BIDDING DOCUMENT

Issued on: 19 April 2024
Closing Date: 3 June 2024 at 12h00

Ref: **W/ONB/NSFAF-01/2024**

Procurement of

THE SUPPLY AND INSTALLATION OF AIRCONDITIONERS AT THE STUDENT CARE CENTRE OF THE NSFAF HEAD OFFICE IN WINDHOEK

OPEN NATIONAL BIDDING
[Issued in terms of section 7(1)(i) of the Public Procurement Act, 2015]

NAMIBIA STUDENTS FINANCIAL ASSISTANCE FUND

Cost: N$*0.00*

BIDDER'S NAME:	
CONTACT DETAILS:	**TEL:**
	EMAIL:
TOTAL QUOTED AMOUNT (VAT INCLUSIVE):	**FIGURES:**
	WORDS:

SBD for Procurement of Works

PART 1 – BIDDING PROCEDURES

Section I. Instructions to Bidders (ITB)

This Section provides relevant information to help Bidders prepare their bids. Information is also provided on the submission, opening, and evaluation of bids and on the award of Contracts. **Section I contains provisions that are to be used without modification.**

Section II. Bidding Data Sheet

This Section consists of provisions that are specific to each procurement and that supplement the information or requirements included in Section I, Instructions to Bidders.

Section III. Bidding Forms

This Section contains the forms which are to be completed by the Bidder and submitted as part of his Bid.

Section IV. Evaluation Criteria

This section contains supplementary evaluation criteria which the Employer may choose to apply to the procurement under consideration.

PART 2 – EMPLOYER'S REQUIREMENTS

Section V. Employer's Requirements

This Section contains the Specification, the Drawings, and supplementary information that describe the Plant and Installation Services to be procured.

PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section VI. General Conditions of Contract

This Section contains the general clauses to be applied in all contracts. **The text of the clauses in this Section shall not be modified.**

Section VII. Special Conditions of Contract

The contents of this Section supplement the General Conditions of Contract and shall be prepared by the Employer.

Section VIII. Contract Forms

This Section contains forms which, once completed, will form part of the Contract. The forms for **Performance Security** and **Advance Payment Security**, when required, shall only be completed by the successful Bidder after contract award.

Appendix 1. Bills of Quantities

Appendix 1 contains the detailed Bills of Quantities which, once completed, will form part of the Contract.

Standard Bidding Document

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PART 1 – Bidding Procedures

Section 1 - Instructions to Bidders

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Section I - Instructions to Bidders

A. General

1. Scope of Bid

1.1 The Public Entity as defined in Section II "Bidding Data Sheet" **(BDS)** also referred to herein as Employer invites bids for the construction of Works, as **described in the BDS** and Section VII, "Special Conditions of Contract" (SCC).

The name and identification number of the Contract are **provided in the BDS and the SCC**.

1.2 The successful Bidder shall be expected to complete the Works by the Intended Completion Period **specified in the BDS.**

1.3 Throughout these bidding documents, the terms:

(a) the term "in writing" means communicated in written form (e.g. by mail, e-mail, fax,) with proof of receipt;

(b) if the context so requires, "singular" means "plural" and vice versa;

(c) "day" means calendar day unless otherwise stated; and

2. Source of Fund

2.1 The Works shall be financed by the Public Entity's own budgetary allocation, **unless otherwise stated in the BDS.**

3. Public Entities Related to Bidding Documents & to application for review

3.1 The public entity related to these bidding documents is NSFAF, acting as the procurement entity (Purchaser).

4. Fraud and Corruption

4.1 The Government of the Republic of Namibia requires that bidders/suppliers/contractors, participating in procurement in Namibia, observe the highest standard of ethics during the procurement process and execution of contracts.

4.2 The Employer will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for

the contract in question;

For the purposes of this Sub-Clause:

(i) "corrupt practice" is the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;

(ii) "fraudulent practice" is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

(iii) "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

(iv) "coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

(v) "obstructive practice" is deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede an investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation.

4.3. Bidders, suppliers and public officials shall also be aware of the provisions stated in section 67 and 68 of the Public Procurement Act, 2015 which can be consulted on the website of the Procurement Policy Unit (PPU) : www.mof.gov.na/procurement-policy-unit

5. Eligible Bidders

5.1 A Bidder may be a natural person, private entity, or government-owned entity or any combination of them in the form of a joint venture, under an existing agreement, or with the intent to constitute a legally enforceable joint venture. All partners shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms.

5.2 A Bidder shall not have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. A Bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if :

(a) they have a controlling partner in common; or

(b) they receive or have received any direct or indirect subsidy from any of them; or

(c) they have the same legal representative for purposes of this bid; or

(d) they have a relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the Bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or

(e) a Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all Bids in which the party is involved. However, this does not limit the inclusion of the same subcontractor in more than one bid; or

(f) a Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid; or

(g) a Bidder, or any of its affiliates has been hired (or is proposed to be hired) by the Employer as Engineer for the contract.

5.3 (a)A bidder that is under a declaration of ineligibility by the Government of Namibia in accordance with applicable laws at the date of the deadline for bid submission and thereafter shall be disqualified.

(b)Bids from contractors appearing on the ineligibility lists of African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, Inter-American Development Bank Group and World Bank Group shall be rejected.

5.4 Government-owned enterprises in the Republic of Namibia shall be eligible only if they can establish that they are legally and financially autonomous and operate under commercial law, and that they are not a dependent agency of the Government.

6. Qualifications of Bidders

6.1 All bidders shall provide in Section III, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary.

6.2 Bidders shall include the information and documents listed hereunder with their bids, unless otherwise **stated in the BDS**. The non-submission of the documents by the Bidder within the prescribed period may lead to the rejection of its bid.

(a) copies of original documents defining the constitution or legal status, place of registration, and principal place of business of the Bidder;

(b) total monetary value of construction works performed for each of the last five years;

(c) experience in works of a similar nature and size for each of the last five years or as otherwise **stated in the BDS**; and clients who may be contacted for further information on those contracts;

(d) major items of construction equipment proposed to carry out the Contract;

(e) qualifications and experience of key site personnel and technical personnel proposed for the contract;

(f) report on the financial standing of the Bidder for the last three years, such as certified copies of Financial Statements/Audited Accounts as filed at the Registrar of Companies;

(g) evidence of adequacy of working capital for this Contract (access to line(s) of credit and availability of other financial resources);

(h) authority to seek references from the Bidder's bankers; and

(i) information regarding any litigation, current or during the last five years, in which the Bidder was/is involved, the parties concerned, the issues involved, the disputed amounts, and awards;

(j) proposals for subcontracting components of the Works amounting to more than 10 percent of the Contract Price.

6.3 To qualify for award of the Contract, bidders shall meet the following minimum qualifying criteria:

(a) a minimum average annual financial amount of construction work over the period **specified in the BDS**.

(b) experience as prime contractor in the construction of a minimum number of works of a nature and complexity equivalent to the Works over a period as **specified in the BDS** (To comply with this requirement, works cited should be at least 70 percent complete);

(c) proposals for the timely acquisition (own, lease, hire, etc.) of the essential equipment **listed in the BDS**;

(d) a Contract Manager/Supervisor with five years' experience in works of an equivalent nature and volume, including no less than three years as Manager or as otherwise **specified in the BDS**; and

(e) liquid assets and/or credit facilities, net of other contractual commitments and exclusive of any advance payments which may be made under the Contract, of no less than the amount **specified in the BDS**.

A consistent history of litigation or arbitration awards against the Applicant or any partner of a Joint Venture may result in disqualification.

B. Contents of Bidding Document

7. Sections of Bidding Document

7.1 The Bidding Document consists of all the Sections indicated below and should be read in conjunction with any Addenda issued in accordance with ITB 10.

Section I - Instructions to Bidders (ITB)
Section II- Bidding Data Sheet
Section III - Evaluation Criteria
Section IV - Bidding Forms
Section V - Employer's Requirements
Section VI – General Conditions of Contract
Section VII- Special Conditions of Contract
Section VIII - Contract Forms

7.2 The Invitation for Bids issued by the Employer is not part of the Bidding Document.

8. Clarification of Bidding Document

8.1 A prospective Bidder requiring any clarification of the Bidding Document shall contact the Employer in writing at the Employer's address **indicated in the BDS.**

The Employer will respond in writing to any request for clarification, provided that such request is received 14 days prior to the deadline for submission of bids.

Should the Employer deem it necessary to amend the Bidding Document as a result of a request for clarification, it shall do so following the procedure under ITB 10.

9. Site visit/Pre-bid meeting

9.1 Bidders, at the Bidders' own responsibility and risk, are encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing their Bids and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidders' own expense.

9.2 The Bidder or its designated representative is invited to attend a pre-bid meeting, as **provided for in the BDS**. The purpose of the pre-bid meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

10. Amendment of Bidding Document

10.1 At any time prior to the deadline for submission of bids, the Employer may amend the Bidding Document by issuing addenda and extend the deadline for submission of bids, if needed.

C. Preparation of Bids

11. Cost of Bidding

11.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Employer shall in no case be responsible or liable for those costs irrespective of the outcome of the bidding process.

12. Language of Bid

12.1 The Bid, supporting documents as well as all correspondence relating to the bid exchanged by the Bidder and the Employer shall be in English Language.

13. Documents Comprising the Bid

13.1 The Bid shall comprise the following:

(a) Bid submission Form (in the format indicated in Section IV);

(b) Qualification information and documentary evidence establishing the Bidder's qualifications to perform the contract;

(c) completed Bill of Quantities / Activity Schedule;

(d) the following documentary evidence is required

1. have a valid company Registration Certificate;
2. have an original valid good Standing Tax Certificate;
3. have an original valid good Standing Social Security Certificate;
4. have a valid certified copy of Affirmative Action Compliance Certificate, proof from Employment Equity Commissioner that bidder is not a relevant employer, or exemption issued in terms of Section 42 of the Affirmative Action Act, 1998;
5. have a certificate indicating SME Status (for Bids reserved for SMEs);
6. An undertaking on the part of the Bidder that the salaries and wages payable to its personnel in respect of this proposal are compliant to the relevant laws, Remuneration Order, and Award, where applicable and that it will abide to sub-clause 4.6 of the General conditions of Contract if it is awarded the contract or part thereof;

14. Bid Submission Form and Schedules

14.1 The Bid Submission Form, Schedules, and all documents listed under ITB 13.1 shall be prepared using the relevant forms, if so provided.

15. Alternative Proposal

15.1 Alternative Technical Proposals and completion dates if allowed shall be indicated in Section V- Specifications. The evaluation methodologies for their consideration shall be given in Section III.

