or cast steel bodies with screwed ends up to 50mm and flanged ends for valves with a diameter of 65 mm and over.

Working parts of check valves are to be spring loaded, completely guided or swing flap operation and fabricated of stainless steel or bronze with elastic seats.

Check valves shall be of the non-slam type for horizontal or vertical installation.

Check valves with stainless steel perforated cone and resilient conical diaphragm are also acceptable if flange mounted in a short straight removable flanged type section or bobbin for easy removal of the valve.

Diaphragm to be suitable for the system fluid characteristics.

Float valves up to 40 mm ø shall have bronze valve bodies and working parts, screwed connections and shall be suitable to open against the system pressure.

Float valves of a diameter of more than 50 mm shall have cast iron bodies with flanged ends and bronze seat rings.

Plug cocks up to 50mm shall have bronze bodies and plugs, screwed ends with gland and square heads.

Plug cocks of a diameter of 65 mm and over shall have cast iron bodies and bronze plugs, flanged ends with square heads.

Plug cocks shall be used for balancing purposes.

26.5 **CALIBRATED BALANCING VALVES**

Calibrated balancing valves shall be of the plug cock type with bronze or cast iron valve bodies, bronze disc, internal seals, screwed ends, up to 60 mm and flanged ends for 65 mm ø and over.

Calibrated balancing valves shall be of the globe type with bronze or cast iron valve bodies with screwed ends-up to 50mm and flanged ends for 65 mm ø and over.

Valves shall be provided with screwed take-off connections to which a pressure differential gauge can be coupled and provided with check valves in the take-offs.

A valve position indicator shall form integral part of the valves.

Valves shall be suitable for a working pressure of 1000 kPa and a working temperature of 90 ° C unless otherwise specified.

A removable polyurethane cover shall be provided for each valve.

Portable differential pressure gauges shall be supplied with the above valves, complete with all necessary tubing, shut off and ventcocks and carrying cases. At least one differential pressure gauge shall be supplied for each project and one additional gauge for every 20 valves after the first 30 valves.

Graphs and charts showing the flow quantities against valve openings and pressure differential across the valves shall be supplied for each portable pressure differential gauge.

The pressure gauges shall be calibrated to the latest SI units.

On completion of the installation, the portable differential Pressure Gauges and charts shall be handed over to the owner's representative.

The sub-contractor shall supply and fit, where shown on the drawings, valves to regulate and measure the total fluid flow to each item of equipment. Valves shall be similar or equal to TOUR AGENTUR.

26.6 **PRESSURE REDUCING VALVES**

Pressure reducing valves up to 32mm ø for steam, air or water shall have bronze bodies with screwed ends, stainless steel working parts and built-in stainless steel strainers. Valves shall be direct acting and shall be suitable for the system fluid characteristics, pressure and temperature.

Pressure reducing valves of 40mm ø and over for steam, air or water, shall have cast steel or malleable iron valve bodies with flanged ends, stainless steel working parts and built-on strainers. Valves shall be pilot operated.

Pressure reducing valves shall be selected in accordance with the manufacturer's recommendations for inlet pressures and shall be designed to give a constant downstream pressure with varying upstream pressure.

26.7 **SAFETY RELIEF VALVES**

Safety relief valves for compressed air shall be according to BS 1123.

Safety relief-valves shall be of the spring loaded type with side outlet and screwed connections. Valve bodies shall be of bronze or cast iron and working parts and trim of bronze.

The outlet of safety relief valves shall be piped to a safe position on the outside of the building.

Safety relief valves for hot water and steam shall be in compliance with BS 759.

26.8 **AIR VENTS**

Air vents for steam shall be of the automatic balanced pressure type, with bronze or brass bodies with screwed ends, stainless steel liquid filled bellows and stainless steel working parts.

Air vents for steam shall be selected to the manufacturer's recommendations regarding working steam pressure, temperature, etc.

Outlets from air vents for steam shall be piped to the nearest safe drainpoint.

Air vents for water shall be automatic and shall have bodies of cast iron with screwed ends, floats, float mechanisms and all working parts of stainless steel.

Air vents for water shall be selected to the manufacturer's recommendation regarding working water temperatures and pressures.

Outlets from air vents for water shall be piped to the nearest drain points.

Vent pipes of 50mm ø shall be installed at all high points in the systems or as shown on the engineer's drawings. Vent pipes shall be provided with 15mm ø globe valves in a position readily accessible at the top of the 50mm ø pipe.

Vent pipes shall be taken up to 200 mm above the highest point in the system and then bent and taken down to a position 200 m above the finished floor level.

The globe valve in the vent pipe shall be installed at a position 2000 mm above finished floor level and permanently connected to the nearest drain by means of rigid steel piping.

Air bottles with vent pipes shall be installed at the highest points in the system or as shown on the engineer's drawings.

26.9 **STRAINERS**

Strainers shall be of the angle or Y-type. Strainers up to 50 mm shall have screwed ends and strainers of 65 mm ø and above, shall have flanged ends.

Strainers for cold water up to 65 ° C and 1000 kPa and over shall have bronze bodies and bronze screens.

Strainers for steam or hot water over 65 ° C shall have cast steel bodies and stainless steel screens.

In lieu of bronze screens stainless steel screens will be acceptable.

Screens shall be perforated as follows:

Strainer Size (mm)	Perforation Size (mm)
10-50	1.0
65-150	1.5
200 and over	2.0

Strainers shall be provided with a 50mm blowdown pipe and cock on the cap piped to the nearest drainpoint. Flexible piping shall be used.

The effective free area of each strainer, in terms of perforations shall be not less than three times the cross sectional area of the inlet.

Strainers shall be installed on the inlet side of all hot water, chilled water and condenser water pumps.

26.10 **WATER SEPARATING EQUIPMENT**

Steam traps shall be installed at all low points in the system and where indicated on the engineers drawing.

Steam traps shall be of automatic operation and shall have bronze or stainless steel bodies and working parts.

The selection of steam traps shall be submitted to the engineer for approval before ordering.

Drain traps for compressed air services shall be of automatic operation and shall be of the float type with bodies of malleable iron stainless steel or bronze.

26.11 **GAUGES**

Pressure gauges for water or air shall be of the Bourdon type and glycerine filled.

Pressure gauges for steam services shall be of the turbine movement type.

Pressure gauge dials shall have a diameter of at least 100 mm.

A gauge cock and siphon tube shall be provided with each gauge.

Gauges shall be calibrated to the latest SI units to a minimum reading of 50% higher but nor more than 75% higher than the system working pressure.

A red line shall be provided on the dial at the maximum system pressure.

Pressure gauges shall be of the heavy duty type with adjustable zero point.

26.12 **FLOW METERS**

Flow meters shall be of the stainless steel orifice plate type fitting between flanges.

Corner pressure tapping shall be used.

Flange tapping shall be used.

D, D/2 pipe tapping shall not be permitted.

The complete flow meter including flanges shall be supplied by a reputable manufacturer.

The screwed take-off connections shall have built-in check valves.

Flow meters shall be suitable for the system working pressure and a temperature of 120 ° C unless otherwise specified.

A differential pressure gauge, complete with tubes, shut-off cocks, air vents and a carrying case shall be supplied for the flow meters.

Graphs or charts on which the flow quantities are plotted against pressure differential across the flow meter shall be supplied.

The differential pressure gauge shall be matched to the orifice plates and shall give a direct fluid quantity reading.

Orifice plates permanently connected to direct reading differential pressure gauges as described above shall be fitted in each condenser water circuit and chilled water supply line to each chiller and the main chilled water supply and return pipes to the chiller plantroom.

26.13 THERMOMETERS, THERMOMETER POCKETS AND THERMOSTAT POCKETS

One thermometer shall be installed on the inlet side and one thermometer on the outlet side of each piece of heat exchange equipment.

Thermometers shall be of the replaceable glass type of straight or angle pattern with bronze casings and calibrated in degrees C.

Scale length shall be at least 170 mm and calibration shall be suitable for the system temperature range.

Loose thermometer and thermostat wells shall be provided.

Thermometer and thermostat wells shall be manufactured of brass with a wall thickness of not less 1.5 mm around the thermometer or thermostat bulb.

Thermometer and thermostat wells shall project at least 50 mm into the pipe.

Thermometer and thermostat wells shall project a distance into the pipe equal to at least two thirds of the pipe diameter.

Wells shall have dust excluding caps with gaskets and chains.

Pipes smaller than 65 mm ø shall be enlarged at the points where the wells are installed to (accommodate the wells).

Wells shall be oil filled and be installed vertical or at an angle of at least 45 ° to the horizontal so as to retain oil.

The position of each thermostat shall be such that they can be read easily by a man standing on the floor with normal room illumination.

26.14 EXPANSION OF PIPES

Proper provision for the expansion and contraction in all parts of the piping systems shall be made.

Where pipe loops or changes in direction of piping cannot be employed to absorb the expansion and contraction, expansion joints shall be provided.

Guides shall be provided on both sides of all expansion joints and loops and in additional allocations recommended by the expansion joint manufacturer.

Expansion joints, connecting piping, anchors and guides shall conform with the manufacturers' recommendations.

26.15 CONNECTIONS TO VIBRATING EQUIPMENT

Stainless steel bellows type flexible connectors shall be used for equipment connections to vibrating equipment or where shown on the engineers' drawings.

All flexible connectors shall have flanged joints and be designed for 1000 kPa for one and a half times system working pressure, whichever is the higher value.

Only connections manufactured and supplied by a reputable manufacturer, which is well represented in South Africa shall be acceptable.

Rubber isolated tension members shall be provided to prevent excessive elongation.

26.16 SLEEVES AND PLATES

Provide sleeves where piping runs through walls, flooring or ceilings. Sleeves must be of 1,2mm thick galvanised steel sheet, large enough to leave not less than 6mm clear around the pipe and insulation, if any. Sleeves through flooring must be of the proper length to pass through the entire floor construction with finish. Wall, ceiling and floor sleeves shall be provided with plates on both sides of the wall, ceiling or floor. Plates shall be designed so as to leave the pipe free from expansion and contraction.

Supply all required sleeves to the main Contractor at a time well in advance of building construction. Position sleeves to be built in by the main Contractor.

26.17 TESTING OF PIPE INSTALLATIONS

All pipe fittings shall be tested hydrostatically up to a pressure of 1000 kPa or 1.5 times the maximum system pressure, whichever is the higher value.

Tests shall be carried out before the application of insulation.

Water systems shall be filled with water and air vented at least 24 hours before the test.

The test pressure shall be maintained for a period of at least 2 hours after the pump has been disconnected.

Leaks in screwed joints shall be corrected by re-making the joints.

Leaks in welded joints shall be cut out and re-welded.

Test instruments shall be tested for accuracy in a laboratory approved by the engineer or by the manufacturers. Test certificates showing the degree of accuracy shall be furnished to the engineer on request.

Instruments, equipment and labour required for the tests shall be supplied by the tenderer.

Testing of parts of the system shall be permissible but the total system shall be tested at the engineers discretion.

Piping systems shall be pressure tested with the fluid it was designed for.

Vacuum systems shall be tested with nitrogen at a pressure of 1000 kPa or at a pressure of 3 kPa (absolute) at the discretion of the Engineer.

All piping circuits shall be tested to a pressure of at least 1.5 times working pressure at any point in the system, such tests to be witnessed by the ‘Engineer on the basis of his having been given reasonable notice to this effect.

26.18 WITNESSING OF TESTS

The Contractor shall notify the Engineer in writing at least seven working days prior to the test.

The Engineer will certify acceptance of all test. Such certification does not in any way alter the responsibilities of the Contractor under this Contract.

26.19 **CONSTRUCTION MATERIALS**

Construction and materials of valves shall comply with the following specifications.

1. Bronze valves: BS 1400 LG 2-C, or ASTM B62-63
2. Cast iron valves: BS 1452 GR 14, or
3. Class B: ASTM A126-61T
4. SG Cast-iron valves: BS 2789-1961, or ASTM A445-63T
5. Cast steel valves: BS 1504-161A, or ASTM A216

26.20 **FLUSHING/DRAINING**

Upon the completion of all pressure tests throughout the building complex, and prior to the commencement of commissioning of pumping systems, the entire system shall be drained and flushed to ensure the removal of waste jointing material, accumulated dirt, and sundry construction materials.

Refer to Water Treatment section for method of cleaning and flushing a piping reticulation.

27. INSULATION

27.1 **GENERAL**

Clean and treat all surfaces before insulation. Prepare and paint steel surfaces in accordance with Clause 4.3.36 & 4.3.37 with a base coat prior to insulation.

Do all pressure tests in the presence of the Engineer prior to insulation.

All thermal insulation work must be executed by specialists in this field.

Use adhesives sealants and coatings which are compatible with the insulation material. Use only insulation materials which do not produce toxic fumes when burning.

Submit certified test reports from independent institutions in which the following information is given:

The thermal conductivity of insulating materials at operating temperature.

The surface spread of flame of insulating materials, adhesives and other finishes.

The permeance of vapour barrier systems (chilled water systems).

The sound absorption co-efficient of insulation materials (internal insulated ducts).

The surface spread of flame of insulation cladding shall be in accordance with BS 476 Class I.

Use only insulation, adhesives and finishes which are resistant to rotting, mould, fungus growth, decay and attack by vermin.

Upon conclusion of the pressure tests and before the application of insulation sections all piping shall be thoroughly de-greased and painted with a high quality anti-corrosive paint.

The work shall be executed in a workmanlike manner and the final surface shall be of a neat, smooth and symmetrical finish.

Thermal insulation of equipment shall comply with BS CP3005 – 1969, provisions of BS 1334, BS 1558 AND BS 476 or the latest amendments as applicable.

Oil, grease, rust, scale and dirt shall be removed from surfaces by means of a suitable cleaning agent before the application of insulation.

No equipment shall be insulated until tested and approved.

Pipes shall be painted with bitumastic paint before application of insulation.

The permeability of insulation cladding around chilled water pipes shall not be more than 1.

Thickness of insulation cladding will be checked by the Engineer after completion of insulation work. If any thicknesses are less than that recommended by the manufacturer, the sub-contractor will be requested to apply one extra cover coat over the whole installation at his own expense.

Continuity of the vapour barrier shall be ensured.

27.2 **INSULATION OF CHILLED WATER PIPES**

All supply and return pipes shall be insulated with preformed sections of insulation with a heat transmission co-efficient not higher than 0,035 watts per square metre degree C.

The insulation thickness shall not be less than 25mm over any pipe or fitting. Insulation on pipes larger than 125mm in ø shall not be less than 40mm. For project insulation thickness refer to layout drawings.

The preformed sections of insulation shall be provided with a factory applied canvas finish. During installation the sub-contractor shall ensure that the canvas finishes overlap each other by at least 25mm on all joints.

A vapour-proof protective cladding equivalent to “FOSTER SEALFAS coating 30-36” or “DECADEX fire check” shall be brush-applied over the canvas covering. N/P. The applications shall be as follows:

FOSTER 30-36 – 2 coats each at 1,6m² per litre DECADEX FIRE CHECK – 2 coats each at 1m2 per litre.

Circumferential joints to the insulation shall receive one application of ‘FOSTER FOAMSEAL 30-45” or equivalent, to the full thickness of the insulation during erection to obviate lateral migration of moisture vapour along the pipe when in service.

All points where pipe supports are used or where the vapour barrier is broken due to cut-outs in the insulation, shall be sealed with “FOSTER FOAMSEAL 30-45” or equivalent during erection.

Circumferential and longitudinal laps to the canvas shall be adhered with “FOSTER SEALFAS coating 30-36’1 or equivalent before application of final coats.

Bends, valves, flanges and fittings shall be insulated and covered as described for pipes.

Note:

Exposed pipe insulation inside the central chiller plantroom and all insulated piping in the basement parking areas, riser shafts and outside the building (weather exposed) shall be insulated with the relevant thickness, as stated above, P.I.C. and shall be provided with applied shop-strand glass fibre mat. The vapour barrier in this instance shall be formed by applying two brush coats of epoxy resin to suit colour specification.

All flanges, valves, non-return valves and other devices in this pipework requiring servicing shall have easily removable jackets.

Pipes in Plant Rooms

Insulate all supply and return pipes in plant rooms with sectional resin bonded glass fibre insulation with a density of at least 96kg/m3 and with the following thickness.

Pipes up to 125mm diameter – 25 mm

Pipes bigger than 125mm diameter – 40mm

Use glass fibre insulation with a factory applied canvas finish.

Install a vapour barrier using only coatings and cloth approved by the Engineer. The vapour barrier must have a permeance not exceeding 0,30 perms.

Seal all circumferential joints to the insulation with an approved sealant to the full thickness of the insulation during erection to prevent lateral migration of moisture vapour along the pipe when in service.

Seal all points where pipe supports are used or where the vapour barrier is broken due to cut-outs in the insulation, with an approved sealant.

Seal all circumferential and longitudinal laps of the canvas.