16. Bid Prices and Discounts

16.1 The Contract shall be for the whole Works, as described in ITB Sub-Clause 1.1, based on the priced Activity Schedule/Bill of Quantities submitted by the Bidder.

16.2 Bidders shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items for which no rate or price is entered by Bidders, shall not be paid for by the Public Entity when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities. Corrections, if any, shall be made by crossing out, initialing, dating and rewriting.

16.3 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date 14 days prior to the deadline for submission of bids, shall be included in the rates, prices, and total Bid price submitted by

Bidders.

16.4 The price to be quoted in the Bid Submission Form shall be the total price of bid after any discount offered.

The discount if any and the conditions of its application shall be indicated separately.

17. Currencies of Bid and Payment

17.1 The bid price and rates shall be in Namibian Dollars and fixed for the duration of the contract unless otherwise **specified in the BDS.**

17.2 Unless otherwise **specified in BDS** interim payment for Plant and Material on site is applicable as per GCC 39.7.

18. Documents Comprising the Technical Proposal

18.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in the Bidder Qualification Form (Section IV), in sufficient details to demonstrate the adequacy of the Bidders' proposal to meet the work requirements and the completion time.

19. Period of Validity of Bids

19.1 Bids shall remain valid for a period **specified in the BDS.** The Bid Validity period should not exceed 180 days.

19.2 In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request that the bidders extend the period of validity for a specified additional period. The request and the responses thereto shall be made in writing.

20. Bid Security/Bid Securing Declaration

20.1 The Bidder shall furnish either a subscription to a Bid Securing Declaration or a Bid Security in its original form with its bid as part of its bid, if so **required in the BDS**.

20.2 Bid Security shall be in the form of a Bank Guarantee from a local commercial bank as per the format contained in section IV and shall be valid for a period of 30 days beyond the validity period of the bid or beyond any period of extension.

20.3 Any bid not accompanied by an enforceable and substantially compliant Bid Security or a subscription to a Bid Securing Declaration in the Bid Submission Form, if required in accordance with ITB 20.1, shall be rejected by the Employer as non-responsive.

20.4 Bid Security shall be forfeited or the Bid Securing declaration exercised for non-compliance on the part of the Bidder for reasons mentioned in the Bid Security format contained in Section III or the Bid Suring Declaration contained as Appendix to the Bid Submission Form.

21. Format and Signing of Bid

21.1 The Bidder shall prepare one original of the documents comprising the bid as described in ITB 13.1 and clearly mark it "ORIGINAL". In addition, the Bidder shall submit the number of copies **as specified in the BDS,** clearly mark with the label "COPY." In the event of any discrepancy between the original and the copies, the original shall prevail.

21.2 The original and all copies of the bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder.

D. Submission and Opening of Bids

22. Sealing and Marking of Bids

22.1 Bidders may always submit their bids by postal mail or by hand. Procedures for submission, sealing and marking are as follows:

(a) Bidders submitting bids by mail or by hand shall enclose the original and each copy of the Bid, including alternative bids, if permitted in accordance with ITB 15, in separate sealed envelopes, duly marking the envelopes as "ORIGINAL", "ALTERNATIVE" and "COPY." These envelopes containing the original and the copies shall then be enclosed in one single envelope. The rest of the procedure shall be in accordance with ITB sub-Clauses 22.2.

22.2 The inner and outer envelopes shall:

(a) bear the name and address of the Bidder;

(b) be addressed to the Employer as indicated in ITB 22.1;

(c) bear the specific identification of this bidding process indicated in accordance with ITB 1.1; and

(d) bear a warning not to open before the time and date for bid opening.

23. Deadline for Submission of Bids

23.1 Bids shall be delivered to the Employer at the address and no later than the time and date **specified in the BDS**.

The Employer may, at its discretion, extend the deadline for the submission of bids by amending the Bidding Document in accordance with ITB 10.

24. Late Bids

24.1 Late bids shall not be considered. They will be returned unopened

25. Withdrawal, Substitution, and

25.1 No bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of bids and the

Modification of Bids

expiration of the period of bid validity specified by the Bidder on the Bid submission Form or any extension thereof.

26. Bid Opening

26.1 The Employer shall open the bids at the time place and address **specified in the BDS** in the presence of Bidders` designated representatives who choose to attend.

26.2 The bidders' names, the Bid Prices, the total amount of each bid, any discounts, any alternative bid, bid modifications and withdrawals, the presence or absence of bid security, and such other details as the Employer may consider appropriate, will be announced and recorded by the Employer at the opening.

E. Evaluation and Comparison of Bids

27. Confidentiality

27.1 Information relating to the examination, evaluation, comparison, and post-qualification of bids and recommendation of contract award, shall not be disclosed to Bidders or any other person not officially concerned with such process.

27.2 Any attempt by a Bidder to influence the Employer in the evaluation of the bids or Contract award decisions may result in the rejection of its bid.

28. Clarification of Bids

28.1 To assist in the examination, evaluation, and comparison of the bids, and qualification of the Bidders, the Employer may, at its discretion, ask any Bidder for a clarification of its bid. No change in the prices or substance of the bid shall be sought, offered, or permitted, except to confirm the correction of arithmetical errors discovered by the Employer in the evaluation of the bids, in accordance with ITB 31.

29. Determination of Responsiveness

29.1 The Employer’s determination of a bid’s responsiveness is to be based on the contents of the bid itself, as defined in ITB13.

29.2 A substantially responsive bid is one that meets the requirements of the Bidding Document without material deviation, reservation, or omission.

29.3 The Employer shall examine the technical aspects of the bid submitted in accordance with ITB 18, Technical Proposal, in particular, to confirm that all requirements of Section V (Employer’s Requirements) have been met without any material deviation, reservation or omission.

29.4 If a bid is not substantially responsive to the requirements of the Bidding Document, it shall be rejected by the Employer and may not subsequently be made responsive by correction

of the material deviation, reservation, or omission.

30. Nonconformities, Errors, and Omissions

30.1 Provided that a bid is substantially responsive, the Employer may waive any non-material non-conformity in the bid, request that the Bidder submit the necessary information or documentation, to rectify nonmaterial nonconformities in the bid related to documentation requirements but not related to any aspect of the price of the bid; and shall rectify quantifiable nonmaterial nonconformities related to the Bid Price.

31. Correction of Arithmetical Errors

31.1 Provided that the bid is substantially responsive, the Employer shall correct arithmetical errors on the following basis:

(a) only for unit price contracts, if there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Employer there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected;

(b) if there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

(c) if there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

32. Margin of Preference

32.1 **Unless otherwise specified in the BDS**, Margin of Preference shall not apply.

33. Evaluation of Bids

33.1 The Employer shall use the criteria and methodology defined in this clause and no other evaluation criteria or methodologies shall be permitted.

33.2 To evaluate a bid, the Employer shall consider the following:

(a) the bid price, excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities for admeasurement contracts or Schedule of Prices for lump sum contracts, but including Daywork items, where priced competitively; and

(b) price adjustment for correction of arithmetic errors, discounts, non-conformities, due to the supplementary criteria as defined in Section III, and Margin of Preference, if applicable.

33.3 If this Bidding Document allows Bidders to quote separate prices for different contracts, and to award multiple contracts to a single Bidder, the methodology to determine the lowest evaluated price of the contract combinations, including any discount offered in the Bid Submission Form, is specified in Section III (Evaluation and Qualification Criteria).

33.4 If the bid for an admeasurement contract, which results in the lowest Evaluated Bid Price, is seriously unbalanced, front loaded or substantially below updated estimates or if any item in the Priced Activity Schedule is front loaded or contains an erroneous amount in the opinion of the Employer, the Employer may after clarification require the Bidder to produce detailed price analysis for any or all items that the amount of the performance security be increased at the expense of the Bidder.

34. Comparison of Bids

34.1 The Employer shall compare all substantially responsive bids in accordance with ITB 33 to determine the lowest evaluated bid.

35. Qualification of the Bidder

35.1 The Employer shall determine to its satisfaction whether the Bidder that is selected as having submitted the lowest evaluated substantially responsive bid meets the qualifying criteria.

36. Employer's Right to Accept Any Bid, and to Reject Any or All Bids

36.1 The Employer reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to contract award, without thereby incurring any liability to Bidders.

F. Award of Contract

37. Award Criteria

37.1 Subject to ITB 36.1, the Employer shall award the Contract to the Bidder whose offer has been determined to be the lowest evaluated bid and is substantially responsive to the Bidding Document, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.

38. Notification of Award

Prior to the expiration of the period of bid validity, the Employer shall, for contract amount above the prescribed threshold of N$ 2 M, notify the selected bidder of the proposed award and accordingly notify unsuccessful bidders. Subject to Challenge, the Employer shall notify the selected Bidder, in writing, by a Notification of award for award of contract. The Notification of award shall specify the sum that the Employer will pay the

Contractor in consideration of the execution and completion of the Works (hereinafter and in the Conditions of Contract and Contract Forms called "the Contract Price") and the requirement for the Contractor to remedy any defects therein as prescribed by the Contract.

38.1 Until a formal contract is prepared and executed, the notification of award shall constitute a binding Contract.

39. Signing of Contract

39.1 Promptly upon issue of notification of award, the Employer shall send to the successful Bidder the Contract Agreement.

39.2 Within thirty (30) days of receipt of the Contract Agreement, the successful Bidder shall sign, date, and return it to the Employer.

40. Performance Security

40.1 Within thirty (30) days of the receipt of the notification of award from the Employer, the successful Bidder shall furnish the Performance Security in accordance with the conditions of contract, using for that purpose the Performance Security Form included in Section VIII (Contract Forms).

40.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or to sign the Contract Agreement within the prescribed delay shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security.

41. Advance Payment and Security

41.1 The Public Entity shall provide an Advance Payment on the Contract Price as stipulated in the GCC, subject to a maximum amount, **as stated in the BDS**. The Advance Payment shall be guaranteed by a security as per the format contained in Section VIII.

42. Plant and Materials on site

42.1 Unless otherwise **specified in BDS** interim payment for Plant and Material on site is applicable as per GCC 39.7.

43. Debriefing

43.1 The Employer shall promptly attend to all debriefing for the contract made in writing and within 30 days from the date of the publication of the award.

Section II. Bidding Data Sheet (BDS)

The following specific data for the works to be procured shall complement, supplement, or amend the provisions in the Instructions to Bidders (ITB). Whenever there is a conflict, the provisions herein shall prevail over those in ITB.