Provide straight runs of pipe with a 0,5mm thick galvanised sheet metal cladding over the insulation material. Clad bends with “lobster back” bends also of 0.5mm thick galvanised sheet metal.

Cut the sheet metal covering to the size of the pipe support. Secure cladding by galvanised steel bands or pop rivets every 500mm. Do not use self-tapping screws.

Install sheet metal cladding with seams in the “20 minutes past the hour” position. Where possible install the cladding with the seams in non-visible positions.

Pipes outside Plant Rooms

Insulate pipes and fittings as above but do not use sheet metal cladding. The insulation shall be covered with shop-stand glass fibre mat as above.

27.3 METAL CLADDING OF PIPES

All chilled and hot water pipes in plantrooms shall be provided with a 0,5 mm thick galvanised sheet metal cladding over the insulation material. The cladding shall be installed after the vapour-proofing has been approved by the Engineer.

Care shall be taken not to damage the vapour barrier.

Cladding shall be secured by stainless steel bands every 500 mm. Self-tapping screws shall not be used.

The sheet metal covering shall be cut at pipe supports or hangers.

No dents or any damage to sheet metal covering will be accepted at the final inspection.

27.4 VALVES AND FITTINGS

Valves and fittings shall be insulated with resin-bonded mineral, wool, or glass fibre with a minimum density of 96 kg/m.

Plaster of at least 13 mm thick shall be applied over a steel mesh covering the insulation. The plaster shall be of the asbestos hard setting compound type, trowelled to a neat, smooth, and symmetrical finish.

The insulation of valves and fittings shall fit neatly to the rest of the pipe insulation.

Care shall be taken that all valves and fittings can be operated without damaging the insulation.

The end plates of strainers shall be insulated with suitable closed cell foam rubber to prevent any dripping.

27.5 **EXPANSION TANKS**

Construction

The tanks shall be made of pressed steel “Braithwaite” or equivalent construction.

The tanks shall consist of one-meter square sections bolted together, complete rigidity being assured by angle stays fixed to cleats or gussets which in turn are bolted to side and base plates.

All steel used shall be galvanised.

A suitable sealing compound shall be used to seal all seams of the tanks.

The nature and temperature of the water shall determine the choice of sealant.

The sealant compound shall be approved by the Engineer.

The complete construction shall be leak-proofed.

The top of the tank shall be covered to the same construction standard as the rest of the tank and shall be suitable for outdoor installation of the tank.

An accessible manhole shall be provided for maintenance purposes. The manhole cover shall close tight against the water pressure.

Each tank shall be fitted with a valved drain connection as well as an overflow connection both piped to the nearest drain point.

Each tank shall be fitted with make-up and quick fill connection.

A feed and expansion connection shall be fitted to each tank.

27.6 **PUMPS**

Centrifugal water pump/motor sets shall be supplied and fitted where indicated on the drawings and the accompanying schedules.

Pumps shall be of the vertical split end suction type incorporating bronze impellers, stainless steel shafts and mechanical seals unless otherwise specified.

Water pumps must be centrifugal pumps with volute casings and must have non-overloading characteristics. Pump casings may be horizontally or vertically split. The pump installation must be complete with flanged inlet and outlet connections, matching flanges, removable drive coupling guard and fabricated steel base for pump and motor.

Pumps must be selected for the maximum possible efficiency at the required duty point and must be free of vibration and silent in operation.

Pumps must be provided with adequate protection over inlet and outlet flanges before being delivered to site. Protection covers must be able to withstand normal handling during construction work.

Unless otherwise specified in the Project Specification pump speed must not exceed 1 500 r/min. No pump must be operated at a speed exceeding the maximum recommended by the manufacturer.

Check the design total system resistance as specified in the Project Specification when all the information regarding selected system elements is available. The actual motor duties must then be transferred onto the electrical distribution board drawings.

Pump pressure and flow characteristics must be selected to match the total system requirements under all control conditions.

Ensure that the minimum NPSH as required by the pump manufacturer is maintained throughout the required operating pressure and flow range at the pumped fluid temperature.

Pumps must be suitable for the fluids and fluid temperatures which, they hand, and must be selected accordingly.

Fit renewable casing wearing rings on all pumps with discharge diameters of 80mm and larger and with delivery pressures in excess of 175 kPa. Wearing rings must be manufactured of bronze, chromium steel, nickel steel or an alloy suitable for the particular application.

Impellers must be manufactured of bronze and must be statically and dynamically balanced. Impellers of pumps having 40mm diameter and larger discharge connections, must be fully enclosed and hydraulically balanced.

Provide pumps with mechanical seals matching the duty, fluid, and temperature requirements, aligned by a representative of the pump supplier.

Pump casing design pressure must match the total system working pressure or be 1.5 times the discharge pressure, whichever is the greater.

Pump casings must be of close-grained cast iron.

Suction and discharge connections must be flanged with machined flanges corresponding to the pressure rating of the casing.

Bearings must be grease lubricated ball and roller bearings selected for long duty life and to accommodate radial and axial loads.

Provide grease gun lubrication. The grease gun nipples must be of an approved type and must comply with BS 1486 and be of the hexagonal “hook on” type 11 or 21.

Provide a stainless-steel metal drip tray with drain connection underneath each pump. Drain connections must be piped to the nearest drain or gully.

Pumps with stuffing box type shaft seals will only be considered if:

The shaft is fitted with a replaceable stainless-steel wearing sleeve;

A lantern ring is fitted;

A minimum of 4 standard packing rings can be fitted; and

Bronze thrust bushes are provided.

Protect pump drives by a securely mounted sheet metal guard.

Provide manual vent valves at high points on the pump casings. for applications with temperatures above boiling point, the vent must be piped to a safe drain point.

Provide drain plugs at low points on the pump casings.

Provide each pump with a cast iron or fabricated steel bedplate of ample size to hold both pump and motor in correct alignment. Pump and motor must be accurately aligned when running at normal temperature. The impeller must be removable without dismantling the motor or pipe work. Dowel pins must be fitted to base plates after alignment.

No more than one pump and motor must be mounted on one common bed-plate. The bed-plate of each pump must be separately mounted on anti-vibration machine base mountings.

Pumps of design different from that specified above offered as integral parts of factory made equipment, will also be considered.

The efficiency of each pump selected must not be less than 70% and not more than 10% below the peak of the efficiency curve for the impeller furnished.

The supplier must ensure that the NPSH of the pump selected, is suitable for each pump application.

The supplier must ensure that the motor supplied is adequate for the full pump characteristic and not only for the duty specified.

Pumps shall be connected through flexible couplings of the rubber tyre type, equal to FENNERFLEX, to electric motors operating at a speed not exceeding 1440 rpm. Pumps and motors shall be mounted on robust channel steel bases and the pump body is to be fitted with a galvanised steel (Minimum thickness 1,6mm) drip tray with discharge pipe to waste.

The pump/motor set is to be complete with robust coupling guard, easily removable.

The pump motor shall be sized for not less than 1,3 times the pump shaft power requirement.

The pump set is to be mounted on a concrete inertia base of minimum thickness 200mm.

Correctly sized anti-vibration spring mounts on height saving brackets are to be mounted underneath the inertia base, and over a concrete sub-base of minimum height 100mm.

In case the offered chiller equipment having a higher capacity (i.e. chilled condenser water flow) than specified, then the contractor shall ensure, without extra cost to the Client, that the offered pump flow rates match the increased flow requirements of the offered chiller/compressor.

Furthermore, the selection of the model and size of the motor/pump set shall include an allowance for a 10% increase in pump pressure, i.e. the pump duty shall not be selected on the outer pump curve or the maximum impeller diameter.

The capacities of the pumps offered shall exceed the minimum flow requirements, specified in the schedules.

Should alternative refrigeration equipment be offered with flow rate capacities greater than the schedules, the larger pumps shall be selected and these form part of the submitted tender price.

Pump/motor sets with motor powers in excess of 1.5kw shall have flexible pipe connection at both the suction and discharge pipe connections.

27.7 **VALVES AND FITTINGS**

27.7.1 **GENERAL**

The water treatment company shall have a fully equipped laboratory to assist in fault finding and field systems division to maintain the equipment installed.

Provide water treatment for all closed-circuit cooling towers.

Provide water treatment and water quality control to match the specific application and local site and water conditions.

Provide water treatment for evaporative cooling units only where specified in the Project Specification.

Tenders shall include for the supply, delivery and installation of all necessary equipment, including labour, fittings and electrical wiring and connections to render the installation operative.

All the required chemicals shall be supplied, delivered and applied both initially and subsequently during the maintenance period. Additional dosing for adjustments shall be for the supplier’s account.

The chemicals which, are used shall not contain chromate's. The effluents from any of the above systems shall meet with municipal by-law regulation of Zinc, Copper, Aluminium, Sodium, Tin and other toxic metals. The pH must be between 2,5 – 11,5 or any stricter values laid down in local By-Laws.

Tenderers shall ensure that effluent discharge from a treat circuit does not violate any national laws or any local authority By-Laws. The onus for determining the applicable regulations rests with the contractor.

Dosing quantities and periods shall be determined by the equipment supplier.

27.7.2 **TEST KIT**

A test kit for testing the quality of the water complete with instructions how to operate the test kit shall be supplied to the Owner.

27.7.3 **SERVICE VISITS**

The Contractor shall, through his supplier, in addition to the supply and maintenance of the equipment, draw samples of the system water and chemically analyze this water on site on a monthly basis during the guarantee period. The results, together with the make-up quantities and chemicals used, shall be recorded and these reports shall be sent to the Engineer immediately on completion of tests with copies to the Employer and Contractor.

The Contractor shall ensure that these visits are carried out as specified.

27.7.4 **WATER DOSING PLANT**

Unless otherwise specified, provide cooling tower/condenser water circuits with automatic dosing plant including bleed control.

The functions of such equipment shall be:

1. conductivity control
2. water stabilisation chemical dosing
3. microbiological control chemical dosing

Where capacities are not specified the dosing plant must have sufficient capacity for the application and local water quality.

Provide each evaporative condenser or cooling tower circuit with its own independent dosing plant and bleed control.

The dosing system must be complete with all necessary chemicals, controls, valves and appliances.

The system must comprise an automatic bleed-off valve controlled by an electronic measuring cell from the water conductivity and automatic measuring type dosing pump/s. The electronic measuring cell must continually measure the water conductivity and control the bleed-off valve and dosing pump/s accordingly.

The pre-set values of the water conductivity must be adjustable. The TDS must be controlled in the range of 600-800mg/b.

The water treatment must ensure that:

1. scale forming and corrosion are prevented.
2. algae and microbiological growth are controlled.

3. sediment is controlled with low water consumption.

4. Chemicals must comply with the local health authority regulations and must be compatible with all materials forming part of the piping system.

5. Provide approved dilution tanks as reservoirs for the metering pumps.

6. Provide sufficient chemicals and salt for three months use at first hand over.

When the plant is in effective operation, water samples must be drawn after the softener and from the condenser sump. The samples must be analysed by a recognised laboratory suitably equipped and the report submitted to the Engineer.

Carry out service calls with water analysis and recognised corrosion tests out every three months during the maintenance period. Send reports to the Engineer.

Provide isolating valves to allow all components of the water treatment plant to be removed for maintenance without affecting the operation of the cooling plant.

The water treatment plant must be electrically interconnected with the recirculating water pump so that it cannot operate unless the pump is running.

Chemicals must be readily available from a recognised local supplier.

Select chemicals so as not to interact with or neutralise each other.

Concentration of chemicals in pipe system must be in accordance with suppliers' recommendations.

28. DUCTING

27.8 GENERAL

Sheet metal ductwork shall be manufactured in accordance with SANS 1238, and installed balanced and tested as set out in SANS 10173. The installation and manufacture of ductwork shall strictly be in accordance with SANS standard specifications with specific attention given to the following:

- Changes in size and shape of ducting: refer to SANS 1238, section 6.3. Particular requirements are given on the standard drawings.

- Access openings, doors and covers: refer to SANS 1238, Section 5.3.

- Sealant requirements: refer to SANS 1238, Section 5.6.

- External ducting insulation: refer to SANS 10173, Section 5.4.

- Material thickness and duct stiffening for low pressure ductwork: refer to SANS 1238, Section 6 for rectangular ductwork and SANS 1238, Section 7 for circular ductwork.

- Radius and square bends as well as turning vanes: refer to SANS 1238, section 6.4. Typical bend layouts as set out in SANS 1238 are given on the standard drawings.

- Unless the sheet-metal ductwork is inherently corrosion protected, all sheet-metal shall be protected against corrosion as outlined in SANS 1238, Section 8.

- It shall be the responsibility of the installing contractor to ensure proper assembly and sealing of sheet-metal ductwork and insulation strictly in accordance with SANS specifications.

- The air duct system shall be of the low pressure type and the ductwork shall be manufactured of galvanised mild with general material requirements as set in section 5.1 & 5.2 of SANS 1238. The

ductwork shall either be circular or rectangular in cross-section as indicated on the project drawings.

- The first dimension given on the drawings for rectangular ductwork shall be read as the width on plan and the depth on section, and the second dimension shall be read as the depth on plan and the width on section.

- The duct dimensions shown on the drawings are sheet metal dimensions. All final dimensions shall be checked on site, or verified by means of architect's working drawings and structural drawings, before the fabrication of the ducting.

- Sealing membranes and adhesives for affixing insulation shall meet the indexes for surface spread of flame, heat contribution and smoke production as set out in section 4 of SANS 1238.

- The inner surfaces of ducting shall be insulated with sonic type acoustic 25mm linear. Dampers, sound attenuators, duct splitters and turning vanes shall be installed where indicated on the drawings.

- Flexible connections shall be provided between all fans, sound attenuators, air-handling units, and ducting. Flexible connections exposed to weather shall be provided with protecting galvanised sheet steel cover strips. The material used for flexible joints shall comply with the requirements as set out in SANS 1238, section 5.5. Flexible connections shall be provided on both sides of the equipment with a fixing method as indicated on the standard drawings.

- Ducting shall always be installed in such a way, that, especially in plant rooms, maximum height between the floor and the underside of ducting is achieved.

- The installation and testing of hangers shall comply with the requirements as set out in SANS 10173. All hangers shall be treated against rust and shall be painted.

- The galvanised surface of the ducting shall not be damaged or marked in any way. The internal surface of plenums and ducting shall also be painted black where necessary, to prevent the visibility of the inside surface of the duct or plenum.

- Exterior supply and return air ducting and cladding that is exposed to sunlight shall be painted with an approved solar heat reflective paint

- Where ducting required painting, all galvanised ducting shall be prepared, coated and painted to the following method. All galvanized surfaces requiring painting shall be thoroughly cleaned with galvanised iron cleaner, rinsed and dried. It shall then be painted with one coat galvanised iron primer or self etch primer. Finally, the surface shall be given two coats of high gloss enamel paint to a colour as specified by the architect. All coats shall either be of the Plascon or Dulux type. If Dulux products are used then the final coat shall be "*Dulux Gloss Enamel*" or "*Dulux Roofguard*". If Plascon products are used then the final coat shall either be "*Plascon Wall 'n All*", "*Plascon Super Enamel*" or "*Plascon Roofpaint*".

- Reinforcement, duct stiffening and fastening accessories shall be galvanised and installed where required. Only duct accessories manufactured from compatible materials, which comply with SANS 10173, shall be installed with the ductwork. Tie rods shall be manufactured from galvanised steel. Rivets, screws, bolts and other fastening equipment shall be corrosion proof.

a. LONGITUDINAL SEAMS AND TRANSVERSE JOINTS

Pieces of ductwork shall be joined with the necessary sealants, as applicable, as set out in SANS 10173, Section 5.

Longitudinal seams and Transverse joints for rectangular ductwork shall be in accordance with SANS 1238, Section 6. The types of seams and joints outlined in the SANS standard are depicted on the standard drawings for clarity.

As an alternative to transverse joints specified in SANS 1238, other flanged joints such as MEZ-flanges will also be considered provided that they meet the SANS requirements. MEZ-flanges or equivalent products shall be manufactured from cold rolled steel and hot-dip galvanised after manufacture.

Longitudinal Seams and Transverse Joints for circular ductwork shall be according to SANS 1238, Section 7. Particular details on the seams and joints are outlined on the standard drawings.

b. HANGING AND SUPPORTING OF DUCTWORK

Hangers and supports for rectangular and circular ductwork shall comply with SANS 10173, section 5.3 *"Ductwork with a vapour barrier"*. The hanger and support types are depicted in the standard drawings.

Hangers and supports for rectangular and circular ductwork with no insulation shall comply with SANS 10173, section 5.3 *"Ductwork with no vapour barrier"*. The hanger and support types used for ducting with insulation may be used. In addition to these types, the types depicted in the standard drawing may also be used.

c. DUCTING INSULATION

All air ducts carrying heated or cooled air, except where ducting run in conditioned spaces or specifically stated to the contrary shall be externally thermally insulated. Internal insulation sonic acoustic linear will be used. All joints and valves, dampers etc. shall also be adequately insulated. All ducting insulation material and installation shall comply with the requirements as set out in SANS 10173, section 5.4.2.1.

External duct insulation shall be highly resistant, organic glass fibre blanket bonded with resin, faced and vapour protected with an aluminium foil cover laminate. The external insulation shall be of the Europair FRK Duct Wrap type or other approved with similar properties as given in the table below. "Other approved" means approved by the engineer during the tender stage.

Type	Thickness (mm)	Volumetric Mass (kg/m^3)	Thermal Conductivity (W/m^{o}C)	Temperature Limits	Fire Rating
Duct Wrap 25	25	18	0.040 @ 35 ^{o}C	120 ^{o}C	Class 1
Duct Wrap 50	50	16	0.040 @ 35 ^{o}C	120 ^{o}C	Class 1

Insulating material shall be fixed to the duct with adhesive and strapped or clamped at intervals not exceeding 300 mm. Mechanical fastener pins may also be used on the bottom and sides of the duct. The Contractor shall reinstate the integrity of the vapour barrier after the pins have been fixed. Joints in the insulation shall be taped by means of an aluminium type of the same quality as the foil facing with a minimum overlap 50 mm. No vapour seal shall be left punctured.

All external insulated ductwork shall be provided with a vapour barrier to the requirements as set out in SANS 10173, section 5.4.2.3. If an alternative insulation material to Europair FRK Duct Wrap type is used that is not faced with an aluminium foil then a continuous vapour barrier shall be secured to the insulation and adequately sealed with an adhesive aluminium tape or equal method. The vapour barrier material shall comply with the requirements for flammability of sealing membranes of SANS 1238.

Ducting running in areas exposed to the weather elements shall be provided with an additional protective layer applied over the existing vapour barrier.

Galvanised sheet metal shall cover the insulated ductwork to shed water and provide protection against physical damage. The galvanised sheet metal cladding shall at least be 0.6 mm in thickness and secured tightly to the insulation.

In the case of a vapour barrier, care shall be taken to ensure that the vapour barrier is not damaged in any way. If the vapour barrier is damaged in the process of installing the cladding then the contractor shall repair, seal and reinstate the integrity of the vapour barrier as needed.

d. FLEXIBLE DUCTING

Flexible ducting shall comply with the requirements as set out in SANS 10173, section 5.7. Flexible ducting shall be proprietary manufactured with a fire rating to SABS 0177 Part 3 Class 1. The flexible ducting shall have an adequate working pressure and temperature range to suit the application of the installation.

Flexible ducting shall at all times be kept to a length not exceeding 1.5m. Flexible ducting shall not have more than the equivalent of one 90^{o} bend and bends shall be of maximum possible radius. Flexible ducting shall be supported with sufficient and correct brackets that will ensure maintenance of shape.

Flexible ducting shall be provided between air terminals, diffusers and all locations as indicated on the project drawings.

Uninsulated flexible ducting shall be manufactured from aluminium laminate with a heavy-duty steel helix core. The flexible ducting shall be of the Europair Euroflex Aludec – 45 types or other approved.

For insulated flexible ducting the inner core shall be of aluminium laminate with a heavy duty steel helix core. The flexible ducting shall be insulated with 25/40/50 mm fibreglass insulation and provide with reinforced multiple layer aluminium laminated outer vapour barrier. The flexible ducting shall be of the Europair Euroflex thermally insulated Isodec Type 25/40/50 A.

e. TESTING OF DUCTWORK

All ducting shall be leak tested in accordance with SANS 10173, section 4.3. No ducting shall have leakage rates in excess of 5 % of the required air flow rate in any section of ductwork or in excess of the SANS permissible leakage rates, whichever is the smallest.

f. STANDARD DRAWINGS

The following standard drawings shall apply to the installation of ducting and shall be read in conjunction with this specification.

DRAWING DESCRIPTION	DRAWING NUMBER
Bends and turning vanes for various size rectangular ducts	STD-15
Longitudinal seams for rectangular low pressure ductwork	STD-16
Transverse joints for rectangular low pressure ductwork	STD-17
Hangers and supports for ducting without insulation and vapour barrier	STD-18
Hangers and supports for ducting with insulation and vapour barrier	STD-19
Fastening of flexible material to metal ductwork	STD-21
Longitudinal seams and transverse joints for circular ductwork	STD-22
Typical change in size and shape of duct cross-sectional areas	STD-23
Bends and turning vanes for various size circular ducts	STD-14

29. AIR TERMINALS AND DAMPERS

27.9 **GENERAL**

Where selected by the contractor, air diffusion equipment shall be selected in accordance with the manufacturer's recommendations, capable of passing the specified air quantity at the appropriate throw without creating excessive resistance, noise or local draughts. All air diffusing equipment shall be capable of meeting NC level requirements for the space environment where the equipment is installed.

In all instances where spigot boxes (plenums) are used for the connection of air diffusion equipment, the inside surfaces shall be painted black to prevent visibility of the internal surface from ground level.

During commissioning of the system, each grille, diffuser, valve etc. shall be set to deliver the specified air quantity. It is the Contractor's responsibility to check regenerated noise levels of grilles offered against the overall acoustic performance of the system required. Noisy grilles and diffusers that exceed the NC level requirements of the given space shall be replaced at the Contractor's expense with more suitable types.

All air terminals and dampers shall be of the Europair / Trox manufacture or equally approved. "Other Approved" means approved by the Engineer.

a. RETURN, TRANSFER AND DOOR GRILLES

Return air grilles shall be manufactured from extruded type anodised aluminium, naturally anodised or epoxy powder coated to a colour as specified by the Engineer. Return air grilles shall in all instances have fixed blades with a curved blade profile.

Return air grilles shall be capable of meeting the airflow requirements, as set out on the project drawings, with a face velocity not exceeding 2 m/s.

Transfer air grilles shall be complete with fixed curved blades and outer frame on both sides of the wall or partition. Transfer air grilles shall be of aluminium extruded type, naturally anodised or epoxy powder coated to a colour as specified by the Engineer. Openings in walls where transfer grilles are to be installed shall be provided by the Building Contractor.

Door air grilles shall be installed in wooden doors only. In cases where steel and glass doors are used, transfer grilles or transfer ducting as an alternative shall be installed. Door air grilles shall be of the chevron-blade type. Door air grilles shall be manufactured from extruded type anodised aluminium naturally anodised or epoxy powder coated to a colour as specified by the Engineer.

Transfer ducting shall comprise of galvanised sheet metal ducting and aluminium curved blade intake and outlet transfer grilles. Flexible ducting shall not be used as transfer ducting.

Return, transfer and door air grilles shall be provided where indicated on the project drawings and shall be installed to the supplier's recommendation.

Return air grilles shall be installed directly on the ducting where indicated on the project drawings unless specified otherwise. The connection between return air grilles and ducting shall be airtight and sufficiently strong to handle the duct pressure.

b. WEATHER LOUVERS

Weather louvers shall have standard blade spacing of 50 mm.

Weather louvers shall be manufactured of extruded aluminium, naturally anodised or epoxy powder coated to a colour as specified by the engineer. Weather louvers shall be constructed with drip edges to blades and rigid frames to enable building in. The top and bottom blade of each weather louver shall be fitted flush with the frame and shall be smooth without grooves, channels or recesses where dirt or water can accumulate. Weather louvers shall be watertight and shall prevent the entrainment of raindrops at a face velocity of up to 3 m/s. Plastic bird mesh screens shall be fitted behind the blades. Galvanised expanded metal or wire mesh screens with 12 mm opening sizes shall also be accepted.

Weather louvers smaller than 450 x 300 mm, shall have 19 mm spacing between blades. Grilles shall be installed horizontally at the location where indicated on the project drawings.

c. FIXING OF WALL-MOUNTED GRILLES AND LOUVRES

All wall-mounted grilles and louvers shall be fixed to a hard wood frame. The timber frames shall be supplied with the grilles as part of this installation.

The timber frames shall be manufactured in such a way that the flanges of the grilles is mounted flush with the wall and extend past the outer edge of the timber frames by approximately 5 mm. The timber frames shall be provided with the necessary cleats with which to mount them in brick or concrete walls. The depth of the timber frames shall be similar to the walls in which they are fitted.

d. SUPPLY AIR DIFFUSERS AND SUPPLY AIR GRILLES

Where supply air grilles are specified on the project drawings, the supply air grilles shall be manufactured of extruded type anodising grade aluminium and shall be provided with opposed blade volume control dampers, unless specified otherwise on the project drawings. Volume control dampers fitted with supply air grilles shall conform to SANS 1238, section 6.5 requirements. The blades shall be adjustable from the front of the grille.

Where aluminium ceiling diffusers are specified on the project drawings, diffusers shall be manufactured from extruded type 5OS aluminium, naturally anodised or epoxy powder coated to a colour as specified by the Engineer. Ceiling diffusers shall be complete with an opposed blade damper, plenum box with spigot and ceiling plate. Ceiling type diffusers shall have a standard flat frame with blade spacing and distribution pattern as indicated on the standard drawings.

Where steel diffusers are specified on the project drawings, diffusers shall be manufactured from steel and powder coated to a colour as specified by the Engineer. Diffusers shall be equipped with a locking bracket to lock the adjustable radial disc once the system has been balanced. Alternatively diffusers shall be manufactured from steel and finished in a chip resistant baked epoxy powder coating to a colour as specified by the Engineer. The control disc shall be adjustable to vary airflow for balancing purposes. The diffuser shall be equipped with a locknut on the control shaft to lock the volume control disc in position after the system has been balanced.

Diffusers shall be installed at the locations where indicated on the project drawings. The Contractor shall install insulated flexible ducting of length not exceeding 1.5m and of the same diameter as the diffuser, extending from the supply duct to the diffuser. Spigots shall be attached to the ducting and sealed with silicon sealer around the outer perimeter of the joint. Flexible ducting shall be strapped to the diffuser and spigots with steel straps to form an airtight connection.

Alternatively, where indicated on the project drawings, diffusers shall be “hard” connected to ducting with rivets or taper screws and sealed with silicone sealer to form an airtight connection. All diffusers shall be capable of meeting the discharge pattern and throw requirement as set out on the project drawings.

e. VOLUME CONTROL DAMPERS

Volume control dampers shall be of the opposed multi-blade damper (OBD) type or alternatively be of the butterfly-valve type suitable for use in circular ducting.

Volume control dampers shall be installed in ducting where indicated on the project drawings. The Contractor shall balance the ducting system after installation and set the required flow rates to the various air terminals as specified on the project drawings. The Contractor shall test, balance and adjust the duct system to the requirements of SANS 10173: 2003, Section 8.

All dampers, whether it is an OBD or a butterfly valve, shall in all cases comply with requirements of SANS 1238, Section 6.5. The damper frames and blades shall be constructed of galvanised mild steel, assembled with galvanised bolts, nuts and washers. Extruded aluminium blades shall also be acceptable. Blades shall have a mill, anodized or epoxy powder finish. All volume control dampers shall have manually quadrant operation. Dampers shall be gear operated.

Dampers creating unacceptable vibrations and noise levels will be rejected and will need to be replaced at the Contractor’s expense.

30. NOISE AND SOUND ATTENUATION

The installation shall operate without causing undue noise and vibration. The contractor shall take the necessary precautions to ensure that noise levels in occupied areas do not exceed the levels specified below:

Environment	NC Level
Offices/Labs	35
Other	35

- Noise generating equipment such as fans, motors etc. shall be selected to operate as close to the point of maximum efficiency as possible. It is the responsibility of the mechanical contractor to check operating noise levels of equipment before bidding. Contractors offering equipment with low noise ratings may receive preference.

- Background noise levels shall be measured separately with the plant switched off and shall be deducted from the total measured sound pressure levels.

- Contractors are advised to calculate sound levels on the system offered before bidding. Where it is not possible to meet the specified sound levels due to the noise generated by the equipment, or due to inadequacies in the building structure, or the design of the plant, such deficiencies shall be stated in the bid together with the contractor's recommendations and cost implications.

- Where piping and ducting pass through walls or slabs, the opening around the pipe, duct or sound attenuator shall be sealed with high density fibreglass and galvanized flashing on both sides of the wall or slab. Shafts directly connected to plant rooms shall be considered as part of the plant room.

- Noise levels on the outside of buildings due to ventilation equipment shall not exceed the following values when measured at a distance of 10 m directly in front of the noise source (fan outlet, air grille, etc.) unless more stringent levels are called for in any bye-laws by local authorities such as municipalities etc.

Environment	NC Level
Buildings in city centers adjacent to or across roads to flats, hostels. hotels etc. with 24 hour plant operation:	35

- Equipment shall be provided with sound attenuators, enclosures, or sound attenuating cowls in order to meet the minimum sound levels specified above, if required.

- If the noise levels exceed the NC values specified above, the contractor shall be responsible to carry out all the necessary rectifications at his own expense. Noise readings outside the building shall preferably be taken at night when the background noise levels are low.

All fans shall be fitted with attenuators to reduce room noise levels.

Where attenuators are selected by the contractor, the attenuator shall be selected such that the pressure drop on both suction and discharge attenuators are minimized whilst meeting the noise level attenuation performance levels as required.

Where in-line axial flow fans are used, Donkin Silax or Silax-P or equally approved cylindrical attenuators shall be used. These attenuators shall have casings constructed from pre-galvanised steel sheet, glass fibre absorbing material and a 1.6 mm thick pre-galvanised wire mesh to retain the acoustic material. Where Silax-P attenuators are used, actuators shall have an acoustic pod constructed from pre-galvanised wire mesh and filled with fibre glass acoustic material. The acoustic material shall meet BS 476:Part 7, Class 1 spread of flame requirements.

31. AIR FILTERS

a. GENERAL

Air filters of the make, type and size as specified on the drawings shall be installed.

Filters installed close to exposed air inlets, shall be protected by means of weather louvres and wire mesh screens.

Filter holding frames shall be of approved manufacturer with standardized dimensions to enable replacement with equivalent filters of all recognized manufacturers.

Construction and manufacture of all components shall be such that under no circumstances any un-filtered air can by-pass filters or filter banks.

Sufficient space shall be allowed in front or behind filters, to enable inspection and servicing.

b. FILTER MEDIA

Washable filter media shall be fitted behind hinged return air grilles where indicated on the project drawings. The filter media shall be of the Peter McLeod PM 100 type or equally approved, 100 grams / m^2 density and 5 mm thick. The filter media shall be of the synthetic type and shall be capable of arresting lint of the return air. The filter media shall fit and extend past the outer perimeter of the wire mesh in the return air grille such that the bypass of unfiltered air is avoided. The filter media shall be fire proof. Glass fibre filter media type shall not be acceptable

c. FILTERS

All AHU units shall be fitted with a primary pleated filter, mounted at the location where indicated on the project drawings.

Frames and filters shall be constructed in such a manner that the passage of unfiltered air is prevented. Gaskets shall be provided between filters and filter holding frames to prevent the bypass of unfiltered air. Primary filters shall slide into the filter holding frame and shall easily be removed without the need to destruct the ductwork to which the filter holding frame is fixed.

Each filter bank shall be supplied with an identification label stating type of filters, quantity of filter elements, model numbers and all other information necessary for re-ordering filter material.

Filters shall be adequately protected against dirt during construction and shall not be operated until the system is thoroughly cleaned.

d. PRIMARY PLEATED FILTERS

Primary filters shall be of the 50 mm pleated washable panel type. The media shall be synthetic and shall be of the self-supporting type. The media shall fit into and extend to seal all round in the panel frame to ensure that no air bypasses the media. The filter outer panel frame shall be of galvanised steel.

All filter accessories including the channel filter holding frames and clips shall be standard products of the filter manufacturer. Filter holding frames shall be manufactured from galvanised steel. Filter holding frames shall be bolted or riveted together, where necessary, and shall be suitably reinforced in larger arrangements to withstand all possible operating conditions. An airtight seal shall be provided where filter holding frames are joined together. All metal parts shall be sufficiently protected against corrosion.

Primary filter panels shall fit into channel holding frames with sealing gaskets located between filter panel and channel holding frame. Where the channel holding frames are located on the downstream side of the filter, at least two spring loaded clips shall be used to ensure a positive seal against the edge gaskets and to keep filter panel in place. Where the channel holding frames are located at the upstream side of the filter, at least four spring loaded clips shall be used. All clips shall be from stainless steel.

The primary filter shall be of filtration class G3 / G4 have an average ASHRAE arrestance of 90 %, SABS tested. The dust holding capacity shall not be less than 150 g per square meter. The initial (clean) and final (dirty) resistance of the filter shall be 65 Pa and 250 Pa respectively. The above-mentioned features shall be based on a rated face velocity of 2.5 m/s.