A. General	
ITB 1.1	The Public Entity is: **NAMIBIA STUDENTS FINANCIAL ASSISTANCE FUND (NSFAF)** The Project is **The Supply and Installation of Air conditioners at the Student Care Centre, NSFAF Head Office in Windhoek**
ITB 1.2	The Intended Completion period is 8 to 10 weeks from start date
ITB 2.1	The Funding Agency is: **NSFAF**
ITB 5.3	A list of firms debarred from participating in Public Procurement in Namibia is available at **http://www.mof.gov.na/procurment -policy-unit** A list of firms debarred by World Bank is available at **http://www.worldbank.org/debarr**
ITB 6.2	The information required from bidders in ITB Sub-Clause 5.2 is modified as follows: omit Items 6.2 (d), (f) and (g)
ITB 6.2 (c)	Contractors shall have at least **5** years relevant experience
ITB 6.3 (a)	The Contractor must have a minimum average annual financial amount of construction of N$ 5 million over the last 3 years.
ITB 6.3 (b)	The number of works is: two (2) or more The period is: 5 years
ITB 6.3 (c)	The essential equipment to be made available for the Contract by the successful Bidder shall be: N/A.
ITB 6.3 (d)	As stated in the ITB
ITB 6.3 (e)	The minimum amount of liquid assets and/or credit facilities net of other contractual commitments of the successful Bidder shall be N$ 1 million.

B. Bidding Documents	
ITB 8.1	The Public Entity's address for clarification is: **NSFAF** Address: **746, Eros Road, PO Box 23053, Windhoek** Country: **Namibia** Telephone: **+264 61 434 6070/55/77** Email: Procurement@nsfaf.na Requests for clarification should be received by the Employer no later than **14 days prior** to the deadline to submission
ITB 9.2	A **compulsory** pre-bid meeting has been scheduled for Date and Time: 10 May 2024 at **12h00 (Namibian Time)** **Location: NSFAF HEAD OFFICE, WINDHOEK** Bids submitted by bidders who did not attend the pre-bid meeting will be disqualified.
C. Preparation of Bids	
ITB 13.1(e)	Any additional materials required to be completed and submitted by the Bidders are NONE.
ITB 17.1	The Contract is not subject to price adjustment in accordance with GCC Clause 44.
ITB 17.2	Interim Payment for Plant and Material on site is not applicable.
ITB 19.1	The Bid shall be valid for 90 days after the deadline set for the submission of bid, the deadline being counted as day one of the validity period.
ITB 20.1	Bid shall include a subscription to a Bid Securing Declaration
D. Submission and Opening of Bids	
ITB 21.1	In addition to the original of the bid, the number of copies is: one copy
ITB 23.1	The deadline for submission of bids shall be at 12H00 on 3 June 2024;
ITB 23.1	The Employer's address for the purpose of Bid submission is

	NSFAF Address: **746, Eros Road, PO Box 23053, Windhoek** Country: **Namibia** Attention: Procurement Management Unit
ITB 26.1	The bid opening shall take place at: **NSFAF HEAD OFFICE, GROUND FLOOR, WINDHOEK** Address: **746, Eros Road, PO Box 23053, Windhoek** Country: **Namibia** **Date*:* 3 June 2024*; Time*:12H00**
E. Evaluation and Comparison of Bids	
ITB 32.1	**[The following provision should be included and the required corresponding information inserted <u>if margins of preference are applicable</u>. Otherwise omit]** A margin of preference **shall not** apply.
F. Award of Contract	
ITB 40.1	The Standard Form of Performance Security acceptable to the Public Entity shall be "a Bank Guarantee". The Bank guarantee shall 10% of the contract price inclusive of provisional and contingencies sum and VAT.
ITB 41.1	No Advance Payment will be paid.
ITB 42.1	Interim Payment for Plant and Material on site **is** applicable.

Section III - Evaluation Criteria

This section contains supplementary criteria that the Employer shall use to evaluate bids.

1. Evaluation

In addition to the criteria listed in ITB 33 the following criteria shall apply:

(a) Adequacy of Technical Proposal

Evaluation of the Bidder's Technical Proposal will include an assessment of the Bidder's technical capacity to mobilize key equipment and personnel for the contract consistent with its proposal regarding work methods, scheduling, and material sourcing in sufficient detail and fully in accordance with the requirements stipulated in Section V (Employer's Requirements).

(b) Multiple Contracts

Pursuant sub-clause 1.1 of the Instructions to Bidders, if Works are grouped in multiple contracts, evaluation will be as follows:

(c) Completion Time

An alternative Completion Time, if permitted under ITB 15.1, will be evaluated as follows: *Not permitted*

(d) Technical Alternatives

Technical alternatives, if permitted under ITB 15.1, will be evaluated as follows: no alternatives will be accepted

(e) Margin of Preference

None

In addition to the criteria listed above, the following criteria shall apply.

1.1 Technical Evaluation Criteria

#	Description	Yes	No
1	Has the Bidder completed its Technical Bid in accordance with technical specifications presented in the Bill of Quantities		
2	Has the Bidder submitted descriptive proof of technical expertise for employees dedicated to this particular project, i.e. Site Manager, Foreman, and any other key personnel as listed in Table 2.5 personnel		
3	Has the Bidder Submitted a list of similar work carried out by the bidder over the last five years; This list must be accompanied with signed letter and or		

	practical completion or completion certificates for at least **three (3)** projects from the relevant Project Managers who supervised the works.		
4	Has the Bidder Submitted a comprehensive company profile and project record (for similar type and size projects) and also for the specialist installations as contained in the bidding document and indicated below. The project record for each specialist must be accompanied by a letter and or practical completion or completion certificate from the Principal Agent / Project Manager / Architect / Engineer who has supervised the works. The specialist installations where company profiles and CV's to be provided are as follows: **Refrigeration technician**		
5	Has the Bidder submitted proof of registration with relevant registration bodies for all key employees as listed on Table 2.5 personnel		
6	Has the Bidder submitted a list of works of similar nature (size/value, type and site) in the last 5 years. Proof thereof provided. (projects amounting to a cumulative financial amount of: **N$ 5 Million** with a minimum project value of $ 0.5 million		

Failure to submit all above-mentioned documents and references, the bidder may be deemed non-compliant.

1.2 Evaluation Scores

Note: The items listed below must be cross-referenced to relevant sections and description above.

No.	Description	Complies	
		Yes	No
1	Experience of the key technical personnel. Site Agent/Site Foreman/ Refrigeration Technician. – Applicable trade qualifications, proof of technical expertise and/or CV submitted and do the named skilled staff members comply with the requirements?		
2	Proof of appointing a registered and adequately experienced refrigeration technician. Proof of registration with relevant boards of control and proof of work completed with reference letter of recommendation from previous contracts.		
3	Provision of a CV/ project record for the specialist installations as per section 1.1.6 above.		

2. Qualification

Factor	2.1 Eligibility					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture, Consortium or Association			
			All partners combined	Each partner	At least one partner	
2.1.1 Nationality	This bid is limited to Namibian Citizens/permanent residents only.	Must meet requirement	Existing or intended JV must meet requirement	Must meet requirement	N / A	Proof of citizenship/permanent residence status
2.1.2 Conflict of Interest	No- conflicts of interests as described in **ITB 5.3**.	Must meet requirement	Existing or intended JV must meet requirement	Must meet requirement	N / A	Bid Submission Form
2.1.3 Bank Ineligibility	Not having been declared ineligible by the Public Entity as described in **ITB 5.4.**	Must meet requirement	Existing or intended JV must meet requirement	Must meet requirement	N / A	Bid Submission Form
2.1.4 Government Owned Entity	Compliance with conditions of **ITB 5.5**	Must meet requirement	Must meet requirement	Must meet requirement	N / A	Statement

Factor	2.1 Eligibility					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture, Consortium or Association			
			All partners combined	Each partner	At least one partner	
2.1.5 Ineligibility based on a United Nations resolution or Namibian Law	Not having been excluded as a result of the laws of Republic of Namibia or official regulations, or by an act of compliance with UN Security Council resolution, in accordance with **ITB 5.8**	Must meet requirement	Existing or intended JV must meet requirement	Must meet requirement	N / A	Bid Submission Form

Factor	2.2 Historical Contract Non-Performance					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture, Consortium or Association			
			All partners combined	Each partner	At least one partner	

Factor	2.2 Historical Contract Non-Performance					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture, Consortium or Association			
			All partners combined	Each partner	At least one partner	
2.2.1 History of non-performing contracts	Non-performance of a contract did not occur within the last **five (5) years** prior to the deadline for application submission, based on all information on fully settled disputes or litigation. A fully settled dispute or litigation is one that has been resolved in accordance with the Dispute Resolution Mechanism under the respective contract, and where all appeal instances available to the bidder have been exhausted.	Must meet requirement by itself or as partner to past or existing JV	Existing JV must meet requirement	N / A	Lead partner Must meet requirement	Statement
2.2.2 Pending Litigation	All pending litigation shall in total not represent more than ten percent (10%) of the Bidder's net worth and shall be treated as resolved against the Bidder.	Must meet requirement by itself or as partner to past or existing JV	Must meet requirement	Must meet requirement by itself or as partner to past or existing JV	N / A	Statement

2.2.3. Financial Resources	The Bidder must demonstrate access to, or availability of, financial resources such as liquid assets, unencumbered real assets, lines of credit, and other financial means, other than any contractual advance payments to meet: (i) the following cash-flow requirement: **N$1,000,000.00** Broken down into the following: • t least 50% liquid capital and 50% materials and (ii) the letter of intent and lines of credit.	Must meet requirement	Must meet requirement	N/A	Must meet requirement	Bank confirmation letter

Factor	2.3 Experience					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture, Consortium or Association			
			All partners combined	Each partner	At least one partner	
2.3.1 General Experience	Experience under contracts in the role of contractor, subcontractor, or management contractor for at least the last **five** [**5**] **years** prior to the applications submission deadline, and with activity in at least nine (9) months in each year.	N / A	N / A	N / A	N / A	Statement
2.3.2 Specific Experience	(a)Participation as contractor, management contractor, or subcontractor, in at least **three** (**3**) contracts within the last **five (5) years**, each with a value of at least **One million Namibian dollars** (**N$ 1 000 000.00)**, that have been successfully and substantially completed and that are similar to the proposed Works. The similarity shall be based on the physical size, complexity, methods/technology or other characteristics as described in Section V, Employer's Requirements.	Must meet requirement	Must meet requirement	N / A	Must meet requirement	Statement

Factor	2.3 Experience					
Sub-Factor	Criteria					Documentation Required
	Requirement	Bidder				
		Single Entity	Joint Venture, Consortium or Association			
			All partners combined	Each partner	At least one partner	
2.3.3 Specific Experience	b) For the above or other contracts executed during the period stipulated in 2.3.2(a) above, a minimum experience in the following key activities: – HVAC Construction	Must meet requirements	Must meet requirements	N / A	Must meet requirements	CV's of key personnel

2.5 Personnel

The Bidder must demonstrate that it will have the personnel for the key positions that meet the following requirements:

No.	Position	Total Work Experience (years)	In Similar Works Experience (years)
1	Contracts Manager / Site Agent		
2	Foreman		
3	Refrigeration Technician		
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			

The Bidder shall provide details of the proposed personnel and their experience records in the relevant Forms included in Section IV, Bidding Forms.

Section IV - Bidding Forms

Table of Forms

Bid Submission Form

The Bidder must prepare the Bid Submission Form on stationery with its letterhead clearly showing the Bidder's complete name and address.

Note: All italicized text is for use in preparing these forms and shall be deleted from the final document.

Date: _____
Bidder's Reference No.: _____
Procurement Reference No:……

To:

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB) Clause 10;

(b) We offer to execute in conformity with the Bidding Documents the following Works:
_____;

(c) The total price of our Bid after discounts, if any, offered in item (d) below is:
_____

_____;

(d) The discounts offered and the methodology for their application are:
_____

_____ ;

(e) Our bid shall be valid for a period of _____ *[insert validity period as specified in ITB 19.1.]* days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(f) We hereby confirm that we have read and understood the content of the Bid Securing Declaration attached hereto and subscribe fully to the terms and conditions contained therein, if required. We understand that non-compliance to the conditions mentioned may lead to disqualification.

(g) If our bid is accepted, we commit to obtain a Performance Security in accordance with the Bidding Document;

(h) We, including any subcontractors or suppliers for any part of the contract, do not have any conflict of interest in accordance with ITB 5.2;

(i) We are not participating, as a Bidder in more than one bid in this bidding process other than alternative offers submitted in accordance with ITB 15;

(j) Our firm, its affiliates or subsidiaries, including any Subcontractors or Suppliers for any part of the contract, has not been declared ineligible under the laws of Namibia;

(k) We are not a government owned entity / We are a government owned entity but meet the requirements of ITB 5.4;[1]

(l) We understand that this bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed;

(m) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive; and

(n) If awarded the contract, the person named below shall act as Contractor's Representative:

_____

Name: .....

In the capacity of: .....

Signed: .....

Duly authorized to sign the Bid for and on behalf of: .....

Date: .....

Seal of Company .....

[1] ***Use one of the two options as appropriate.***

Appendix to Bid Submission Form

BID SECURING DECLARATION

(Section 45 of Act)

(Regulation 37(1)(b) an 37(5))

Date: .....*[Day|month|year]*.....

Procurement Ref No.: .....

To: .....*[insert complete name of Public Entity and address]*.....

I/We* understand that in terms of section 45 of the Act a public entity must include in the bidding document the requirement for a declaration as an alternative form of bid security.

I/We* accept that under section 45 of the Act, I/we* may be suspended or disqualified in the event of

(a) a modification or withdrawal of a bid after the deadline for submission of bids during the period of validity;

(b) refusal by a bidder to accept a correction of an error appearing on the face of a bid;

(c) failure to sign a procurement contract in accordance with the terms and conditions set forth in the bidding document, should I/We* be successful bidder; or

(d) failure to provide security for the performance of the procurement contract if required to do so by the bidding document.

I/We* understand this bid securing declaration ceases to be valid if I am/We are* not the successful Bidder

Signed:
.....
[*insert signature of person whose name and capacity are shown*]

Capacity of:
[indicate legal capacity of person(s) signing the Bid Securing Declaration]

Name:
.....
[insert complete name of person signing the Bid Securing Declaration]

Duly authorized to sign the bid for and on behalf of: [insert complete name of Bidder]

Dated on _____ day of _____, _____
[*insert date of signing]*

Corporate Seal (where appropriate)
[Note*: In case of a joint venture, the bid securing declaration must be in the name of all partners to the joint venture that submits the bid.]
delete if not applicable / appropriate

Republic Of Namibia

Ministry of Labour, Industrial Relations and Employment Creation

Witten undertaking in terms of section 138 of the Labour Act, 2015 and section 50(2)(D) of the Public Procurement Act, 2015

1. EMPLOYERS DETAILS

Company Trade Name:……

Registration Number :...……...

Vat Number: ……

Industry/Sector: ……

Place of Business:……..

Physical Address:……..

Tell No.:……

Fax No.:…….

Email Address:……..

Postal Address:……..

Full name of Owner/Accounting Officer:……..……...

…….....

Email Address:……..

2. PROCUREMENT DETAILS

Procurement Reference No.:……..

Procurement Description: ……..

……

……

Anticipated Contract Duration: …….

Location where work will be done, good/services will be delivered: ……..

……

3. UNDERTAKING

I ……*[insert full name]*, owner/representative

of ……*[insert full name of company]*

hereby undertake in writing that my company will at all relevant times comply fully with the relevant provisions of the Labour Act and the Terms and Conditions of Collective Agreements as applicable.

I am fully aware that failure to abide to such shall lead to the action as stipulated in section 138 of the labour Act, 2007, which include but not limited to the cancellation of the contract/licence/grant/permit or concession.

Signature: ……..

Date: ……..

Seal:…….

Please take note:

1. *A labour inspector may conduct unannounced inspections to assess the level of compliance*
2. *This undertaking must be displayed at the workplace where it will be readily accessible and visible by the employees rendering service(s) in relations to the goods and services being procured under this contract.*

Qualification Information

*[The information to be filled in by **bidders** in the following pages shall be used for purposes of post-qualification or for verification of prequalification as provided for in ITB Clause 6. This information shall not be incorporated in the Contract. Attach additional pages as necessary. Pertinent sections of attached documents should be translated into English. If used for prequalification verification, the Bidder should fill in updated information only.]*

1. Individual Bidders or Individual Members of Joint Ventures

1.1 Constitution or legal status of Bidder: *[attach copy]*

Place of registration: *[insert]*

Principal place of business: *[insert]*

Evidence of signatory authorized to sign the bid (if applicable): *[attach]*

1.2 Annual amounts of construction works performed during the last *[insert number]* years *[insert amounts in the national currency equivalent]*

1.3 Number *[insert number]* of works of a nature and amount similar to the Works performed as prime Contractor over the last *[insert number]* years. *[Also list details of work under way or committed, including expected completion date(s).]*

Project/Contract name and country	Name of client and contact person	Type of work performed and year of completion	Value of contract in NAD
(a) (b)			

1.4 Major items of Contractor's Equipment proposed for carrying out the Works. *[List all information requested below. Refer also to ITB Sub-Clause 6.3 (c).]*

Item of equipment	Description, make, and age (years)	Condition (new, good, poor) and number available	Owned, leased (from whom?), or to be purchased (from whom?)
(a) (b)			

1.5 Qualifications and experience of key personnel proposed for administration and execution of the Contract. *[Attach biographical data. Refer also to ITB Sub-Clause 6.3 (d).]*

Position	Name	Years of experience (general)	Years of experience in proposed position
(a) (b)			

1.6 Proposed subcontracts and firms involved. Refer to General Conditions of Contract Clause 7.

Sections of the Works	Value of subcontract	Subcontractor (name and address)	Experience in similar work
(a) (b)			

1.7 Evidence of access to financial resources to meet the qualification requirements: cash in hand, lines of credit, etc. List below and attach copies of support documents.

1.8 Name, address, and telephone, telex, and facsimile numbers of banks that may provide references if contacted by the Public Entity.

1.9 Information on current litigation(s) in which the Bidder is involved.

Other party(ies)	Cause of dispute	Amount involved
(a) (b)		

1.10 Proposed Program (work method and schedule). Descriptions, drawings, and charts, as necessary, to comply with the requirements of the Bidding Documents.

2. Additional Requirements

2.1 Bidders should provide any additional information requested in the Bidding Document.

Bill of Quantities

The Bills of Quantities consists of Annexure 1 attached to the Bid Document. The Total excluding VAT from the Annexure is to be transferred to this summary and totaled to arrive at the bid price.

Total brought forward from:

Annexure 1 – Airconditioning Installation for the Student Care Centre of the NSFAF Head Office	N$	
Sub-total	N$	
Plus: VAT (15%)	N$	
Total Bid Price (Carried to Bid Submission Form and Bid Cover Page)	N$	

PART 2 – Employer's Requirements

Section V - Employer's Requirements

Table of Contents

SECTION V PART 1 Drawings

The following drawings are issued together with and shall be read in conjunction with the bid document:

ENGINEER'S DRAWING LIST

1167/MG/103	HO Building Ground Floor: HVAC Layout Part 2
1167/MG/108	HO Building Second Floor: HVAC Layout

ARCHITECT'S DRAWINGS

A432	Ground Floor Ceiling Plan
A860	Student Care Centre AC Layout & Details

SECTION V PART 2 Specifications

Bidders shall refer to the Technical Specifications, drawings and Bills of Quantities issued together with and as a part of this Bidding Document and take note of the Preliminary and General sections contained therein.

2.1 STANDARD SPECIFICATION FOR VENTILATION AND AIRCONDITIONING INSTALLATIONS

TABLE OF CONTENTS

STANDARD SPECIFICATION FOR VENTILATION AND AIRCONDITIONING INSTALLATIONS

2.1 SCOPE OF WORK

This specification covers the supply, installation, testing, balancing and commissioning of an air-conditioning and ventilation installation. The Contractor shall be responsible for selecting, purchasing and placing in position all equipment in the spaces shown. All work shall be done in a first class workmanlike manner and the Contractor shall at handing over provide a reliable and trouble free air-conditioning and ventilation installation working without objectionable noise or drafts. Where no specific type or quality of material has been indicated a standard article as approved by the Engineer shall be provided.

2.2 COMPLIANCE WITH REGULATIONS AND STANDARDS

The Contractor shall be responsible for ensuring that the air-conditioning and ventilation installations comply with all the latest statutory requirements and regulations and in particular with the following:

a) The "Standard Regulations for Wiring of Premises" issued by the South African Institute of Electrical Engineers.

b) The Factories, Machinery and Building Work Act.

c) Government, Provincial and Local Authorities, Ordinances, Regulations, By-Laws, Rules and other legal instructions.

d) Standard Specifications and Codes of Practice issued by the South African Bureau of Standards and British Standards Institute. If there is a conflicting statement in the above specifications the specification from the SABS shall have precedence.

e) Standards and Codes of Practice issued by recognised authorities in the Ventilation and Air-conditioning field, such as ASHRAE, SMACNA and ASME.