Primary filters shall be of the 50 mm pleated washable panel type and be of the Peter McLeod Manufacture. The media shall be synthetic and shall be of the self-supporting type. The media shall fit into and extend to seal all round in the panel frame to ensure that no air bypasses the media. The filter outer panel frame shall be of galvanised steel.

All filter accessories including the channel filter holding frames and clips shall be standard products of the filter manufacturer. Filter holding frames shall be manufactured from galvanised steel. Filter holding frames shall be bolted or riveted together, where necessary, and shall be suitably reinforced in larger arrangements to withstand all possible operating conditions. An airtight seal shall be provided where filter holding frames are joined together. All metal parts shall be sufficiently protected against corrosion.

Primary filter panels shall fit into channel holding frames with sealing gaskets located between filter panel and channel holding frame. Where the channel holding frames are located on the downstream side of the filter, at least two spring loaded clips shall be used to ensure a positive seal against the edge gaskets and to keep filter panel in place. Where the channel holding frames are located at the upstream side of the filter, at least four spring loaded clips shall be used. All clips shall be from stainless steel.

e. SECONDARY BAG FILTERS

Filter media shall be self-supporting, leak-free and stable under all air-flow conditions. Filter depths less than 150mm will not be accepted.

Front frames shall be of aluminium, galvanized steel or reinforced high density hard polyurethane foam, with a continuous seal. Filters shall be of the disposable type. Slide-in type of arrangements will not be accepted for filters in this class.

Galvanized protection screens shall be fitted to match the airflow arrangement.

f. FILTER HOLDING FRAMES AND HOUSING BOXES

Filter holding frames shall be the manufacturer's standard product installed and used in accordance with his recommendations. Frames shall be manufactured from at least 16 gauge galvanized or epoxy powder coated steel.

Holding frames may be bolted or riveted together and shall be suitably reinforced in larger arrangements to withstand all possible operating conditions.

Fasteners shall be of the positive sealing type that clips in, with a minimum of four fasteners per filter. Fasteners shall match the particular filter, filter arrangement and frame.

Filter boxes shall be constructed and installed such that under no circumstances may any un-filtered air by-pass the filters. Boxes shall be sealed with silicone sealer at installation and filters shall be fitted with approved seals.

32. ELECTRICAL SUPPLY

The electricity supply to all mechanical equipment shall supplied with an isolator within 1m of 400V 50 Hertz 3 phase for the Chiller, AHUs, Humidifier units and 230V 50 Hertz 1 phase plus neutral for the supply air terminals and controls as indicated on the drawings and all equipment shall be selected to operate at the appropriate 3 & 1 phase voltages.

Generally the power to all the mechanical equipment shall be provided by the Electrical Contractor in isolator mounted within 1 m from the air conditioning unit. The Mechanical Contractor shall do the entire electrical

installation from the isolators to the outdoor and the indoor units for controls and termination points as required to complete the system functionality.

The entire electrical installation shall comply with:

- SANS 10142-1-2003: The wiring of premises Part 1: Low-voltage installations

On completion, the Contractor shall issue a compliance certificate for the entire electrical installation.

Electrical and control cables mounted between indoor and outdoor units shall be installed without joints in the cable and shall be of the UV protected type.

33. SCHEDULE OF PARTICULARS

This part of the specification shall be fully completed by the Tenderer. Failure to do so may invalidate the tender. Information not provided shall imply that the equipment offered complies with the specifications, written or implied.

The Engineer has the right to order removal and replacement of any equipment not conforming to the written or implied specifications.

The Contractor shall ensure that all performance specifications can be verified on request. Verification may include physical tests which the Contractor shall then do at his own cost

All performance specifications shall be provided at the site conditions.

a. Equipment

Unit Identification					
- Identification Number		AHU1	AHU2	AHU3	CHILLER
- Area Name					
Cooling Coil					
- Total Cooling Capacity	kW				
- Sensible Cooling Capacity	kW				
- Maximum Face Velocity	m/s				
- Chilled Water Flow Rate	ℓ/s				
- Chilled Water Supply Temperature	ºC				
- Chilled Water ΔT	K				
- Material (tubes/fins)					
Electrical Heating					
- Electrical Heater Element	kW				
- Steps					
Humidifier					
- Type					
- Efficiency	%				
- Maximum Face Velocity	m/s				
- Flowrate	kg/hr				
Supply Air Fan					
- Maximum Air Flow Rate	ℓ/s				
- Fresh Air (Minimum air flow rate)	ℓ/s				
- External Static Pressure	Pa				
- Variable Speed Drive					
Filters					
- Efficiency	%				
- Arrestance	%				
- Maximum Face Velocity	m/s				
- Primary Filter					
- Secondary Filter					
Power Supply					
- Volt / phase / frequency	V/Ø/Hz				
- Power Factor (min)	%				
Equipment Absorbed Power at Design Conditions					
- Summer	kW				
- Winter	kW				

PRIMARY CHILLED WATER PUMPS P1 & P2		
DESCRIPTION	SPECIFIED	OFFERED
Model		
Make		
Water Flow (l/s)	5.5 l/s	
Head (m)		
Power Consumption (kW)	2.2kW	
No.Off	2	

b. FILTERS

DESCRIPTION	UNIT	FB1
Make / manufacturer		
Model no.		
Type		
Size	mm	
Air flow	l/s	
Pressure loss	Pa	
Finish		
Other		

c. SUPPLY AIR GRILLES

DESCRIPTION	UNIT	SAG1	SAG2
Make / manufacturer			
Model no.			
Type			
Size	mm		
Air flow	l/s		
Pressure loss	Pa		
Finish			
Heaters	kW		
Other			

d. EXTERNAL LOUVRE

DESCRIPTION	UNIT	WL1
Make / manufacturer		
Model no.		
Type		
Size	mm	
Air flow	l/s	
Pressure loss	Pa	
Finish		
Other		

e. RETURN AIR GRILLE

DESCRIPTION	UNIT	RA 1
Make / manufacturer		
Model no.		
Type		
Size	mm	
Air flow	l/s	
Pressure loss	Pa	
Finish		
Other		

f. HEATER BANKS

DESCRIPTION	UNIT	HB 1	HB 2
Make / manufacturer			
Model no.			
Type			
Size	mm		
Air flow	l/s		
Pressure loss	Pa		
Power	kW		
Finish			
Other			

34. CHEDULE OF QUANTITIES

a. GENERAL

The quantities set out in the Schedule of Quantities are to be read in conjunction with the project specifications and drawings.

Unless otherwise stated, items are measured net in accordance with the drawings, and no allowance is made for waste.

The quantities set out in the Schedule of Quantities are the estimated quantities of the Contract Works, but the Contractor will be required to undertake whatever quantities may be directed by the Engineer from time to time. The Contract Price for the completed contract shall be computed from the actual quantities of work done, valued at the relevant unit rates and prices.

The prices and rates to be inserted in the Schedule of Quantities are to be the full inclusive prices for the work described under the several items. Such prices and rates shall cover all costs and expenses that may be required in and for the execution of the work described, and shall cover the cost of all general risks, liabilities, and obligations set forth or implied in the documents on which the bid is based, as well as overhead charges and profit. Reasonable prices shall be inserted as these will be used as a basis for assessment of payment for additional work that may have to be carried out. Prices and rates shall include all profit and the Main Contractor's attendance/profit.

A price or rate is to be entered against each item in the Schedule of Quantities, whether the quantities are stated or not. An item against which no price is entered will be considered to be covered by the other prices or rates in the Schedule.

Except where rates only are required, the Bidder shall insert all amounts to be included in his total bid price in the "Amount" column and show the corresponding total bid price.

NOT INCLUDED IN THIS DOCUMENT

This entire specification and Bills of Quantities shall be read in conjunction with the Mechanical General Technical Specification of the NMISA, which is available on request.

= END OF SPECIFICATION =

TENDER DOCUMENT

PROCUREMENT OF A COMPLETE HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) SYSTEM AT GROUND FLOOR AND FIRST FLOOR OF BUILDING 4E (WEST WING) INCLUDING INSTALLATION AND COMMISSIONING

ELECTRICAL POWER SUPPLY SPECIFICATIONS

QUANTUM BUILT AND ENVIRONMENT CONSULTANTS (PTY) LTD

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PART B: ELECTRICAL WORK

NOTICE TO TENDERERS

1. The tenderer for the principal contract shall submit additional information regarding the installer of the Electrical Installation together with the returnable enclosed with the tender enquiry documents
2. The Contractor, on acceptance of his tender for the principal contract shall submit within the period stated, the information indicated on the forms following immediately after the Summary of the Bills Of Quantities for this installation.

SPECIFICATION FOR ELECTRICAL WORK

PART 1 - GENERAL

CONTENTS

PART 1 - GENERAL

1 TESTS

After completion of the works and before practical completion is achieved, a full test will be carried out on the installation for a period of sufficient duration to determine the satisfactory working thereof. During this period the installations will be inspected and the Contractor shall make good, to the satisfaction of the Principle Agent/Electrical Engineer or the employer, any defects which may arise.

The Contractor shall provide all instruments and equipment required for testing and any water, power and fuel required for the commissioning and testing of the installations at completion.

2 MAINTENANCE OF INSTALLATIONS

With effect from the date of the Practical completion Certificate the Contractor shall at his own expense undertake the regular servicing of the installation during the maintenance period and shall make all adjustments necessary for the correct operation thereof.

If during the said period the installations is not in working order for any reason for which the Contractor is responsible, or if the installations develops defects, he shall immediately upon being notified thereof take steps to remedy the defects and make any necessary adjustments.

Should such stoppages however be so frequent as to become troublesome, or should the installations otherwise prove unsatisfactory during the said period the Contractor shall, if called upon by the Principle Agent/Electrical Engineer or the Employer, at his own expense replace the whole of the installations or such parts thereof as the Principal Agent/Electrical Engineer or the Employer may deem necessary with apparatus specified by the Principal Agent/Electrical Engineer or the Employer.

3 REGULATIONS

The installation shall be erected and tested in accordance with the Acts and Regulations as indicated in the scope of works

4 NOTICES AND FEES

The Contractor shall give all notices required by and pay all necessary fees, including any inspection fees, which may be due to the local Supply Authority.

On production of the official account, only the net amount of the fee charged by the Supply Authority for connection of the installation to the supply mains, will be refunded to the Contractor by the Employer.

5 SCHEDULE OF FITTINGS

In all instances where schedule of light, socket outlet and power points are attached to or included on the drawings, these schedules are to be regarded as forming part of the specification.

6 QUALITY OF MATERIALS

Only materials of first class quality shall be used and all materials shall be subject to the approval of the Employer. Departmental specifications for various materials to be used on this Contract are attached to and form part of this specification.

Wherever applicable the material is to comply with the relevant South African Bureau of Standards, specifications, or to IEC Specifications, where no SANS Specifications exist.

Materials wherever possible, must be of South African manufacture.

7 CONDUIT AND ACCESSORIES

The type of conduit and accessories required for the service, i.e. whether the conduit and accessories shall be of the screwed type, plain-end type or of the non-metallic type and whether metallic conduit shall be black enamelled or galvanised, is specified in Part 2 of this specification.

Unless other methods of installation are specified for certain circuits, the installation shall be in conduit throughout. No open wiring in roof spaces or elsewhere will be permitted.

The conduit and conduit accessories shall comply fully with the applicable SANS specifications as set out below and the conduit shall bear the mark of approval of the South African Bureau of Standards.

a) Screwed metallic conduit and accessories: SANS 61386-1 and 21.

b) Plain-end metallic conduit and accessories: SANS 61386-1 and 21.

c) Non-metallic conduit and accessories: SANS 61386-1 and 21.

All conduit fittings except couplings, shall be of the inspection type. Where cast metal conduit accessories are used, these shall be of malleable iron. Zinc base fittings will not be allowed.

Bushes used for metallic conduit shall be brass and shall be provided in addition to locknuts at all points where the conduit terminates at switchboards, switch-boxes, draw-boxes, etc.

Draw-boxes are to be provided in accordance with the "Wiring Code" and wherever necessary to facilitate easy wiring.

For light and socket outlet circuits, the conduit used shall have an external diameter of 20mm. In all other instances the sizes of conduit shall be in accordance with the "Wiring Code" for the specified number and size of conductors, unless otherwise directed in part 2 of this specification or indicated on the drawings.

Only one manufactured type of conduit and conduit accessories will be permitted throughout the installation.

Running joints in screwed conduit are to be avoided as far as possible and all conduit systems shall be set or bent to the required angles. The use of normal bends must be kept to a minimum with exception of larger diameter conduits where the use of such bends is essential.

All metallic conduit shall be manufactured of mild steel with a minimum thickness of 1,2mm for plain-end conduit and 1,6mm in respect of screwed conduit.

Under no circumstances will conduit having a wall thickness of less than 1,6mm be allowed in screed laid on top of concrete slabs**.**

Bending and setting of conduit must be done with special bending apparatus manufactured for the purpose and which are obtainable from the manufacturers of the conduit systems. Damage to conduit resulting from the use of incorrect bending apparatus or methods applied must on indication by the Department's inspectorate staff, be completely removed and rectified and any wiring already drawn into such damaged conduits must be completely renewed at the Contractor's expense.

Conduit and conduit accessories used for flame-proof or explosion proof installations and for the suspension of luminaires as well as all load bearing conduit shall in all instances be of the metallic screwed type.

All conduit and accessories used in areas within 50 km of the coast shall be galvanised to SANS 32 and SANS 121.

Tenderers must ensure that general approval of the proposed conduit system to be used is obtained from the local electricity supply authority prior to the submission of their tender. Under no circumstances will consideration be given by the Department to any claim submitted by the Contractor, which may result from a lack of knowledge in regard to the supply authority's requirements.

8 CONDUIT IN ROOF SPACES

Conduit in roof spaces shall be installed parallel or at right angles to the roof members and shall be secured at intervals not exceeding 1,5m by means of saddles screwed to the roof timbers.

Nail or crampets will not be allowed.

Where non-metallic conduit has been specified for a particular service, the conduit shall be supported and fixed with saddles with a maximum spacing of 450 mm. The Contractor shall supply and install all additional supporting timbers in the roof space as required.

Under flat roofs, in false ceilings or where there is less than 0,9m of clearance, or should the ceilings be insulated with glass wool or other insulating material, the conduit shall be installed in such a manner as to allow for all wiring to be executed from below the ceilings.

Conduit runs from distribution boards shall, where possible terminate in fabricated sheet steel draw-boxes installed directly above or in close proximity to the boards.

9 SURFACE MOUNTED CONDUIT

Wherever possible, the conduit installation is to be concealed in the building work; however, where unavoidable or otherwise specified under Part 2 of the specification, conduit installed on the surface must be plumbed or levelled and only straight lengths shall be used.

The use of inspection bends is to be avoided and instead the conduit shall be set uniformly and inspection coupling used where necessary.

No threads will be permitted to show when the conduit installation is complete, except where running couplings have been employed.

Running couplings are only to be used where unavoidable, and shall be fitted with a sliced couplings as a lock nut.

Conduit is to be run on approved spaced saddles rigidly secured to the walls.

Alternatively, fittings, tees, boxes, couplings etc., are to be cut into the surface to allow the conduit to fit flush against the surface. Conduit is to be bedded into any wall irregularities to avoid gaps between the surface and the conduit.

Crossing of conduits is to be avoided, however, should it be necessary purpose-made metal boxes are to be provided at the junction. The finish of the boxes and positioning shall be in keeping with the general layout.

Where several conduits are installed side by side, they shall be evenly spaced and grouped under one purpose-made saddle.

Distribution boards, draw-boxes, industrial switches and socket outlets etc., shall be neatly recessed into the surface to avoid double sets.

In situations where there are no ceilings the conduits are to be run along the wall plates and the beams.

Painting of surface conduit shall match the colour of the adjacent wall finishes.

Only approved plugging materials such as aluminium inserts, fibre plugs, plastic plugs, etc., and round-head screws shall be used for fixing saddles, switches, socket outlets, etc., to walls, wood plugs and the plugging in joints in brick walls are not acceptable.

10 CONDUIT IN CONCRETE SLABS

In order not to delay building operations the Contractor must ensure that all conduits and other electrical equipment which are to be cast in the concrete columns and slabs are installed in good time.

The Contractor shall have a representative in attendance at all times when the casting of concrete takes place.

Draw-boxes, expansion joint boxes and round conduit boxes are to be provided where necessary. Sharp bends of any nature will not be allowed in concrete slabs.

Draw and/or inspection boxes shall be grouped under one common cover plate, and must preferable be installed in passages or male toilets.

All boxes, etc., are to be securely fixed to the shuttering to prevent displacement when concrete is cast. The conduit shall be supported and secured at regular intervals and installed as close as possible to the neutral axis of concrete slabs and/or beams.

Before any concrete slabs are cast, all conduit droppers to switchboards shall be neatly spaced and rigidly fixed.

11 FLEXIBLE CONNECTIONS FOR CONNECTING UP OF STOVES, MACHINES, ETC.

Flexible tubing connections shall be of galvanised steel construction, and in damp situations of the plastic sheathed galvanised steel type. Other types may only be used subject to the prior approval of the Department's site electrical representative.