2.3 ACCESSIBILITY

All equipment shall be so installed as to be readily accessible for operation, maintenance and repair. Minor changes and deviations from the quotation drawings may be made to achieve this, but major changes or changes involving extra costs may not be made without approval of the Engineer.

Where equipment cannot be reached from the floor, and also where indicated, platforms and cat ladders shall be installed. All platforms and cat ladders are to be in accordance with the Factory Inspector's requirements.

2.4 PAINTING AND PROTECTION AGAINST CORROSION

All unprotected surfaces shall be treated in accordance with the following procedure:

a) Surfaces shall be thoroughly cleaned in accordance with SANS 10064.

b) Surfaces shall thereafter be primed with zinc chromate primer.

c) Surfaces shall then be painted with two coats of coloured enamel paint complying with Grade 1 of SANS 10630. Colours are to be approved by the Engineer.

When zinc coating is specified this shall mean hot dip galvanized zinc coating. Where the zinc coating is damaged by cutting, drilling or punching, the edges shall be painted with zinc dust pigmented paint. Regular repainting shall be reduced to a minimum by using galvanized steel wherever possible. All plantroom and exposed ducting shall be painted as specified. Ducting exposed to the outside shall be painted with two coats of epoxy paint.

2.5 IDENTIFICATION

2.5.1 General

Each instrument, gauge, meter, switch, pilot lamp, push button, panel mounted item and sensor shall be labelled identifying the equipment controlled by such items. Labels shall be of non corrodible material with engraved black lettering on a white background. All labels shall be screwed or riveted on.

2.5.2 Ducts

In plantrooms and other exposed areas, ductwork shall be labelled by painting the service area which the duct feeds with 100 mm white letters on a black background, either directly on the duct or on a plate which is then firmly fitted to the duct. Stencils shall be used for the painting of the letters. Arrows showing the direction of flow shall be painted on all ducts at regular intervals.

2.5.3 Pipes

All piping shall be colour coded and marked with identifying bands and arrows provided at the entering and leaving point of each piece of equipment as well as at every 10 m of straight run of piping.

The colour coding shall be in accordance with the relevant SANS specification or as approved by the Engineer.

2.5.4 Valves

All valves shall be marked by a bronze plate on a chain, properly fixed to the valve. Numbers or letters on the marking plates shall relate to a schematic flow diagram framed behind glass in plantrooms.

The minimum diameter of marking plates shall be 30 mm and 1 mm thick with punched on letter/numbers at least 8 mm high.

2.5.5 Access Panels

Ceiling access panels shall be marked with suitable markers approved by the Engineer.

2.6 VIBRATION ISOLATION

All rotating equipment such as fans, pumps, compressors, etc. shall be mounted on inertia bases and isolated from the structure by means of spring mountings. All fans shall be provided with flexible connections on the fan inlet and outlet duct connections.

All rotating equipment shall be statically and dynamically balanced and the selected operating speed shall not be within 30% of the critical speed.

Flexible connections in pipework may be omitted but if unacceptable noise transmission results, the Contractor shall at his own expense insert flexible connections during commissioning and make good all insulation damaged in the process.
The sound attenuation system shall be designed so as not to exceed the levels specified in Part 3. If there is any doubt as to the noise level in any area, the Contractor shall take and submit sound pressure readings in all six frequency bands plotted on the sound pressure curves with the NC levels shown. Readings shall be taken 3.0 m from the terminal or sound source and the curves shall be clearly marked at which area, terminal or position they have been taken. If noise levels are higher than specified, the equipment shall be replaced with more silent equipment or additional attenuation shall be provided, all at the Contractor's expense.

2.7 INSULATION

2.7.1 Ducting

Unless specified otherwise in the project specification or on the drawings, supply and return air ducting shall be insulated internally with 25 mm thick PU foam insulation and vapour proofed with 'Sonic Liner' or similar.

Internal insulation shall be fixed with spot welded pins and secured with washers.

The following types of ductwork shall not to be insulated unless specifically specified: exhaust air ducts, toilet extract ducts and relief air ducts.

Plantroom ducting and ducting exposed to the weather shall be insulated externally with 25 mm thick high density fibreglass or PU foam held in position with bird mesh and plastered with a hard setting cement to a smooth finish, or covered with GRP and painted white.

All externally insulated elements that may easily be damaged during normal maintenance shall be protected against mechanical damage.

2.7.2 Piping

Exposed chilled water piping shall be insulated by glued on pre-formed polyurethane sections and vapour proofed with coloured poly vinyl chloride tape. Polyester sections that have been pre-covered with PVC will also be accepted.

Chilled water piping in shafts will be vapour proofed by a painted canvas covering.

Insulation through sleeves and ceiling openings shall be continuous.

Steam piping shall be insulated with canvas covered preformed PU foam sections held in positions with galvanized sheetmetal strips.

Refrigeration piping shall be insulated by preformed rubber insulation and joints and ends shall be properly vapour sealed.

Pipework insulation exposed to atmospheric conditions shall be waterproofed by galvanized sheet metal jackets.

2.7.3 Fittings

Fittings shall be insulated in a similar way as specified for that particular pipe.

2.7.4 Equipment

Chilled water pumps shall not be insulated but a drip tray shall be provided.

Fans handling cooled air or heated air and that are externally exposed to atmospheric conditions shall be insulated by fibreglass bats held in position by wire mesh and plastered with hard setting cement.

Air handling units shall be insulated by rigid PU foam panels fixed at no more than 500 mm centres and protected by sheet metal panels. The minimum thickness of the double panel construction shall be 50 mm.

Cooling coil sumps shall be insulated with high density PU foam protected by sheet metal cover plates. All joints must be properly sealed to prevent water entering the insulation.

2.7.5 Fire Hazard

Only non-combustible insulation materials will be acceptable.

2.8 INSTRUMENTATION

All necessary instrumentation for the successful monitoring and logging of the plant and equipment is to be provided. Test certificates and correction graphs shall be obtained for all portable equipment prior to any site measurements being taken. Monitoring instruments permanently installed in the systems shall indicate clearly any set points as specified. Digital display units of instruments shall be panel mounted, with individual displays fully labelled. All instruments shall be calibrated for a degree of accuracy as stated, or for better than 5% if not stated.

2.8.1 Thermometers

Thermometers shall comprise of suitable thermometer probes, to be installed in the fluid to be measured, and connected by means of sheathed or otherwise protected conductors to the measuring instrument, and of a LED or LCD display screen, either with permanent display of the temperature being measured, or with touch screen capability for selection of a specific temperature where a common display is used for various temperature measurements. Thermometer probes shall be robust and constructed of materials able to withstand many years of ambient or fluid specific erosion or corrosion effects.

The accuracy of thermometers shall be 0.5^{o}C, within the range from -10^{o}C to +50^{o}C with 1^{o}C graduations or better.

2.8.2 Pressure Gauges

Pressure gauges shall be of the dial type with accuracy of not less than 2%. The face diameter shall be 100 mm. Operating pressure shall be approximately 60% of max scale reading.

All pressure gauges shall be provided with shut off valves. Differential pressure gauges shall have zero centre reading and provision shall be made for individual pressure readings.

2.8.3 Manometers

Manometers used for measuring pressure differentials across filters, coils or other elements shall be of the digital type with Pitot tube probes and LCD or LED displays.

2.8.4 Hygrometers

Hygrometers shall have an accuracy of 5% within the range of 20% to 100% relative humidity. They shall be of the digital display type and shall form part of a thermometer unit as detailed above.

2.8.5 Flow Meters

Shall be of the in-line orifice type and flows shall be measured by means of permanently installed differential pressure probes and LCD or LED display.

2.9 PLANTROOM INSTRUCTIONS

Provide in each plantroom the relevant diagrams showing an outline of the system such as refrigeration, heating, air handling unit, air and electrical distribution with all the control instruments and gauges correctly indicated and identified. All set points, scale settings, true settings, differential bands, throttling ranges, time delay and overload settings shall be indicated to permit the checking and adjusting of each control system.

Diagrams and operating instructions shall be printed on plastic and framed behind glass, and hung on a sufficiently illuminated wall in the plantroom.

2.10 OPERATING AND MAINTENANCE MANUAL

Two sets of operating and maintenance manuals bound in loose leaf, four-hole ring files are to be provided.

The operating and maintenance manual shall be in two parts, with Part I dealing with information pertaining to systems and Part II covering information pertaining to equipment.

2.10.1 Part I - Systems

The systems volumes shall be divided into systems shown on the schematic diagrams such as air handling unit, chilled water generator set, air distribution, chilled water distribution, etc., and as detailed in Part C.

Information on the above systems shall include the following categories of information.

A. <u>Descriptive Information</u>

1. Function of service
2. Classification and coding
3. Design capability
4. Performance characteristics
5. Principal components
6. Distribution arrangement
7. Schematic diagram
8. Control diagram
9. Equipment data (a) Manufacturer - model no.
   (b) Size and rating

B. <u>Operating Instructions</u>

1. Starting and stopping procedures
2. Adjustments and regulations
3. Logs and records

C. Inspection and Maintenance

1. Inspection schedule and check list
2. Schedules and procedures for lubrication, replacement, adjustment, cleaning, painting, protection and testing
3. Inspection and maintenance records.

Reference Documents

a) General arrangement drawings
b) As-built record drawings
c) Test and balance records.

2.10.2 Part II - Equipment

This part shall contain manufacturer's data for each piece of equipment such as fans, filters, chillers, pumps, etc. The following information will be provided for each piece of equipment.

A. Descriptive Literature

1. Catalogue cuts, brochures or shop drawings.
2. Dimensional drawings
3. Materials of construction
4. Parts designation.

B. Operating Characteristics

1. Performance tables and charts
2. Performance curves
3. Pressure, temperature and speed limitations
4. Safety devices.

C. Operating Instructions

1. Pre-start check list
2. Start-up procedures
3. Inspection during operation
4. Adjustment and regulation
5. Testing
6. Detection of signals
7. Precaution

D. Inspection Instructions and Procedures

1. Normal and abnormal operating temperature, pressure and speed limits.
2. Schedule and manner of operation.
3. Detection signals.

E. Maintenance Instructions and Procedures

1. Schedule of routine maintenance.
2. Procedures
3. Troubleshooting chart

F. Spare Parts

1. Essential spares to be kept by building owner
2. Names and addresses of suppliers.

H. Maintenance and Service Contracts

2.11 TESTING

The following tests shall be carried out at the Contractor's expense:

a) Functional Test

Prior to notification of completion of the installation to the Engineer, the entire plant shall be thoroughly tested for proper functioning under all possible operating conditions (normal and simulated).