Connectors for coupling onto the flexible tubing shall be of the gland or screw-in types, manufactured of either brass or cadmium or zinc plated mild steel, and the connectors after having been fixed onto the tubing, shall be durable and mechanically sound.

Aluminium and zinc alloy connectors will not be acceptable.

12 WIRING:

Except where otherwise specified in Part 2 of this specification, wiring shall be carried out in conduit throughout. Only one circuit per conduit will be permitted.

No wiring shall be drawn into conduit until the conduit installation has been completed and all conduit ends provided with bushes. All conduits to be clear of moisture and debris before wiring is commenced.

Unless otherwise specified in Part 2 of this specification or indicated on the service drawings, the wiring of the installation shall be carried out in accordance with the "Wiring Code". Further to the requirements concerning the installation of earth conductors to certain light points as set out in the "Wiring Code", it is a specific requirement of this document that where plain-end metallic conduit or non-metallic conduit has been used, earth conductors must be provided and drawn into the conduit with the main conductors to all points, including all luminaires and switches throughout the installation.

Wiring for lighting circuits is to be carried out with 2,5mm² conductors and a 2.5mm²-earth conductor. For socket outlet circuits the wiring shall comprise 4mm² conductors and a 2,5mm²-earth conductor. In certain instances, as will be directed in Part 2 of this specification, the sizes of the aforementioned conductors may be increased for specified circuits. Sizes of conductors to be drawn into conduit in all other instances, such as feeders to distribution boards, power points etc., shall be as specified elsewhere in this specification or indicated on the drawings. Sizes of conductors not specified must be determined in accordance with the "Wiring Code".

The loop-in system shall be followed throughout, and no joints of any description will be permitted.

The wiring shall be done in PVC insulated 600/1000 V grade cable to SANS 1507.

Where cable ends connect onto switches, luminaires etc., the end strands must be neatly and tightly twisted together and firmly secured. Cutting away of wire strands of any cable will not be allowed.

13 SWITCHES AND SOCKET OUTLETS

All switches and switch-socket outlet combination units shall conform to the Department Quality Specifications, which form part of this specification.

No other than 16 A 3 pin sockets are to be used, unless other special purpose types are distinctly specified or shown on the drawings.

All light switches shall be installed at 1,4m above finished floor level and all socket outlets as directed in the Schedule of Fittings which forms part of this specification or alternatively the height of socket outlets may be indicated on the drawings.

14 SWITCHGEAR

Switchgear, which includes circuit breakers, iron-clad switches, interlocked switch-socket outlet units, contactors, time switches, etc., is to be in accordance with the Departmental Quality Specifications which form part of this specification and shall be equal and similar in quality to such brands as may be specified.

For uniform appearance of switchboards, only one approved make of each of the different classes of switchgear mentioned in the Quality Specifications shall be used throughout the installations.

15 SWITCHBOARDS

All boards shall be in accordance with the types as specified, be constructed according to the detail or type drawings and must be approved by the Employer before installation.

In all instances where provision is to be made on boards for the supply authority's main switch and/or metering equipment the contractor must ensure that all requirements of the authorities concerned in this respect are met.

Any construction or standard type aboard proposed, as an alternative to that specified must have the prior approval of the Employer.

All busbars, wiring, terminals, etc., are to be adequately insulated and all wiring is to enter the switchgear from the back of the board. The switchgear shall be mounted within the boards to give a flush front panel. Cable and boxes and other ancillary equipment must be provided where required.

Clearly engraved labels are to be mounted on or below every switch. The working of the labels in English, is to be according to the lay-out drawings or as directed by the Electrical Engineer and must be confirmed on site. Flush mounted boards to be installed with the top of the board 2,0m above the finished floor level.

16 WORKMANSHIP AND STAFF

Except in the case of electrical installations supplied by a single-phase electricity supply at the point of supply, an accredited person shall exercise general control over all electrical installation work being carried out.

The workmanship shall be of the highest grade and to the satisfaction of the Employer.

All inferior work shall, on indication by the Employer's inspecting officers, immediately be removed and rectified by and at the expense of the Contractor.

17 VERIFICATION AND CERTIFICATION OF ELECTRICAL INSTALLATION (CERTIFICATE OF COMPLIANCE AND TEST REPORT

On completion of the service, a certificate of compliance must be issued to the Principal Agent/Electrical Engineer or Employer in terms of the Occupational Health and Safety Act, 1993 (Act 85 of 1993) in the format as set out in SANS 10142-1 & 2.

18 EARTHING OF INSTALLATION

18.1 MAIN EARTHING

The type of main earthing must be as required by the supply authority if other than the Employer, and in any event as directed by the Principal Agent/Electrical Engineer, who may require additional earthing to meet test standards.

Where required an earth mat shall be provided, the minimum size, unless otherwise specified, being 1,0m x 1,0m and consisting of 4mm diameter hard-drawn bare copper wires at 250mm centres, brazed at all intersections.

Alternatively or additionally earth rods or trench earths may be required as specified or directed by the Electrical Engineer.

Installations shall be effectively earthed in accordance with the "Wiring Code" and to the requirements of the supply authority. All earth conductors shall be stranded copper with or without green PVC installation.

Connection from the main earth bar on the main board must be made to the cold water main, the incoming service earth conductor, if any and the earth mat or other local electrode by means of 12mm x 1,60 mm solid copper strapping or 16 mm^2 stranded (not solid) bare copper wire or such conductor as the Department's representative may direct. Main earth copper strapping where installed below 3m from ground level, must be run in 20 mm diameter conduit securely fixed to the walls.

All other hot and cold water pipes shall be connected with 12mm x 0,8mm perforated for solid copper

strapping (not conductors) to the nearest switchboard. The strapping shall be fixed to the pipework with brass nuts and bolts and against walls with brass screws at 150-mm centres. In all cases where metal water pipes, down pipes, flues, etc., are positioned within 1,6m of switchboards an earth connection consisting of copper strapping shall be installed between the pipework and the board. In vertical building ducts accommodating both metal water pipes and electrical cables, all the pipes shall be earthed at each distribution board.

18.2 ROOFS, GUTTERS AND DOWN PIPES

Where service connections consist of overhead conductors, all metal parts of roofs, gutters and down pipes shall be earthed. One bare 10mm² copper conductor shall be installed over the full length of the ceiling void, fixed to the top purlin and connected to the main earth conductor and each switchboard. The roof and gutters shall be connected at 15m intervals to this conductor by means of 12mm X 0,8mm copper strapping (not conductors) and galvanised bolts and nuts. Self-tapping screws are not acceptable. Where service connections consist of underground supplies, the above requirements are not applicable.

18.3 SUB-DISTRIBUTION BOARDS

A separate earth connection shall be supplied between the earth busbar in each sub-distribution board and the earth busbar in the Main Switchboard. These connections shall consist of a bare or insulated stranded copper conductors installed along the same routes as the supply cables or in the same conduit as the supply conductors. Alternatively armoured cables with earth continuity conductors included in the armouring may be utilised where specified or approved.

18.4 SUB-CIRCUITS

The earth conductors of fall sub-circuits shall be connected to the earth busbar in the supply board in accordance with SANS 10142.

18.5 RING MAINS

Common earth conductors may be used where various circuits are installed in the same wire way in accordance with SANS 10142. In such instances the sizes of earth conductors shall be equivalent to that of the largest current carrying conductor installed in the wire way, alternatively the size of the conductor shall be as directed by the Engineer. Earth conductors for individual circuits branching from the ring main shall by connected to the common earth conductor with T-ferrules or soldered. The common earth shall not be broken.

18.6 NON-METALLIC CONDUIT

Where non-metallic conduit is specified or allowed, the installation shall comply with the Department's standard quality specification for "conduit and conduit accessories".

Standard copper earth conductors shall be installed in the conduits and fixed securely to all metal appliances and equipment, including metal switch boxes, socket-outlet boxes, draw-boxes, switchboards, luminaires, etc. The securing of earth conductors by means of self-threading screws will not be permitted.

18.7 FLEXIBLE CONDUIT

An earth conductor shall be installed in all non-metal flexible conduit. This earth conductor shall not be installed externally to the flexible conduit but within the conduit with the other conductors. The earth conductor shall be connected to the earth terminals at both ends of the circuit.

18.8 CONNECTION

Under no circumstances shall any connection points, bolts, screws, etc., used for earthing be utilised for any other purpose. It will be the responsibility of the Contractor to supply and fit earth terminals or clamps on equipment and materials that must be earthed where these are not provided.

Unless earth conductors are connected to proper terminals, the end shall be tinned and lugged.

19 MOUNTING AND POSITIONING OF LUMINAIRES

The Contractor is to note that in the case of board and acoustic tile ceilings, i.e. as opposed to concrete

slabs, close co-operation with the building contractor is necessary to ensure that as far as possible the luminaires are symmetrically positioned with regard to the ceiling pattern.

The layout of the luminaires as indicated on the drawings must be adhered to as far as possible and must be confirmed with the Department's representative.

Fluorescent luminaires installed against concrete ceilings shall be screwed to the outlet boxes and in addition 2 x 6mm expansion or other approved type fixing bolts are to be provided. The bolts are to be ¾ of the length of the luminaires apart.

Fluorescent luminaires to be mounted on board ceilings shall be secured by means of two 40mm x No. 10 round head screws and washers. The luminaires shall also be bonded to the circuit conduit by means of locknuts and brass bushes. The fixing screws are to be placed ¾ of the length of the fitting apart.

Earth conductors must be drawn in with the circuit wiring and connected to the earthing terminal of all fluorescent luminaires as well as other luminaires exposed to the weather in accordance with the "Wiring Code".

Incandescent luminaires are to be screwed directly to outlet boxes in concrete slabs. Against board ceilings the luminaires shall be secured to the brandering or joists by means of two 40mm x No. 8 round head screws.

PART 2: INSTALLATION DETAILS

CONTENTS

PART 2: INSTALLATION DETAILS

1 CABLE SLEEVE PIPES

Where cables cross under roadways, other services and where cables enter buildings, the cables shall be installed in earthenware or high-density polyethylene pipes.

The ends of all sleeves shall be sealed with a non-hardening watertight compound after the installation of cables. All sleeves intended for future use shall likewise be sealed.

2 NOTICES

The Contractor shall issue all notices and make the necessary arrangements with Supply Authorities, the Postmaster-General, and S.A. Transport Services, Provincial or National Road Authorities and other authorities as may be required with respect to the installation.

3 ELECTRICAL EQUIPMENT

All equipment and fittings supplied must be in accordance with the attached quality specification (Part 3 of this document), suitable for the relevant supply voltage, and frequency and must be approved by the Employers Electrical Engineer.

4 DRAWINGS

The drawings generally show the scope and extent of the proposed work and shall not be held as showing every minute detail of the work to be executed.

The position of power points, switches and light points that may be influenced by built-in furniture must be established on site, prior to these items being built in.

5 BALANCING OF LOAD

The Contractor is required to balance the load as equally as possible over the multiphase supply.

6 SERVICE CONDITIONS

All plant shall be designed for the climatic conditions appertaining to the service.

7 SWITCHES AND SOCKET OUTLETS

The installation of switches and socket outlets must conform to clause 13 of Part 1 of this specification.

8 LIGHT FITTINGS AND LAMPS

The installation and mounting of luminaires must conform to clause 19 of Part 1 of this specification.

All fittings to be supplied by the Contractor shall have the approval of the Employer.

The light fittings must be of the type specified in the Schedule of Light Fittings.

9 EARTHING AND BONDING

The Contractor will be responsible for all earthing and bonding of the building and installation. The earthing and bonding is to be carried out strictly as described in clause 18 of Part 1 of this specification and to the satisfaction of the Employer/s Electrical Engineer.

10 MAINTENANCE OF ELECTRICAL SUPPLY

All interruptions of the electrical supply that may be necessary for the execution of the work, will be subject to prior arrangement between the Contractor and the Client and the Employer's Electrical Engineer.

11 EXTENT OF WORK

The work covered by this contract comprises the complete electrical installation, in working order, as shown on the drawings and as per this specification, including the supply and installation of all fittings and also the installation of such equipment supplied by the Employer.

12 SUPPLY AND CONNECTION

The supply will be 400/231 Volt, 50Hz at the connection side.

The Contractor will be responsible for the supply and installation of all the relevant cables as listed in the Schedule of Cables and measured in the Bills of Quantities

13 CONDUIT AND WIRING

Conduit and conduit accessories shall be black enameled/galvanized screwed conduit or black enameled/galvanized plain end conduit in accordance with SANS 61386.

All conduits, regardless of the system employed, shall be installed strictly as described in the applicable paragraphs of clauses 4 to 8 of Part 1 of the specification. Wiring of the installation shall be carried out as directed in clause 9 part 1 of this specification.

Where plain end conduit is offered all switches and light fittings must be supplied with a permanent earth terminal for the connection of the earth wire.

Lugs held by switch fixing screws or self tapping screws will not be acceptable.

13.1 Telephone Installation (NOT APPLICABLE)

The Contractor shall allow for the complete installation of all conduits, outlet boxes, the communication service provider Distribution boards, sleeve pipes, etc., required for the telephone system as shown on the drawings.

The sizes of all telephone conduits are indicated on the drawings and must be installed in the floor slab. Galvanized steel draw-wires shall be installed in all conduits.

End boxes must consist of a 50mm x 100 mm x 100mm outlet box fitted with suitable blank cover plates, flush mounted 0,4m above floor level.

The communication service provider Distribution Board must consist of a 150mm x 600mm x 600mm metal box and hinged door with a 20mm thick wooden backboard. The board must be flush mounted, 1,37m above the floor.

13.2 Intercom Installation (NOT APPLICABLE)

The supply and installation of the intercom system is not included in this Contract.

The Contractor shall allow for the complete supply and installation of all conduits and outlet boxes required for the intercom installation as shown on the drawings.

The size of all conduits, boxes and mounting heights of the end boxes are indicated on the drawings. Galvanized steel draw-wires shall be installed in all conduits and the boxes fitted with suitable blank cover plates.

13.3 Power Trunking

The Contractor shall be responsible for the supply and installation of all power trunking complete with corner pieces, end pieces, junction pieces, supply conduits, cover plates and power outlets as specified and indicated on the drawings.

The power trunking must comply with SANS 61084. The Contractor must ensure that the power trunking is installed to satisfaction of the Employer's Electrical Engineer before commencing with the wiring of the power trunking.

14 POWER POINTS

Allow for the installation of power points and equipment as listed in the schedule, indicated on the drawings and described below:

14.1 Water Heaters

The supply, installation and plumbing work shall be the responsibility of the Mechanical Contractor.

The Electrical Contractor must electrically connect all water heaters as specified and listed in the Schedule of Power Points.

The Electrical Contractor must liaise with the Plumbing Contractor with regard to the method of mounting the water heater, water inlet and outlet, drainage valve as well as the electrical connection.

30Amp. 2-pole isolators, as indicated on drawings and Schedule of Power Points, to be used. The isolator shall be suitable for voltages of up to 250V. Isolators to conform fully to SANS 152 as amended. Microgap switches shall be capable of carrying rated current continuously and making and breaking of rated current. Connection will be by means of 2 x 6mm sq insulated conductors and 4mm sq BCEW from the indicated circuit to a 30Amp 2P Isolator.

30Amp. 3-pole isolators, as indicated on drawings and Schedule of Power Points, to be used. The isolator shall be suitable for voltages of up to 250V. Isolators to conform fully to SANS 152 as amended. Microgap switches shall be capable of carrying rated current continuously and making and breaking of rated current. Connection will be by means of 4 x 6mm sq insulated conductors and 4mm sq BCEW from the indicated circuit to a 30Amp 3P Isolator

60Amp. 3-pole isolators, as indicated on drawings and Schedule of Power Points, to be used. The isolator shall be suitable for voltages of up to 250V. Isolators to conform fully to SANS 152 as amended. Microgap switches shall be capable of carrying rated current continuously and making and breaking of rated current. Connection will be by means of 4 x 10mm sq insulated conductors and 6mm sq BCEW from the indicated circuit to a 60Amp 3P Isolator

14.2 Extractor Fans (Bathrooms)

The fans will be supplied and installed by the Mechanical Contractor. All fans will be connected by the Electrical Contractor. Extraction fan connections will be by means of 20mm conduit from the indicated extractor fan circuit to a 100 x 100mm flush mounted outlet box 300mm under the ceiling or at 2400mm where there is no ceiling.

30Amp. 2-pole isolators, as indicated on drawings and Schedule of Power Points, to be used. The isolator shall be suitable for voltages of up to 250V. Isolators to conform fully to SANS 152 as amended. Microgap switches shall be capable of carrying rated current continuously and making and breaking of rated current

Connection will 3 x 4mm sq insulated conductors to end in a 30Amp, 2-P isolator with red indication light on the switched cover plate. Install a 20mm ø conduit from the isolator to the fan and connect with same wiring as being fed.

14.3 Extractor Fans (Canopy)

The fans will be supplied and installed by the Mechanical Contractor. All fans will be connected by the Electrical Contractor. Extraction fan connections will be by means of 25mm conduit from the indicated extractor fan circuit to a 100 x 100mm flush mounted outlet box at the extractor fan motor.

Extraction fans will be by means of new 25mm conduit from the indicated circuit to a 30Amp 3P Isolator mounted inside a weatherproof 100 x 100mm outlet box within arm's reach of fan and to be connected to a 30A 3P DOL starter at 1400mm AFFL specified and indicated on the drawings.

Extraction fans connection will be by means of new 4 x 6mm sq insulated conductors and 4mm sq BCEW from the indicated circuit to a 30Amp 3P Isolator and to the 30A 3P DOL starter.

14.4 Air Conditioners

The supply, installation and plumbing work shall be the responsibility of the a/c contractor.

The electrical contractor must electrically connect all air conditioners as specified and listed

A 30Amp two-pole isolators, as indicated on the drawings and Schedule of Power Points, to be used. Triple pole isolator shall be rated 660V while two pole shall be suitable for voltages up to 250V. All isolators shall conform fully to SANS 152 as amended. Microgap switches shall be capable of carrying rated current continuously, making, and breaking of rated current.

Connection will be by means of 2 x 4mm sq insulated conductors and 2.5mm sq BCEW from the indicated circuit to a 30Amp 2P Isolator.

A 30Amp three pole isolators, as indicated on the drawings and Schedule of Power Points, to be used. Triple pole isolator shall be rated 660V while two pole shall be suitable for voltages up to 250V. All isolators shall conform fully to SANS 152 as amended. Microgap switches shall be capable of carrying rated current continuously, making, and breaking of rated current.

Connection will be by means of 4 x 6mm sq insulated conductors and 4mm sq BCEW from the indicated circuit to a 30Amp 3P Isolator.

14.4 Compressor (Comp)

Compressor will be by means of new 25mm conduit from the indicated circuit to a 20Amp 3P Isolator mounted inside a weatherproof 100 x 100mm outlet box within arm's reach of compressor as indicated on the drawings.

Compressor connection will be by means of new 4 x 6mm sq insulated conductors and 4mm sq BCEW from the indicated circuit to a 20Amp 3P Weatherproof Isolator

15 CABLES

The Contractor shall supply and completely install all distribution cables as indicated on the drawings, and listed in the Schedule of Cables.

The storage, transportation, handling and laying of the cables shall be according to first class practice, and the contractor shall have adequate and suitable equipment and labour to ensure that no damage is done to cables during such operations.

The cable-trenches shall be excavated to a depth of 0,9m deep below ground level and shall be 450mm wide for one to three cables, and the width shall be increased where more than three cables are laid together so that the cables may be placed at least two cable diameters apart throughout the run. The bottom of the trench shall be level and clean and the bottom and sites free from rocks or stones liable to cause damage to the cable.

The Contractor must take all necessary precautions to prevent the trenching work being in any way a hazard to the personnel and public and to safeguard all structures, roads, sewage works or other property on the site from any risk of subsidence and damage.

In the trenches the cables shall be laid on a 75mm thick bed of earth and be covered with a 150-mm layer of earth before the trench is filled in.

All joints in underground cables and terminations shall be made either by means of compound filled boxes according to the best established practice by competent cable jointers using first class materials or by means of approved epoxy-resin pressure type jointing kits. Epoxy-resign joints must be made entirely in accordance with the manufacturer's instructions and with materials stipulated in such instructions. Low tension PVCA cables are to be made off with sealing glands and materials designed for this purpose which must be of an approved make. Where cables are cut and not immediately made off, the ends are to be sealed without delay.

The laying of cables shall not be commenced until the trenches have been inspected and approved. The cable shall be removed from the drum in such a way that no twisting, tension or mechanical damage is caused and must be adequately supported at intervals during the whole operation. Particular care must be exercised where it is necessary to draw cables through pipes and ducts to avoid abrasion, elongation or distortion of any kind. The ends of such pipes and ducts shall be sealed to approval after drawing in of the cables.

Backfilling (after bedding) of the trenches is to be carried out with a proper grading of the material to ensure settling without voids, and the material is to be tamped down after the addition of every 150mm. The surface is to be made good as required.

On each completed section of the laid and jointed cable, the insulation resistance shall be tested to approval with an approved "Megger" type instrument of not less that 500 V for low tension cables.

Earth continuity conductors are to be run with all underground cables constituting part of a low tension distribution system. Such continuity conductors are to be stranded bare copper of a cross-sectional area equal to at least half that of one live conductor of the cable, but shall not be less than 4mm² or more than 70mm². A single earth wire may be used as earth continuity conductor for two or more cables run together, branch earth wires being brazed on where required.

15.1 LAYING, JOINTING AND MAKING OFF OF ELECTRICAL CABLES

[The requirements specified hereafter, are aimed essentially at high tension cable but are also valid for low tension cable, where applicable.]

1. The use of the term "Inspector", includes the engineer or inspector of the Department or an empowered person of the concerned supervising consulting engineer's firm.

2. No cable is to be laid before the cable trench is approved and the soil qualification of the excavation is agreed upon by the Contractor and inspector.

3. After the cable has been laid and before the cable trench is back-filled the inspector must ensure that the cable is properly bedded and that there is no undesirable material included in the bedding layer.

4. All cable jointing and the making off of the cables must only be carried out by qualified experienced cable jointers. Helpers of the jointers may not saw, strip, cut, solder, etc. The cable and other work undertaken by them must be carried out under the strict and constant supervision of the jointer.

5. Before the Contractor allows the jointer to commence with the jointing work or making off of the cable (making off is recognized as half a joint) he must take care and ensure:

5.1 That he has adequate and suitable material available to complete the joint properly and efficiently. Special attention must be given to ensure the cable ferrules and cable lugs are of tinned copper and of sufficient size. The length of the jointing lugs must be at least six times the diameter of the conductor,

5.2 That the joint pit is dry and that all loose stones and material are removed,

5.3 That the walls and banks of the joint pit are reasonable firm and free from loose material which can fall into the pit,

5.4 That the necessary coffer-dams or retaining walls are made to stop the flow of water into the joint pit,

5.5 That the joint pit is provided with suitable groundsheets so that the jointing work is carried out in clean conditions,

5.6 That the necessary tents or sails are installed over the joint pit to effectively avert unexpected rainfall and that sufficient light or lighting is provided,

5.7 That the necessary means are available to efficiently seal the jointing or cable end when an unexpected storm or cloudburst occurs, regardless of how far the work has progressed,

5.8 That the cables and other materials are dry, undamaged and in all respects are suitable for the joint work or making off,

5.9 That the heating of cable oil, cable compound, plumbers metal and solder is arranged that they are at the correct temperature when required so that the cable is not unnecessary exposed to the atmosphere and consequently the ingress of moisture (care must be taken of overheating)

Flow temperatures of cable oil and compound must be determined with suitable thermometers**.** Cable oil and compound must not be heated to exceed the temperatures given on the containers and precaution must be taken to ensure that the tin is not overheated in one position. The whole mass must be evenly and proportionally heated.

(Temperatures of solder and plumbers metal may be tested with brown paper (testing time: 3 seconds). The paper must colour slightly - not black or burnt).

6. Before the paper-insulated cables are joined, they must be tested for the presence of moisture by the cable jointers test. This consists of the insertion of a piece of unhandled insulated impregnated paper tape in warm cable oil heated to a temperature of 130 ± 5°C.

   Froth on the surface of the oil is an indication that moisture is present in the impregnated insulation and the amount of the froth gives an indication of the moisture present.

7. If the cable contains moisture or is found to be otherwise unsuitable for jointing or making of the inspector is to be notified immediately and he will issue the necessary instruction to cope with the situation.

8. The joint or making off of paper insulated cables must not be commenced during rainy weather.

9. Once a joint is in progress the jointer must proceed with the joint until it is complete and before he leaves the site.

10. The jointer must ensure that the material and his tools are dry at all times, reasonably clean and absolutely free from soil.

11. Relating to the jointing of the cable the following requirements apply:

11.1 All jointing must be carried out in accordance with recognized and tried techniques and comply strictly with the instructions given by the supplier of the jointing kit.

11.2 The cables must be twisted by hand so that the cores can be joined according to the core numbers. If necessary the cable is to be exposed for a short distance to accomplish this. Under no circumstances may the cores in a joint be crossed so as to enable cores to be joined according to the core numbers. If it is not possible to twist the cables so that the preceding requirements can be met, then cores are to be joined in the normal way without any consideration of the core numbers.

11.3 Normally the cables will have profile conductors. The conductors shall be pinched with gas pliers to form a circular section, bound with binding wire so that they do not spread, and then tinned before jointing.

11.4 Jointing ferrules, the length of which are at least 6 times the diameter of the conductors, must be slid over the conductor ends to be joined and pinched tightly. Then they are soldered by means of the ladle process whilst being pinched further closed.

Use resin only as a flux. The slot opening in the ferrule must be completely filled, including all depressions.

Remove all superfluous metal with a cloth dipped in tallow. Work during the soldering process must be from top to bottom. Rub the ferrule smooth and clean with aluminium oxide tape after it has cooled down to ensure that there are not any sharp points or edges.

NB: The spaces between the conductor strands must be completely filled by soldering process and must be carried out quick enough to prevent the paper insulation from burning or drying out unnecessarily.

11.5 After the ferrules have been rubbed smooth and clean, they and the exposed cores must be treated with hot cable oil (110°C) to remove all dust and moisture. These parts are to be thoroughly basted with the oil.

11.6 The jointer must take care that his hands are dry and clean before the joint is insulated. Also the insulating tape which is to be used must first be immersed in warm cable oil (110°C) for a sufficient period to ensure that no moisture is present.

11.7 After the individual cores have been installed they must be well basted with hot cable oil and again after the applicable separator and/or belt insulation tape is applied before the lead joint sleeve is placed in position.

11.8 The lead joint sleeve must be thoroughly cleaned and prepared before it is placed on the cable and must be kept clean during the whole jointing process. Seal the filling apertures of the sleeve with tape until the sleeve is ready for compound filling.

11.9 The plumbing joints employed to solder the joint sleeve to the cable sheath, must be cooled off with tallow and the joint sleeve is to be filled with compound while it is still warm. Top up continuously until the joint is completely filled to compensate for the compound shrinkage.

11.10 The outer joint box must be clean and free from corrosion. After it has been placed in position it

must be slightly heated before being filled with compound. Top up until completely full.

12. As far as cable end boxes are concerned the requirements as set out above are valid where applicable.

16. DISTRIBUTION BOARDS

In addition to clause 14 and clause 15 of Part 1 of this specification the following shall also be applicable to switchboards required for this service.

The Contractor shall supply and install the distribution boards as indicated on the drawings and listed in the distribution Board Schedule. All distribution boards shall comply with the quality specification in Part 3 of this specification, and be approved by the Employer's Electrical Engineer.

The following types of distribution boards are required for the service:

BOARD	TYPE	PANEL	FAULT LEVEL	LOAD kVA
DB A1	Semi recessed mounted with lockable doors	Normal	15	242
DB A2	Semi recessed mounted with lockable doors	Normal	6	42

The latest Departmental Quality Specification Section for Distribution Boards must be adhere to by Part 3 of the specification.

17. MINIATURE SUBSTATION AND NETWORK

N/A

18. SCHEDULE OF LIGHT FITTINGS

N/A

19. SCHEDULE OF POWER POINTS

Refer to drawings

20. SCHEDULE OF CABLES, CONDUIT AND WIRING

Refer to drawings

21. SCHEDULE OF DISTRIBUTION BOARDS

The front panels of normal supply, standby power and no-break supply sections shall be painted in distinctive colours as follows:

Normal supply : Light Orange, colour B26 of SANS 1091.
Standby power : Signal Red, colour A11 of SANS 1091.
No-break supply: Dark Violet, colour F06 or Olive Green, Colour H05 of SANS 1091.

Indicated is the probable fault level rating (kA) of the busbars. Refer to the Summary of Switchgear and Circuits for the minimum fault level rating of specified equipment.

BOARD	TYPE	PANEL	FAULT LEVEL	LOAD kVA
DB A1	Semi recessed mounted with lockable doors	Normal	15	242
DB A2	Semi recessed mounted with lockable doors	Normal	6	42

22. SUMMARY OF SWITCHGEAR AND CIRCUITS

NOTE: ALL CIRCUIT BREAKERS MUST BE OF THE MAGNETIC HYDRAULIC TYPE AND NO THERMAL CIRCUIT BREAKERS WILL BE ALLOWED. ALL THE CIRCUIT BREAKERS MUST BE OF THE SAME TYPE OF RANGE. ALL CIRCUIT BREAKERS MUST BE MANUFACTURE AND ASSEMBLE AT SOUTH AFRICA, NO IMPORTS WILL BE ALLOWED.

22.1 Distribution Board DB A1

Refer to drawings

22.4 Distribution Board DB B

Refer to drawings

23. SCHEDULE OF POWER POINTS

Refer to drawings

24. LIGHTNING PROTECTION

N/a

NOT INCLUDED IN THIS DOCUMENT

THIS ENTIRE SPECIFICATION AND BILLS OF QUANTITIES SHALL BE READ IN CONJUNCTION WITH THE ELECTRICAL GENERAL TECHNICAL SPECIFICATION AND QUALITY SPECIFICATION OF THE DEPARTMENT, WHICH IS AVAILABLE ON REQUEST.

PART 4: ELECTRICAL WORK MATERIAL SCHEDULE

The Contractor shall complete the following schedules and submit them to the Electrical Engineer within 21 days of the date of the acceptance of the tender.

The schedules will be scrutinised by the Electrical Engineer and should any material offered not comply with the requirements contained in the specification, the Contractor will be required to supply material in accordance with the contract at no additional cost.

NB: **Only one manufacturer's name to be inserted for each item.**

Item	Material	Make or trade name	Country of origin
1.	Miniature substation		
2.	Distribution boards		
3.	Circuit breakers 1P, 2P, 3P		
4.	On load isolators without trips		
5.	Contactors 1P, 2P, 3P		
6.	Earth leakage relays 1 & 3 phase		
7.	H.R.C. fuse switches		
8.	Kilowatt hour meter		
9.	Current transformers		
10.	Voltmeter		
11.	Maximum demand ammeter		
12.	Daylight sensitive switch		
13.	Time switch		
14.	Conduit		
15.	Conduit boxes		
16.	Power skirting		
17.	Surface switches		
18.	Watertight switches		
19.	16A flush socket outlets		
20.	16A surface socket outlets		
21.	16A watertight socket outlets		
22.	PVCA cable		
23.	Cable trays		
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PARTICULARS OF ELECTRICAL CONTRACTOR

The electrical contractor to complete the info below and attach the certified documentation (ECB & ECA & DOL) to the electrical tender document. If the info is not complete and certified documentation not attach to the electrical tender, the tenderer to be disqualified and marked as non-responsive to the tender.

TENDER NO: _____ REFERENCE: _____

SERVICE: _____

NAME OF THE ELECTRICAL CONTRACTOR THREE PHASE REGISTER: _____

_____

ADDRESS _____

_____

CONTACT NUMBER: _____

ELECTRICAL CONTRACTOR'S REGISTRATION NUMBER AT THE ELECTRICAL CONTRACTING BOARD OF SOUTH AFRICA.

ECB NUMBER: _____

ELECTRICAL CONTRACTOR'S REGISTRATION NUMBER AT THE ELECTRICAL CONTRACTORS ASSOCIATION OF SOUTH AFRICA

ECA NUMBER: _____

ELECTRICAL CONTRACTOR'S REGISTRATION NUMBER AT THE DEPARTMENT OF LABOUR:

DOL NUMBER _____

THE QUALIFIED THREE PHASE ELECTRICIAN IS REQUIRED TO SUBMIT THE FOLLOWING COMPREHENSIVE INFO:

- Original tax clearance certificate
- VAT registration certificate
- Workmen's Compensation registration certificate (or proof of payment of contribution in terms of the COID Act no. 130 of 1993)
- Company / cc / Trust / Partnership registration certificate
- Certified copy of identity document staff on the project
- Certified academic and certified electrical certificate of the staff on the project.