All safety devices shall be tested for effective operation by initiating each relevant sensor.

b) Performance Tests

To determine the full performance of the entire plant/installation and its critical components, all parameters necessary shall be measured at regular intervals over a period as agreed or determined by the Engineer.

The test results shall be tabulated and/or plotted together with the stated performance data and reported to the Engineer in writing.
The test report shall be fully titled, signed and dated prior to submission.

2.12 COMMISSIONING

After satisfactory functional and performance tests have been carried out and after written notification to the Engineer of intent to commission, the entire plant shall be put into operation in the presence of the Engineer and other parties concerned.

Any faults, deficiencies and/or performance inadequacies shall be listed, signed and dated by the Engineer and a copy thereof handed to the Contractor on site who, in due course, shall rectify ALL items listed.

Commissioning shall be deemed having been accepted when the entire plant complies in full with the specification and is to the satisfaction of the Engineer. Notification to that effect shall be given in writing to the Contractor by the Engineer.

2.13 TEMPORARY USE OF EQUIPMENT

No equipment forming part of the permanent installation shall be operated or used during the construction period without the Engineer's written permission.

2.14 GUARANTEE PERIOD

The Contractor shall guarantee the works as covered by the specification and drawings for a period of (12) twelve months from the date of commissioning. Any defects due to inferior materials and/or workmanship (fair wear and tear excepted) shall be repaired or the equipment replaced without delay at the Contractor's expense.

2.15 HANDOVER

The Contractor shall hand over the entire plant when all paintwork, touch-up final adjustment and proper cleaning of the premises has been executed. All tools, manuals, diagrams and guarantee certificates shall be submitted.

The handover shall be deemed having been completed upon receipt of two sets of diagrams, manuals and certificates. Notification to that effect shall be given in writing to the Contractor by the Engineer.

The Guarantee(s) covering the equipment against defects in material and workmanship for a period of twelve months shall commence from the date of handover.

2.16 MAINTENANCE PERIOD

In support of the guarantee for the works the entire installation, as detailed above, shall be maintained by the Contractor for twelve months from the day of commissioning. The maintenance shall also cover the applicable maintenance aspects as set out in the warranties of the individual units/machines and other warranted parts.

The Contractor shall execute four (4) maintenance services during the twelve (12) months maintenance period. The services shall be at approximately three (3) months' intervals.

The final service shall be done just prior to the final handover inspection at the end of the 12 months maintenance and guarantee period. This service shall also include re-testing and rebalancing of the entire system in the presence of the Engineer, and a written report on this service shall be submitted to the Engineer within 14 days of the completion of the service.

The Contractor shall give at least 7 days notice in writing to the Engineer before starting with the final service.

2.17 WORKSHOP DRAWINGS

The Contractor shall prepare at his own expense and shall submit copies of shop drawings of all fabricated work, working or setting-out drawings, shop details and schedules to the Engineer for approval, and no work shall be performed by the Contractor until such approval is given.

It is the Contractor's responsibility to check all submissions for conformity with the Engineer's drawings and specifications, and to correct any errors, omissions or deviations before their transmission to the Engineer.

The Engineer will check drawings for design only, and approval of the drawings, schedules and catalogues shall not be construed as a complete check and shall not relieve the Contractor of this responsibility as above stated.

Except as otherwise indicated, shop drawings of all ducting layouts in all areas are required. Shop drawings shall include the following:

a) Manufacturer's specification, including materials, type, performance characteristics and capacity ratings.

b) Dimensioned drawings, indicating size, component parts and installation details in all plant areas.

c) Electrical wiring diagrams and controls.

2.18 AIR DISTRIBUTION SYSTEM

2.18.1 Air Duct System

General

The duct system shall be installed in accordance with the SANS 10238 Standard Specification for Air-Conditioning Ductwork. All ducting shall be manufactured from galvanised sheetmetal unless otherwise specified.

The entire duct system shall be installed parallel to the building lines in a neat and workmanlike manner.
The detail design of the duct installation shall be such that the airflow is without undue pressure drop and free from drumming for the complete range of operating conditions. Bends and Tee pieces shall be of the radius type wherever possible and multi vane bends shall be used in cases where there are space limitations.

Submit workshop drawings showing details of each piece of ducting to be manufactured prior to manufacturing. Individual pieces of ducting shall be numbered in a logical way on the shop drawings as well as on all ducting delivered to site to ensure that the installation proceeds as planned.

2.18.2 Testing

All duct installations shall be pressure tested and inspected for leaks. The maximum permissible leakage shall be 4% of the total supply air quantity to be delivered by that particular section of the installation.

Noisy leaks shall be repaired whether the measured leakage rate is within limits or not.

Test holes shall be 25 mm diameter and provided with screw-on caps to seal openings after commissioning. One test hole shall be provided in each return and supply air duct of each ducted A/C and ventilation system.

2.18.3 Flexible Duct Connections

Ductwork shall be connected to fans, air handling units and all other vibrating equipment by means of flexible duct connections such as rubberised canvas collars.

2.18.4 Flexible Ducting

The flexible ducting shall be airtight and securely fixed to spigots and diffusers. Flexible ducting shall be of the two element type with a corrosion resistant metal spiral covered with a coated fabric. Free length of the flexible duct sections shall be at least equal to the duct diameter, but no longer than 2 m.

2.18.5 Branch Take-Offs

Branch take-offs shall have an internal radius of not less than 100 mm or alternatively shall be of the 45º take off type. Velocities in branch ducting shall never exceed the velocity in the main duct.

2.18.6 Field Erected Casings

Field erected casings shall be of the sandwich panel type bolted together. Quick fastening

methods shall not be acceptable.

Casings shall not leak, vibrate or drum.

Plantroom floors may be used as bottoms of plenums, but plenum walls must be bolted down with expansion bolts and properly sealed at the joints.

2.18.7 Air Intake and Exhaust Hoods

Air intake and exhaust hoods shall be of the type indicated on the drawings. All intake and exhaust hoods shall be provided with bird screens and shall be vermin proof. They shall be leak free to prevent mixing of fresh and exhaust air.

2.18.8 Medium and High Pressure Ductwork

Medium and high pressure ductwork shall be as specified in the SANS specification but in addition all longitudinal joints shall be soldered to ensure airtight joints.

2.18.9 Flanges

Duct flanges shall be of the MEZ type or equal approved.

2.18.10 Duct Hangers and Supports

All ducts shall be firmly supported or suspended (maximum spacing 2 meters) with struts or frames from the floor or with hangers from the roof structures, as applicable. Where roof truss spacing does not provide for direct suspension of duct hangers this contract shall include the supply and installation of suitably sized steel sections spanning trusses, from which hangers for ducts can be mounted. Vibration transmission through hangers and supports shall be prevented by using mechanical springs to take up the vibrations.

2.19 REFRIGERATION EQUIPMENT

2.19.1 Packaged or Split Packaged A/C Units

2.19.1.1 Supply and install packaged condenser units as indicated on the drawings, with cooling capacities as stated.

The condenser unit shall be complete with screw or scroll or centrifugal compressor, refrigerant cooled hermetic or semi-hermetic motor, condenser, control panel, electronic or pneumatic controls, and complete with initial charge of refrigerant and lubrication oil.

The compressors shall be of the single or two-stage type and capacity control shall be provided on all units larger than 30 kW cooling capacity which are not inverter driven.

The compressor shall have a clearly marked oil sight glass indicating the normal operating oil level.

Units with cooling capacities greater than 40 kW shall be provided with two compressors and two separate refrigeration circuits, to provide backup in case of compressor failure or condenser leak.

Refrigerant to be used shall be R410 or equivalent. All condensers shall be provided with liquid receivers for a pump-down cycle.

2.19.1.2 The system shall provide for automatic stopping when the leaving chilled air temperature of

the air handling units reaches the minimum specified by the manufacturer.

2.19.1.3 The units offered shall be in the standard catalogued products of a reputable manufacturer and documentation shall include selection tables or performance curves, descriptive literature, physical data and dimensions, electrical data, control description and a typical installation.

Performance curves and selection tables shall be based on factory tests.

Tests shall be certified by the factory and they shall be reproducible.

2.19.1.4 The minimum safety protection provided shall be for the following abnormal conditions:

a) Low pressure.
b) High condenser temperature.
c) High compressor pressure.
d) Voltage drop, phase failure or reversal.
The condenser units shall fail safe.

Submit a checklist of running conditions that will be checked as part of the testing, balancing and commissioning procedure.

2.19.1.5 The lubrication system shall be of the force feed type with an oil pump supplying oil under pressure to all compressor and hermetic motor journal thrust bearings.

The oil pump shall be a part of a compressor shaft drive train.

The lubrication system must provide a positive supply of oil to all bearings even during a power failure shutdown.

Sump heaters shall be furnished in the oil reservoir to prevent excessive accumulation of the refrigerant in the oil during long idle periods. Sump heaters shall switch on automatically as a first stage when the unit is switched on after standing time, and the compressor shall only start operating after an adjustable time delay.

The complete lubrication system shall be factory installed and piped.

2.19.1.6 The hermetic or semi-hermetic motor on the condenser unit shall be of the induction type and shall be sized for continuous duty. Inverter powered motors shall be wound and insulated for the full range of frequencies and voltages expected during operation. The motor shall be fully assembled and functionally tested at the unit manufacturer's plant.

The motor shall be liquid refrigerant cooled, and furnished with inherent high temperature protection in each phase of the motor stator windings, by thermistor and related controls.

The full-load amperes drawn at design condition shall not exceed the maximum current specified on the nameplate.

2.19.1.7 The compressor motor starter shall be of the star/delta or solid state type with closed circuit transition. The starter shall be supplied by the refrigeration machine supplier, who will be responsible for the detail component selection. Direct on-line starting shall be allowed only on motors with FLA of 20 A or less.

2.19.1.8 The multi-pass condenser coils shall be manufactured from adequately sized copper tubing with light gauge bonded aluminium fins or approved equivalent. The coils shall have a total face area selected sufficiently large to cope with the maximum heat transfer load required.

2.19.1.9 Condenser cooling air shall enter the housing from the sides and shall exit from the top.

The condensing unit shall be capable of serving one air-handling unit, and shall have adequately sized cooling fans and electric switchgear.

All fan impellers exposed to direct sunlight shall be manufactured from aluminium.

The housing shall be manufactured from sheetmetal and shall be designed to allow for maintenance and cleaning. Adequate protection against accidental contact with any fan shall be provided.

Sufficient panels shall be removable for easy access to all components. The enclosure for single packaged units shall enclose filters, fresh air dampers, evaporator coils, supply air fans and controls.
Sheetmetal shall be treated to resist corrosion.