_____ _____

DATE SIGNATURE OF TENDERER

PART 5:

DRW NO	SHORT DESCRIPTION
34387-311-01-A	Electrical Installation: Ground Layout
34387-311-02-A	Electrical Installation: First Floor Layout

TENDER DOCUMENT

PROCUREMENT OF A COMPLETE HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) SYSTEM AT GROUND FLOOR AND FIRST FLOOR OF BUILDING 4E (WEST WING) INCLUDING INSTALLATION AND COMMISSIONING

DRAWINGS

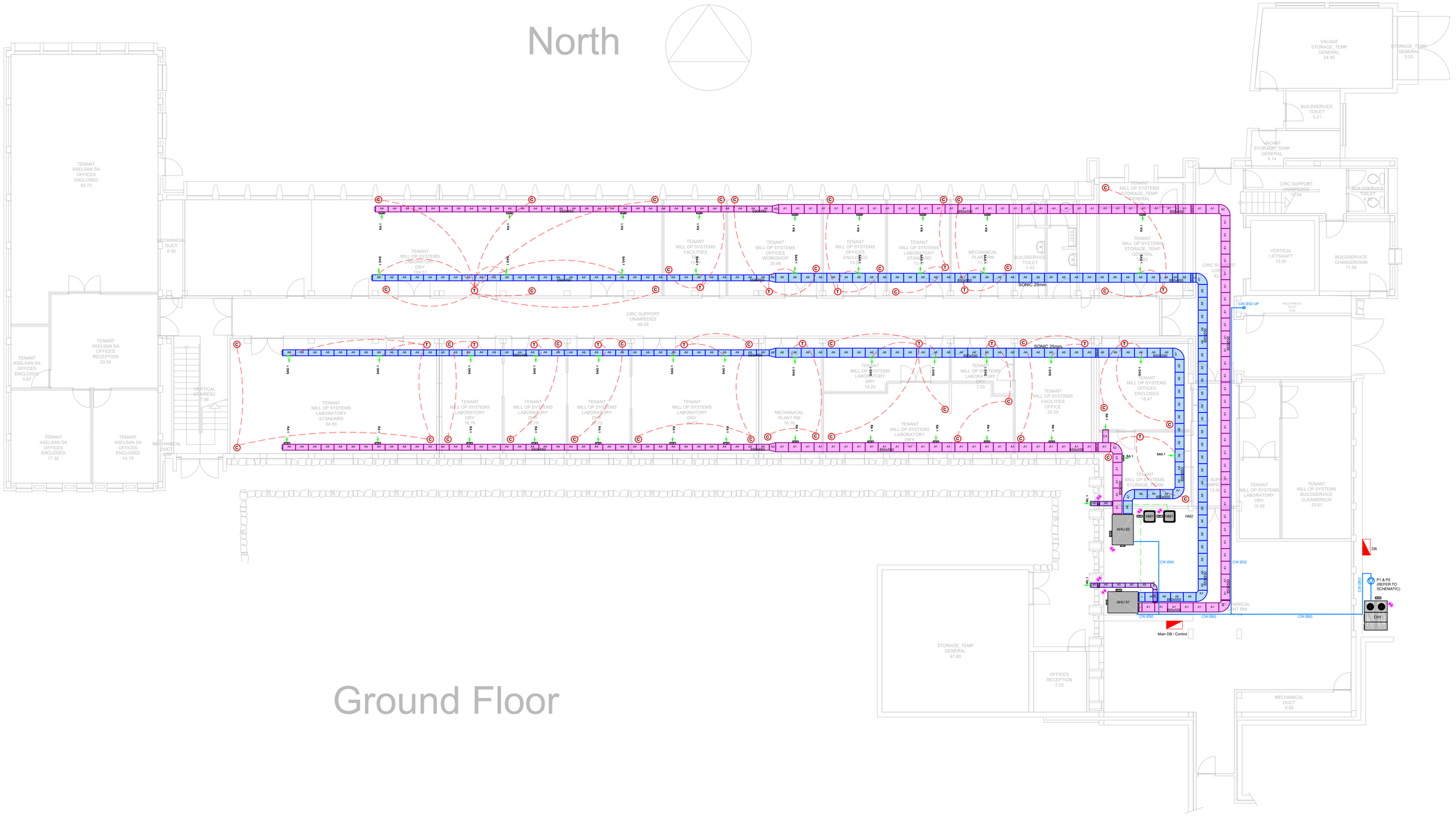
QUANTUM BUILT AND ENVIRONMENT CONSULTANTS (PTY) LTD

TENDER DOCUMENT

PROCUREMENT OF A COMPLETE HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) SYSTEM AT GROUND FLOOR AND FIRST FLOOR OF BUILDING 4E (WEST WING) INCLUDING INSTALLATION AND COMMISSIONING

MECHANICAL DRAWINGS

QUANTUM BUILT AND ENVIRONMENT CONSULTANTS (PTY) LTD



Ground Floor

Ducting Schedule

MARK	DESCRIPTION	SIZE	Count
A1	Straight Duct	850x550	104
A10	Bend 90°	400x400	1
A2	Bend 90°	850x550	3
A3	Equal Taper	850x550 > 550x450	2
A4	Straight Duct	550x450	69
A5	Straight Duct	400x400	8
A6	Straight Duct c/w 25mm Sonic	850x450	108
A7	Bend 90° c/w 25mm Sonic	850x550	5
A8	Equal Taper c/w 25mm Sonic	850x550 > 550x450	2
A9	Straight Duct c/w 25mm Sonic	550x450	69
C1	Endcap	550x450	2
C2	Spigot	400x400	2
C3	Endcap	550x450	2
C4	Plenum	550x300	22
FD 1	Fire Damper	850x450	2
FD 2	Fire Damper	850x550	2
HB1	Heater Bank 6kW c/w matching OBD and actuator (3 step)	400x400	2

Mechanical Equipment Schedule

MARK	DESCRIPTION	COOLING_BTU	HEATING_BTU	FLOW	POWER	PHASE	VOLTAGE	Count
AHU01	Air Handling Unit c/w Prime and Bag Filters	48.9kW	18kW	2220l/s	20kW	3	400V	1
AHU02	Air Handling Unit c/w Prime and Bag Filters	60kW	28kW	2630l/s	30kW	3	400V	1
CH1	Chiller - DC Scroll Inverter, two step	122kW			42kW	3	400V	1
HM1	Humidifier			25kg/h	18.75kW	3	400V	2
P1	Chilled Water Pump			5.5l/s	2.2kW	3	400V	1
P2	Chilled Water Pump			5.5l/s	2.2kW	3	400V	1

Aire Terminal Schedule

MARK	DESCRIPTION	SIZE	COLOUR	Count
WL 1	Hinged Weather Louvre c/w matching OBD	400x400	N/A	2
RA 1	Return Air Grille c/w OBD	500x250	N/A	23
SAG 1	Side Wall Variable Volume Diffuser c/w Matching OBD, actuator and Heater bank (2.5kW)	500x250	N/A	23

LEGEND	
T	TEMPERATURE SENSOR
MS	MOTION SENSOR
C	CONTROL SWITCH
	AC DRAIN LINE
	AC REFRIGERANT LINE
	1 PHASE
	3 PHASE
A6	SUPPLY AIR DUCT
A1	RETURN AIR DUCT

NOTES / LEGEND

CLIENT FILE NUMBER

-

REFERENCE DRAWINGS

NUMBER	REVISION	DRAWING DESCRIPTION

APPROVED BY COUNCIL / CLIENT

CITY ENGINEER / CLIENT — REG. NO. — DATE

AMENDMENTS CODE

A,B,C.../ : BEFORE TENDER
0 / : TENDER DRAWING
1,2,3.../ : AFTER TENDER
Z / : AS BUILT

/A : BY CLIENT
/B : BY ARCHITECT
/C : BY MECHANICAL OR ELECTRICAL
/D : BY BVi
/E : BY OTHER ( )

DATE	INITIAL	No./CODE	REVISION DESCRIPTION
2021.04.29	D.K	A/D	FOR INFORMATION

OFFICES

PROVINCE	OFFICE		E—MAIL
Gauteng	Pretoria	(012) 349-0099	pta@bvirsa.co.za
Free State	**Bloemfontein**	**(051) 447-2137**	**bfn@bvifs.co.za**
	Welkom	(057) 353-2499	wel@bvifs.co.za
Northern Cape	Upington	(054) 337-6600	upt@bvinc.co.za
	Springbok	(027) 712-3614	spk@bvinc.co.za
KwaZulu Natal	Durban	(031) 266-8382	dbn@bvikn.co.za
	Empangeni	(035) 792-1780	emp@bvikn.co.za
Eastern Cape	Port Elizabeth	(041) 373-4343	bviec@mweb.co.za
	Cradock	(048) 881-3344	cdk@bvifs.co.za
Western Cape	Cape Town	(021) 418-3935	cpt@bviwc.co.za

Visit or contact us online at www.bvigroup.co.za

CONSULTING ENGINEERS
Civil, Structural & Electrical Engineers. Environmental & Project Management
Registration no. 1998/000185/07

Bloemfontein
FREE STATE

CLIENT

nmisa
National Metrology Institute of South Africa

PROJECT

NMISA CAMPUS PRETORIA

DRAWING TITLE

MECHANICAL INSTALLATION HVAC GROUND LEVEL

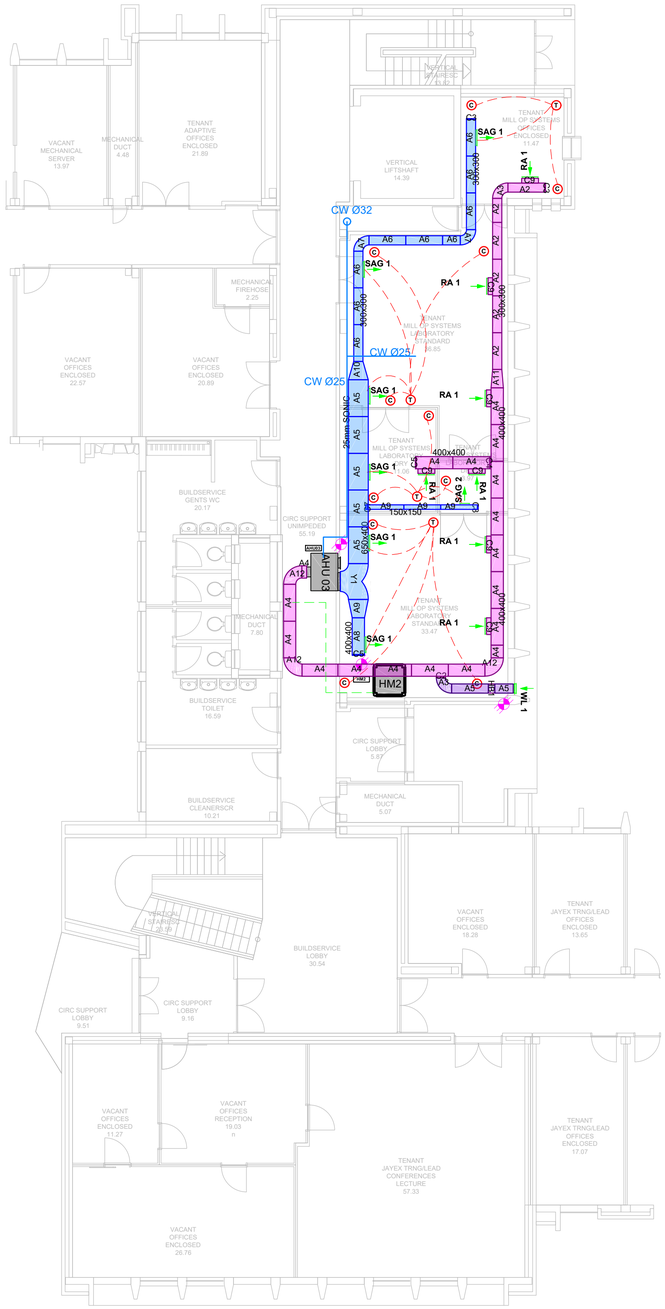
APPROVED BY BVi

D. Kapp — 201570070 — 29 April 2021
ENGINEER/TECHNOLOGIST — REG. NO. — DATE

SCALE	1:200	DRAWN	N.R
DESIGNED	D. Kapp	CHECKED	R.H

PLAN NUMBER	REVISION NO.	DATE SAVED
LAYERS USED: 343287-750-01	1	29 April 2021

North



First Floor

Mechanical Equipment Schedule

MARK	DESCRIPTION	COOLING_BTU	HEATING_BTU	FLOW	POWER	VOLTAGE	PHASE	Count
AHU03	Air Handling Unit c/w Prime and Bag Filters	17kW	9kW	1100l/s	11kW	400V	3	1
HM2	Humidifier			5kg/h	3.75kW	400V	3	1

Air Terminal Schedule

MARK	DESCRIPTION	SIZE	COLOUR	Count
RA 1	Return Air Grille c/w OBD	500x250	N/A	7
SAG 1	Side Wall Variable Volume Diffuser c/w Matching OBD, actuator and Heater bank (2.5kW)	500x250	N/A	6
SAG 2	Side Wall Variable Volume Diffuser c/w Matching OBD, actuator and Heater bank (2.5kW)	300x150	N/A	1
WL 1	Hinged Weather Louvre c/w matching OBD	300x300	N/A	1

Ducting Schedule

MARK	DESCRIPTION	SIZE	Count
A1	Straight Duct	200x550	1
A10	Equal Taper	650x400 > 300x300	1
A11	Equal Taper	400x400 > 300x300	1
A12	Bend 90°	400x400	3
A2	Straight Duct	300x300	6
A3	Bend 90°	300x300	2
A4	Straight Duct	400x400	18
A5	Straight Duct	400x400	2
A5	Straight Duct c/w 25mm Sonic	650x450	5
A6	Straight Duct c/w 25mm Sonic	200x450	1
A6	Straight Duct c/w 25mm Sonic	300x300	9
A7	Bend 90° c/w 25mm Sonic	300x300	2
A8	Straight Duct c/w 25mm Sonic	400x400	1
A9	Equal Taper	650x400 > 400x400	1
A9	Straight Duct c/w 25mm Sonic	150x150	3
C2	Spigot	300x300	1
C3	Endcap	300x300	2
C4	Spigot	400x400	1
C5	Endcap	400x400	2
C7	Spigot	150x150	1
C8	Endcap	150x150	1
C9	Plenum	550x300	7
HB1	Heater Bank 2.5kW c/w matching OBD and actuator (3 step)	300x300	1
Y1	Y Piece	650x400	1

LEGEND	
T	TEMPERATURE SENSOR
MS	MOTION SENSOR
C	CONTROL SWITCH
	AC DRAIN LINE
	AC REFRIGERANT LINE
	1 PHASE
	3 PHASE
A6	SUPPLY AIR DUCT
A1	RETURN AIR DUCT

NOTES / LEGEND

CLIENT FILE NUMBER

-

REFERENCE DRAWINGS

NUMBER	REVISION	DRAWING DESCRIPTION

APPROVED BY COUNCIL / CLIENT

CITY ENGINEER / CLIENT — REG. NO. — DATE

AMENDMENTS CODE

A,B,C.../ : BEFORE TENDER
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1,2,3.../ : AFTER TENDER
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DATE	INITIAL	No./CODE	REVISION DESCRIPTION
2021.04.29	D.K	A/D	FOR INFORMATION

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Registration no. 1998/000185/07

CLIENT

PROJECT

NMISA CAMPUS PRETORIA

DRAWING TITLE

MECHANICAL INSTALLATION HVAC FIRST LEVEL

APPROVED BY BVi

D. Kapp — 201570070 — 29 April 2021
ENGINEER/TECHNOLOGIST — REG. NO. — DATE

SCALE	1:100	DRAWN	N.R
DESIGNED	D. Kapp	CHECKED	R.H

PLAN NUMBER	REVISION NO.	DATE SAVED
LAYERS USED: 343287-750-02	1	29 April 2021

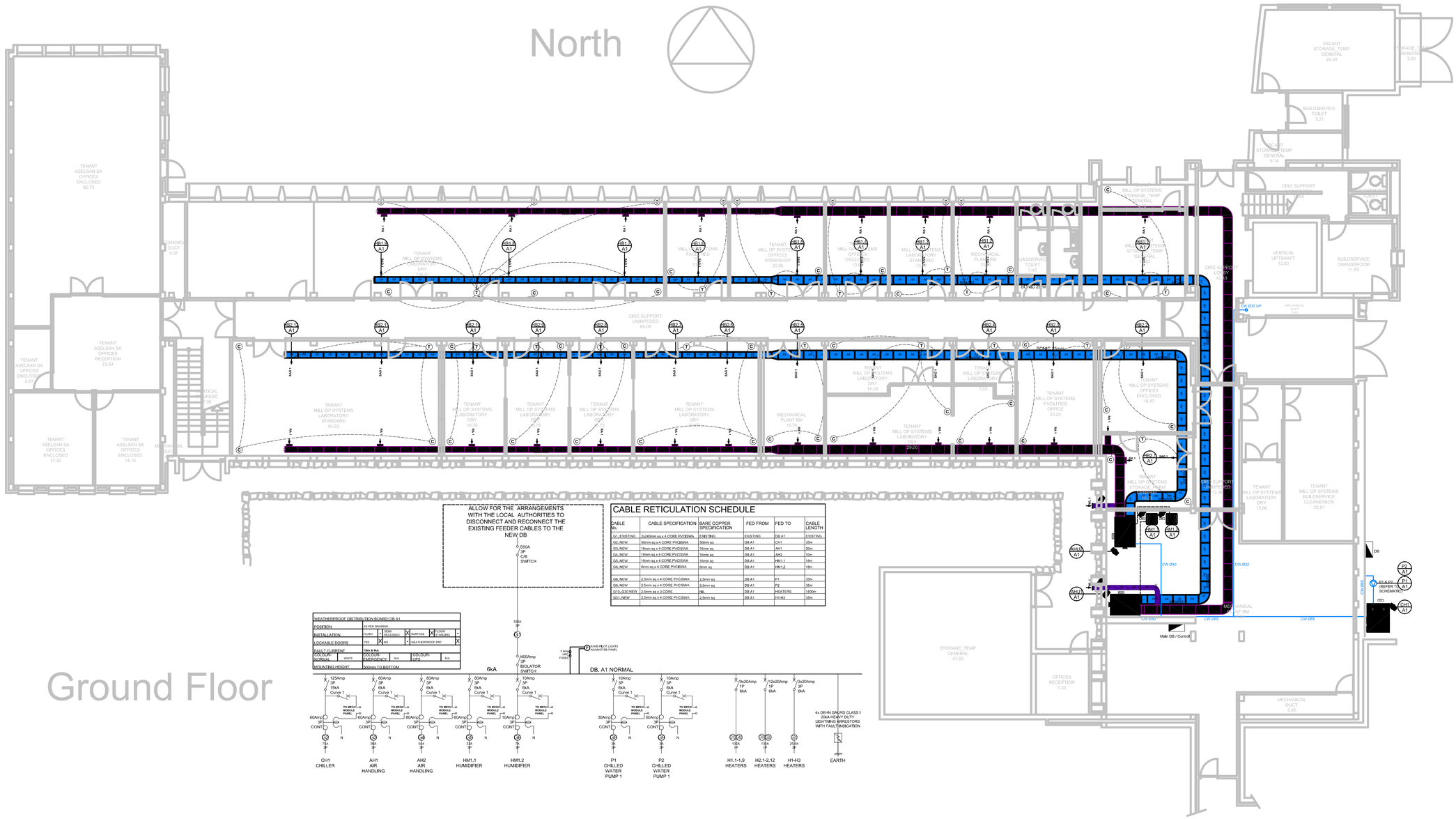
TENDER DOCUMENT

PROCUREMENT OF A COMPLETE HEATING, VENTILATION AND AIR-CONDITIONING (HVAC) SYSTEM AT GROUND FLOOR AND FIRST FLOOR OF BUILDING 4E (WEST WING) INCLUDING INSTALLATION AND COMMISSIONING

ELECTRICAL DRAWINGS

QUANTUM BUILT AND ENVIRONMENT CONSULTANTS (PTY) LTD

Ground Floor



ALLOW FOR THE ARRANGEMENTS WITH THE LOCAL AUTHORITIES TO DISCONNECT AND RECONNECT THE EXISTING FEEDER CABLES TO THE NEW DB

500A 3P C/B SWITCH

CABLE RETICULATION SCHEDULE

CABLE NO.	CABLE SPECIFICATION	BARE COPPER SPECIFICATION	FED FROM	FED TO	CABLE LENGTH
GS1, EXISTING	2x240mm sq x 4 CORE PVC/SWA	EXISTING	EXISTING	DB A1	EXISTING
GS, NEW	50mm sq x 4 CORE PVC/SWA	50mm sq	DB A1	CH1	35m
GS, NEW	16mm sq x 4 CORE PVC/SWA	16mm sq	DB A1	AH1	20m
GA, NEW	16mm sq x 4 CORE PVC/SWA	16mm sq	DB A1	AH2	10m
GS, NEW	16mm sq x 4 CORE PVC/SWA	16mm sq	DB A1	HM1.1	18m
G6, NEW	6mm sq x 4 CORE PVC/SWA	6mm sq	DB A1	HM1,2	18m
G8, NEW	2.5mm sq x 4 CORE PVC/SWA	2.5mm sq	DB A1	P1	35m
G8, NEW	2.5mm sq x 4 CORE PVC/SWA	2.5mm sq	DB A1	P2	35m
G10,-G30 NEW	2.5mm sq x 3 CORE	NIL	DB A1	HEATERS	1400m
G31, NEW	2.5mm sq x 4 CORE PVC/SWA	2.5mm sq	DB A1	H1-H3	35m

WEATHERPROOF DISTRIBUTION BOARD: DB A1

POSITION	AS PER DRAWING							
INSTALLATION	FLUSH	-	SEMI RECESSED	X	SURFACE	X	FLOOR STANDING	-
LOCKABLE DOORS	YES	X	NO	-	WEATHERPROOF IP67			X
FAULT CURRENT	10kA & 6kA							
COLOUR: NORMAL	WHITE		COLOUR: EMERGENCY	N/A		COLOUR: UPS	N/A	
MOUNTING HEIGHT	500mm TO BOTTOM							

320A 3P
400Amp 3P ISOLATOR SWITCH
6kA
5 Amp HRC FUSES
WHITE FLOT LIGHTS Actuated ON PANEL
DB. A1 NORMAL

125Amp 3P 15kA Curve 1	60Amp 3P CONT	F2 75A 3P	N	CH1 CHILLER
60Amp 3P 6kA Curve 1	60Amp 3P CONT	F3 36A 3P	N	AH1 AIR HANDLING
80Amp 3P 6kA Curve 1	80Amp 3P CONT	F4 54A 3P	N	AH2 AIR HANDLING
60Amp 3P 6kA Curve 1	60Amp 3P CONT	F5 33A 3P	N	HM1.1 HUMIDIFIER
10Amp 3P 6kA Curve 1	10Amp 3P CONT	F6 7A 3P	N	HM1.2 HUMIDIFIER
10Amp 3P 6kA Curve 1	30Amp 3P CONT	F8 3A 3P	N	P1 CHILLED WATER PUMP 1
10Amp 3P 6kA Curve 1	30Amp 3P CONT	F9 3A 3P	N	P2 CHILLED WATER PUMP 1
7kx20Amp 1P 6kA		F10 10A 1P		H1,1-1,9 HEATERS
12x20Amp 1P 6kA		F11 10A 1P		H2,1-2,12 HEATERS
7kx20Amp 3P 6kA		F12 25A 3P		H1-H3 HEATERS

4x DEHN GAV/RD CLASS I 20kA HEAVY DUTY LIGHTNING ARRESTORS WITH FAULT INDICATION

EARTH

Ducting Schedule

MARK	DESCRIPTION	SIZE	Count
A1	Straight Duct	850x550	104
A10	Bend 90°	400x400	1
A2	Bend 90°	850x550	3
A3	Equal Taper	850x550 > 550x450	2
A4	Straight Duct	550x450	69
A5	Straight Duct	400x400	8
A6	Straight Duct c/w 25mm Sonic	850x450	108
A7	Bend 90° c/w 25mm Sonic	850x550	5
A8	Equal Taper c/w 25mm Sonic	850x550 > 550x450	2
A9	Straight Duct c/w 25mm Sonic	550x450	69
C1	Endcap	550x450	2
C2	Splgot	400x400	2
C3	Endcap	550x450	2
C4	Plenum	550x300	22
FD 1	Fire Damper	850x450	2
FD 2	Fire Damper	850x550	2
HB1	Heater Bank 6kW c/w matching OBD and actuator (3 step)	400x400	2

Mechanical Equipment Schedule

MARK	DESCRIPTION	COOLING_BTU	HEATING_BTU	FLOW	POWER	PHASE	VOLTAGE	Count
AHU01	Air Handling Unit c/w Prime and Bag Filters	48.9kW	18kW	22201/s	20kW	3	400V	1
AHU02	Air Handling Unit c/w Prime and Bag Filters	60kW	28kW	26301/s	30kW	3	400V	1
CH1	Chiller - DC Scroll Inverter, two step	122kW			42kW	3	400V	1
HM1	Humidifier			25kg/h	18.75kW	3	400V	2
HM2	Humidifier			5kg/h	3.75kW	3	400V	1
P1	Chilled Water Pump			5.5l/s	2.2kW	3	400V	1
P2	Chilled Water Pump			5.5l/s	2.2kW	3	400V	1

Aire Terminal Schedule

MARK	DESCRIPTION	SIZE	COLOUR	Count
WL 1	Hinged Weather Louvre c/w matching OBD	400x400	N/A	2
RA 1	Return Air Grille c/w OBD	500x250	N/A	23
SAG 1	Side Wall Variable Volume Diffuser c/w Matching OBD, actuator and Heater bank (2.5kW)	500x250	N/A	23

LEGEND	
T	TEMPERATURE SENSOR
MS	MOTION SENSOR
C	CONTROL SWITCH
---	AC DRAIN LINE
	AC REFRIGERANT LINE
	1 PHASE
	3 PHASE
A6	SUPPLY AIR DUCT
	RETURN AIR DUCT

NOTES / LEGEND

CLIENT FILE NUMBER

-

REFERENCE DRAWINGS

NUMBER	REVISION	DRAWING DESCRIPTION

APPROVED BY COUNCIL / CLIENT

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DATE	INITIAL	No./CODE	REVISION DESCRIPTION
2021.04.29	J.B	A/D	FOR INFORMATION
2021.04.29	J.B	B/D	FOR INFORMATION

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Northern Cape	Upington	(054) 337-6600	upl@bvinc.co.za
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CLIENT

PROJECT

NMISA CAMPUS PRETORIA

DRAWING TITLE

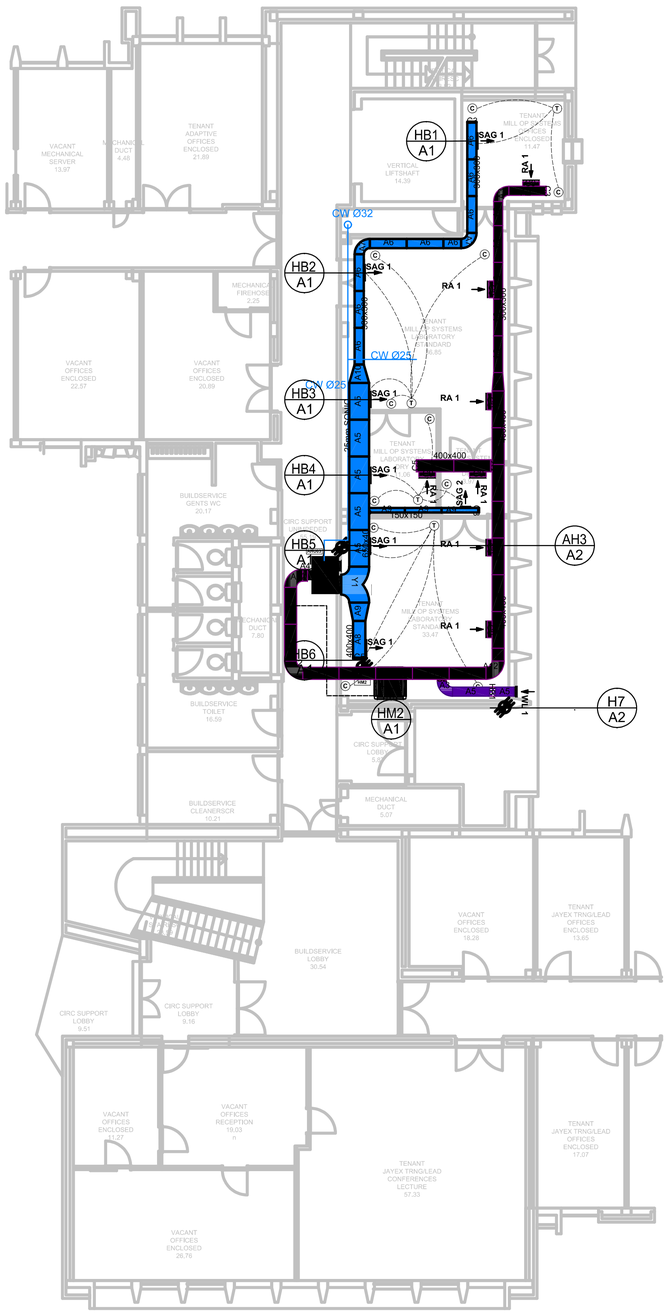
ELECTRICAL INSTALLATION HVAC GROUND LEVEL

APPROVED BY BVI

J BOSHOFF | 200770032 | 29 April 2021
ENGINEER/TECHNOLOGIST | REG. NO. | DATE

SCALE	1:200	DRAWN	JB
DESIGNED	JB	CHECKED	JB
PLAN NUMBER		REVISION NO.	DATE SAVED
LAYERS USED 343287-310-01		B	29 April 2021

North



First Floor

Mechanical Equipment Schedule

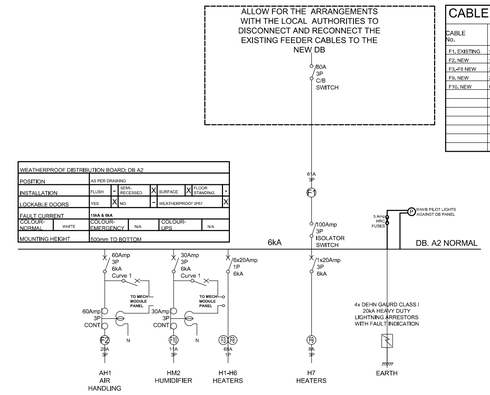
MARK	DESCRIPTION	COOLING_BTU	HEATING_BTU	FLOW	POWER	VOLTAGE	PHASE	Count
AHU03	Air Handling Unit c/w Prime and Bag Filters	17kW	9kW	1100l/s	11kW	400V	3	1
HM2	Humidifier			5kg/h	3.75kW	400V	3	1

Air Terminal Schedule

MARK	DESCRIPTION	SIZE	COLOUR	Count
RA 1	Return Air Grille c/w OBD	500x250	N/A	7
SAG 1	Side Wall Variable Volume Diffuser c/w Matching OBD, actuator and Heater bank (2.5kW)	500x250	N/A	6
SAG 2	Side Wall Variable Volume Diffuser c/w Matching OBD, actuator and Heater bank (2.5kW)	300x150	N/A	1
WL 1	Hinged Weather Louvre c/w matching OBD	300x300	N/A	1

Ducting Schedule

MARK	DESCRIPTION	SIZE	Count
A1	Straight Duct	200x550	1
A10	Equal Taper	650x400 > 300x300	1
A11	Equal Taper	400x400 > 300x300	1
A12	Bend 90°	400x400	3
A2	Straight Duct	300x300	6
A3	Bend 90°	300x300	2
A4	Straight Duct	400x400	18
A5	Straight Duct	400x400	2
A5	Straight Duct c/w 25mm Sonic	650x450	5
A6	Straight Duct c/w 25mm Sonic	200x450	1
A6	Straight Duct c/w 25mm Sonic	300x300	9
A7	Bend 90° c/w 25mm Sonic	300x300	2
A8	Straight Duct c/w 25mm Sonic	400x400	1
A9	Equal Taper	650x400 > 400x400	1
A9	Straight Duct c/w 25mm Sonic	150x150	3
C2	Splgot	300x300	1
C3	Endcap	300x300	2
C4	Splgot	400x400	1
C5	Endcap	400x400	2
C7	Splgot	150x150	1
C8	Endcap	150x150	1
C9	Plenum	550x300	7
HB1	Heater Bank 2.5kW c/w matching OBD and actuator (3 step)	300x300	1
Y1	Y Piece	650x400	1



CABLE RETICULATION SCHEDULE

CABLE No.	CABLE SPECIFICATION	BARE COPPER SPECIFICATION	FED FROM	FED TO	CABLE LENGTH
F1, EXISTING	16mm sq x 4 CORE PVC/SWA	EXISTING	EXISTING	DB A2	EXISTING
F5- NEW	10mm sq x 4 CORE PVC/SWA	50mm sq	DB A2	AH1	40m
F3-<8 NEW	2.5mm sq x 3 CORE	N/L	DB A2	H1-H6	220m
F5- NEW	2.5mm sq x 4 CORE PVC/SWA	2.5mm sq	DB A2	H7	35m
F10- NEW	6mm sq x 4 CORE PVC/SWA	6mm sq	DB A2	HM 2	18m

NOTES / LEGEND

CLIENT FILE NUMBER

-

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2021.04.29	J.B	B/D	FOR INFORMATION

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CLIENT

PROJECT

NMISA CAMPUS PRETORIA

DRAWING TITLE

ELECTRICAL INSTALLATION HVAC FIRST LEVEL

APPROVED BY BVI

J BOSHOFF	200770032	29 April 2021
ENGINEER/TECHNOLOGIST	REG. NO.	DATE

SCALE	1:100	DRAWN	JB
DESIGNED	JB	CHECKED	JB

PLAN NUMBER	REVISION NO.	DATE SAVED
LAYERS USED: 343287-310-02	B	29 April 2021