2.19.1.10 Each unit shall be furnished with a complete PLC based control centre.

The capacity, operating and safety controls and control sequence shall be designed for completely fail-safe automatic operation. ON-delay timers shall be provided for each unit to ensure sequential starting of motors after a power failure. This sequential starting shall also cover the heater banks if applicable.

The control sequence shall prevent re-cycling of the unit and limit the maximum possible starts to six times per hour.

A voltage metering device shall be incorporated in each plant and shall be set to de-energise the entire system in the event of the voltage varying by more than 10% of the normal supply voltage. The device shall be set to re-instate the operation of the plant five minutes after the voltage returns to normal.

The control panel shall have protective controls and shall be complete with LED/LCD screen with scroll or touch control.

The following operational information shall be available on the controller screen:

a) Compressor suction and discharge refrigerant temperatures and pressures.
b) Electric motor current with marked full load amps, switchable for each phase for each motor.
c) Line-to-Neutral and phase-to-phase voltage.
d) Failure/Operation indication for all fan motors, compressors and heater banks.

For further details, see point 2.25.

The control panel shall be complete with an isolator switch so that the unit may be isolated electrically for maintenance purposes.

Wet/Dry type sight glasses and in line filters shall be provided in each condenser unit.

2.19.1.11 The unit shall be installed on level adjusting spring-type vibration isolator assemblies with non-skid pads on a steel subframe which in turn shall be mounted on isolator pads.

The isolators will be selected to minimise the transmission of vibrations to the building structure.

2.19.1.12 The noise level in the plantroom through the operation of all units at any operation point shall not exceed NC 55.

2.19.1.13 The units shall be installed in accordance with the manufacturer's requirements and shall be maintained in an "as new" condition prior to start-up.

The Contractor shall familiarise himself with the space provided for the unit installation and shall ensure that sufficient space is allowed around the condenser unit for maintenance purposes as well as with the access route to be followed in placing the units in position and that sufficient structural strength has been provided on this route.

All components weighing over 250 kg shall have factory installed rigging points.

The components of the condenser unit, particularly the compressor, shall be easily accessible for maintenance without major dismantling of panels or other items of equipment.

The control panel shall have protective controls and shall be complete with reset push buttons, switches and pilot lights.

2.19.2 Split Room Air-conditioning Units

2.19.2.1 Outdoor Unit

The condensing unit shall consist of the compressor, condenser, receiver and fan.

The motor compressor unit shall be of the hermetically sealed type with internal anti-vibration spring mounting and external rubber mounting.

The compressor units shall be filled with sufficient oil and fitted with a current overload protection as well as high temperature overheat protection device.

The condenser cooling air shall enter the housing at the rear and shall exit from the front.

The condensing unit shall be capable of serving one indoor unit, and shall have adequately sized fans and electric switchgear.

The housing shall be manufactured from sheetmetal and shall be designed to allow for easy maintenance and cleaning.
Sufficient panels shall be removable for easy access to all components.

The sheetmetal shall be treated to resist corrosion.

2.19.2.2 Coils

The multi-pass coils shall be manufactured from adequately sized copper tubing with light gauge bonded aluminium fins or approved equivalent.

2.19.2.3 Fans

The condenser fan shall be of the propeller type and manufactured from aluminium or steel.

The fans shall be securely fixed to the motor shafts.

The fan motors shall be T.E.F.C. type continuously rated with long life self-aligning bearings and mounted on resilient fittings.

2.19.2.4 Mounting of Outdoor Units

The outdoor units of the split A/C units shall be mounted on angle iron stands made of 50 x 50 x 5 angle iron fixed to walls as shown on the drawings.

The stands shall be sandblasted prior to the application of one coat of high quality primer and painted to specification. All painting shall be carried out in accordance with SANS Code of Practice 10140 Parts I to III.

2.19.3 Packaged Air Cooled Water Chillers

2.19.3.1 Supply and install packaged air-cooled water chillers as detailed in the Project Specification, Part C.

2.19.3.2 Specification for water chillers is as per point 2.19.1 above, and the following points.

2.19.3.3 Heat Exchanger

The heat exchanger shall be of the shell-and-tube type, adequately lagged to prevent condensation.

2.19.3.4 Circulating Pump

The circulating pump shall be constructed of brass, stainless steel or Monel, with mechanical seals, and shall be of high quality manufacture for continuous trouble free duty. The pump shall be foot mounted on a steel frame or concrete plinth, with direct coupled T.E.F.C. 4-pole electric motor. Motor rated power shall be 30% higher than maximum operating duty.

Pipework coupling shall be flanged or BSP threaded. If BSP connections are used, sufficient unions shall be installed to allow easy removal of the pump for servicing. Pump motor control shall be incorporated into the unit control board.

2.19.3.5 Expansion Tank

A welded GMS expansion tank of capacity as detailed shall be installed in the A/C plantroom at high level, and connected to the pump chilled water inlet pipework.

It shall be provided with a brass float valve on the make-up water inlet.

The tank shall be internally coated with an epoxy tar paint for corrosion protection.

2.19.3.6 Buffer Tank

A buffer tank for chilled water shall be installed if detailed in the Project Specification. The tank shall be of a capacity as specified and shall be connected to the pump suction side.

The tank shall be of polypropylene as Rotovet or similar for low pressure application, or of welded steel construction for pressurised application. The capacity of the tank shall be determined by the total chilled water quantity in the system, and as required for cycling control of the chiller compressors. Buffer tank size shall be kept as small as possible, and wherever possible, unit control shall be such that no tank is required.

2.19.4 Refrigerant, Chilled Water and Drain Piping

2.19.4.1 Refrigerant Pipework

Soft annealed copper tubing of Refrigeration class to SANS 10460 and of adequate internal diameter shall be used throughout. All refrigerant pipework shall be hard soldered, and not joined with mechanical couplings except where unavoidable.

The refrigerant gas piping shall be installed clean and in a tidy fashion. It shall be purged, evacuated and tested thoroughly for leaks prior to charging with refrigerant gas.

Flexible piping shall be installed in liquid and suction lines at the compressors to prevent vibration transmission.

Care shall be taken not to damage or kink the piping.

All gas and liquid lines shall be insulated with 12 mm preformed rubber foam insulation as Armaflex or equal approved.

All pipes shall be sized for the maximum performance of the units, but sizing shall ensure a proper lubricating oil return.

Oil traps shall be provided wherever required to prevent 'slugging' of the compressor. Detailed pipe installation work shall be done according to good refrigeration practice.

All pipes are to run on cable trays or ladders and to be sleeved where they penetrate concrete or brickwork.

2.19.4.2 Chilled Water Pipework

Chilled water pipes shall be of copper tubing to SANS 10460 Class 2, seamless steel pipe or may be of uPVC of Class 6 or higher, as detailed in the Project Specification.

Jointing shall be by hard soldering for copper pipes, welding of steel pipes or by chemical jointing using PVC cement for uPVC pipes. Pipes shall be installed in straight, neat runs, in GMS trunking with removable lids on vertical runs externally, and on cable trays internally. Clamp and fixing distances shall be such that no creep occurs on uPVC pipes.
All pipes shall be held using special clamps or holder bats to allow limited thermal linear movement. Sufficient offsets, 'knees' and expansion loops shall be allowed at the ends of long straight pipe runs to take up any thermal movement without placing strain on the pipes.

All chilled water pipes shall be insulated with 25 mm thick rigid polyurethane preformed sections, covered with PVC sheeting.

Pipes shall be sleeved where they run through concrete beams, slabs or walls.
Chilled water pipes shall be pressure tested to 1.5 times maximum working pressure, for 24 hours.

2.19.4.3 Drain Pipes

All drainpipes shall be laid to fall and shall discharge either at low level onto drained surfaces, or above waste water gulleys. No drain pipe shall be connected to or drain into a sewer vent pipe or sewer pipe.

All drain pipes shall be provided with traps to prevent drip tray overflow due to fan suction pressure. As an alternative a tundish may be used.

Drainpipes shall be fixed and supported as for chilled water pipes above.

Pipes may be either copper to SANS 10460 Class 0, or uPVC Class 4.

Where insufficient space is allowed in ceiling voids to allow adequate drain fall, small pumps with level controls shall be installed at the evaporator units to discharge periodically all drain water from the relevant units. In such cases , drain pipes shall rise to the soffit from the pump via the shortest possible route and drop from the pump onwards to allow gravity drainage of most of the condensate should a power failure occur.

2.19.4.4 Pipe Hangers and Supports

All piping not supported on cable trays or in ducts, or mounted directly on concrete slabs or roof structures, shall be firmly held in position by hangers or supports specifically designed for the particular situation. In determining the load on the hanger, weight of pipe plus fluid and insulation shall be taken into account. All hangers shall be so designed to avoid vibration transmission from the pipe system to the structure. In very long runs of piping expansion loops shall be installed to allow for expansion and contraction.

2.19.4.5 Typical Hanger Spacing

The following hanger spacing shall be used:

Pipe Size	Hanger Spacing
Up to 25 mm	1.2 meters
Over 25 mm	2 meters

Hanger Rods

The following diameter hanger rods shall be used:

Pipe Size	Rod Diameter
Up to 50 mm	8 mm dia rod
Above 65 mm	12 mm dia rod.

In addition to the above, pipe hangers shall be provided at every change of direction in piping. Vibration isolators shall be of the spring type and shall be adjustable in height for a distance of at least 50 mm.

Trapeze type hangers in lieu of individual hangers may be provided subject to the installation of rollers underneath the piping.

Insulation on piping shall be protected with sheetmetal sleeving of 1,6 mm galvanised sheetmetal wherever exposed to the weather or where runs are near areas of heavy traffic.

Specially designed supports shall be provided at the inlet to all equipment and no load shall be transmitted onto installed equipment manifolds.

All vertical pipe risers shall be supported at the bottom by a vertical support equal in diameter and material thickness to the pipe being supported. Underneath the vertical support a special base shall be provided resting on cork or neoprene to isolate any vibration from the structure.

2.20 VRV AIR CONDITIONING SYSTEMS

2.20.1 General

The air conditioning system shall consist of a specified number of individual room type air-conditioners connected by one set of refrigerant pipes to one or more outdoor units. The system is to be of the Variable Refrigerant Volume type, and shall allow individual control of each air-conditioned space. The system to be installed shall be a 2 pipe (heat pump) or a 3 pipe system (heat recovery) as specified in Part 3: Project Specification.

2.20.2 Indoor Units

The indoor units shall consist of the evaporator coil, expansion valve, supply air fan and motor, thermostat and electric control gear.

For high wall mounted units, the supply air outlet shall be at the lower front of the unit. The return air shall enter the unit through the front panel of the unit. For ceiling cassette type units, the supply air outlets shall be at the outer peripherals of the unit. The return air shall enter through the centre section of the unit.

The cabinet and ducting shall be lined internally with sound absorbing material to ensure quiet operation.

The cabinet and ducting shall be manufactured from sheetmetal or thermosetting plastic, and shall be designed to allow for installation below ceilings, i.e. suspended from the roof by hangers, or bolted directly to the wall, or mounted on the floor.

Sufficient panels shall be removable for easy access to all components, especially the filter pad.

The drip pan and fan shroud shall be made either from plastic material or metal. If made from metal, they shall be treated to resist corrosion, and shall be insulated to avoid condensation on the outside.

2.20.3 Outdoor Unit

The condensing unit shall consist of the compressor, condenser, electronic expansion valve, receiver, fan, control panel.

The motor compressor unit shall be of the hermetically sealed scroll type with internal antivibration spring mounting and external rubber mounting. At least one compressor shall be of the inverter type for close capacity control. Other compressors in a multi-compressor outdoor unit shall be of the standard scroll type. Unit control shall provide for compressor switching to ensure that the base load is supplied by standard compressor(s), and varying load by the inverter compressor.

The compressor-units shall be filled with sufficient oil and fitted with a current overload protection as well as high-temperature overheat protection.

The condenser cooling air shall enter the housing at the front, sides and/or rear and shall exit from the top.

The condensing unit shall be sized to be capable of serving all of the indoor units simultaneously and shall have adequately sized components and electric switchgear. Depending on the total required system capacity, a number of modular condensing units shall be coupled in series to provide the total cooling/heating capacity specified.

The unit housing shall be manufactured from sheet-metal and shall be designed to allow for easy maintenance and cleaning.

Sufficient panels shall be removable for easy access to all components.

The sheet-metal shall be treated to resist corrosion.

The refrigerant to be used shall be R410 or equivalent, and the unit selection shall allow for the refrigerant used.

2.20.4 Coils General

The multi-purpose coils shall be manufactured from adequately sized copper tubing with light gauge bonded aluminium fins or approved equivalent.

The condenser and evaporator coils shall be mounted above a drip-tray or pan with flexible drain hose to the outside of the cabinet of the indoor unit and shall be connected to a drain pipe.

2.20.5 Fans

The evaporator or re-circulating air fan shall be of the centrifugal turbo type and shall be very quiet in operation.

The evaporator fan motor shall be of the multi-speed type.

The condenser fan shall be of the propeller type and manufactured from aluminium or steel.

The fans shall be securely fixed to the motor shafts and shall be dynamically balanced.

The fan motors shall have T.E.F.C. type continuous rated, long life double sealed type self-aligning bearings shall be mounted on resilient fittings.

2.20.6 Gas Piping

Soft annealed copper tubing of adequate internal diameter shall be used throughout to link the indoor units to the outdoor unit(s) in either a 2-pipe or a 3-pipe system as specified in the Project Specification. The complete refrigerant piping installation shall be designed and constructed in strict accordance with the manufacturers Engineering Data Manual. Selection and workshop drawings of the proposed piping installation shall be submitted to the engineer for approval prior to installation. All joints, branches and headers shall be factory manufactured and to the manufacturers standard specifications. No field manufactured joints or headers shall be used.

The refrigerant gas piping shall be installed clean and in a tidy fashion. It shall be purged, evacuated and tested thoroughly for leaks prior to charging with refrigerant gas. All hard soldering shall be done using Nitrogen gas shielding.
The lengths of piping as well as the number of soldered connections which may be required shall be kept to a minimum to complete the installation.

Care shall be taken not to damage or kink the piping.

Long radius bends shall be used wherever possible.

Should insulation be required around the pipes this will be specified in the Project Specification as attached hereto.

2.20.7 Filters

Sufficient filtration shall be provided in the indoor units to filter the re-circulating air to avoid clogging of the coil fins.

Cleaning or exchanging the filters shall be possible without removal of the unit from the cabinet.

2.20.8 Louvres and Grilles

Adjustable louvers shall be provided in the indoor unit to control the deflection of the conditioned supply air.

The fascia of the indoor cabinet shall be designed to prevent short-circuiting of the supply air into the return air louvers.

The housing of the outdoor unit(s) shall be provided with sturdy inlet and outlet grilles to provide protection for the coil fins.

2.20.9 Electrical and Controls

The type of control shall be as specified in the Project Specification. BS boxes to control individual or groups of indoor units in heat recovery systems shall be supplied and installed as shown on the drawings or as specified.
The outdoor unit shall have a main control board which shall incorporate unit safeties and protective devices including at least the following:
Main switch, component circuit breakers, motor contactors with O/L protection
Surge protection on each phase and on Neutral
Phase failure and phase sequence protection, over/under voltage protection
Control PC board
Unit diagnostics and operation/failure indication
All field wiring shall be done strictly in accordance with SANS 10142 and with the manufacturers Engineering Data Manual.

2.20.10 Noise Level

The overall noise level rating of the indoor unit shall not exceed the noise level as specified in the Project Technical Specification. The noise level shall be measured at a distance of 3 metres from the unit. Low noise levels of indoor and outdoor units are imperative. Typical noise levels to be achieved are: indoor unit noise levels shall not exceed 45 dB(A) at the highest and 41 dB(A) at the lowest indoor fan speed setting.

2.20.11 Painting

All painting shall be carried out in accordance with the SANS Code of Practice - 10140, Parts I - III, 1978. All metal work of the units shall be pre-treated against corrosion before painting is commenced.

The tenderer shall state the colours and the type of finish of the air conditioning units that are available from the manufacturers. Where on site painting is to be carried out the final colours to be used shall be to the Engineer's specification or as specified in Part 3, Project Technical Specification.

2.21 AIR DISTRIBUTION EQUIPMENT

2.21.1 Air-conditioning Systems

2.21.1.1 Air Handling Units

Supply and install as shown on the drawings, blow through type constant volume air handling units consisting of items listed below. Where packaged A/C units are specified, this section shall be read together with point 2.19.1.

If the air handling units are to be assembled on site, they shall consist of heavy gauge preformed sheetmetal panels insulated with 25 mm fibreglass insulating material and protected on the inside by a lighter gauge sheetmetal.

Spacing plates shall be installed to ensure that 25 mm wide space for insulation is maintained.

Care shall be taken that the insulation covers all areas of the air handling plenum and that no cold surfaces exist where condensation may occur.

Where air-handling units are the evaporator units of the split packaged type, they shall be of the same manufacture as the relevant condenser units.

The air-handling unit shall consist of the evaporator coil, expansion valve, supply air fan and motor, and electric control gear, all contained within a suitable metal enclosure.

The housing shall be manufactured from sheetmetal and lined internally with sound absorbing material to ensure quiet operation.

Sufficient panels shall be removable for easy access to all components, especially the electric wiring board.

The drip pan and fan shroud shall be made either from plastic material or metal. If made from metal they shall be treated to resist corrosion.

The fans of the air handling units shall be of the centrifugal forward curved type and shall be very quiet in operation.

Air handling unit fan motors shall be of the constant-speed type and shall drive the fans via suitably sized V-belts and pulleys, as Fenner or similar. Alternatively, variable speed motors or inverter driven motors shall be connected to fan impellers by shaft couplings and shall provide for variable flow/pressure fan capabilities.

The fans shall be securely fixed to the shafts and be statically and dynamically balanced.

The fan motors shall be totally enclosed with continuous rating, long life self-aligning bearings and mounted with resilient fittings. The fan motors shall be protected against overload by manually resettable thermal protection switches.

The housing may also include filter banks and the fans included shall be rated to supply the airflow rate at the system pressure loss. Filter banks and booster fans may also be mounted separately from the air handling units.

The chilled water coils shall be constructed of copper tubing with copper or aluminium fins bonded together. Each AHU shall be equipped with its own thermostat coupled to a 3-way bypass valve, to regulate chilled water flow through the coil.

Heating shall be by electric heater elements as detailed in the Project Specification, and shall be switched on only if no water flows through the coils under thermostat selection.

2.21.2 Fan Coil Units

Supply and install as shown on the drawings, blow through type constant volume fan coil units consisting of items listed below:

If the fan coil units are to be assembled on site, they shall consist of heavy gauge preformed sheetmetal panels insulated with 25 mm fibreglass insulating material and protected on the inside by a lighter gauge sheetmetal.

Spacing plates shall be installed to ensure that 25 mm wide space for insulation is maintained.

Care shall be taken that the insulation covers all areas of the fan coil plenum and that no cold surfaces exist where condensation may occur.
The fan coil unit shall consist of the chilled water coil, thermal flow throttling valve, supply air fan and motor, electric heater bank and electric control gear, all contained within a suitable metal enclosure.

The housing shall be manufactured from sheetmetal and line internally with sound absorbing material to ensure quiet operation.

Sufficient panels shall be removable for easy access to all components, especially the electric wiring board.

The drip pan and fan shroud shall be made either from plastic material or metal. If made from metal they shall be treated to resist corrosion.

The fans of the fan coil units shall be of the centrifugal forward curved type and shall be very quiet in operation.

The fan coil unit fan motors shall be of the constant-speed type and shall drive the fans via suitably sized V-belts and pulleys.

The fans shall be securely fixed to the shafts and be statically and dynamically balanced.

The fan motors shall be totally enclosed with continuous rating, long life self-aligning bearings and mounted with resilient fittings. The fan motors shall be protected against overload by manually resettable thermal protection switches.

The chilled water coils shall be constructed of copper tubing and copper or aluminium fins, bonded together. Each fan coil unit shall be equipped with its own thermostat coupled to a 3-way bypass valve to regulate chilled water flow through the coil. Heating shall be by electric heater elements as detailed below, and shall be switched on only if no chilled water flows through the coils under thermostat selection.

2.21.3 General Notes on Air Handling Units and Fan Coil Units

2.21.3.1 Air handling unit fans shall be rated for the specified airflow at maximum system pressure. Where the AHU standard fans are not capable of the required performance, additional fans shall be installed to provide the required performance.

2.21.3.2 All filters shall be sized according to manufacturer's recommendations, and rated filter velocities shall not be exceeded. Filtered air quality required shall be guaranteed by the Contractor.

Filter specifications shall be according to Eurovent 4/5 unless otherwise stated, dust extraction efficiencies shall be according to BS 2831, Test Dust No. 2.

Filters shall be of the panel type and shall be washable and reusable.

2.21.3.3 All values and capacities given are minimum required values. Cooling capacity figures given are nett figures of the conditioned space heat load, and for long lengths of refrigerant piping, due considerations must be taken of losses incurred.

2.21.3.4 Where shown, condenser air shall be ducted to the outside of the plantroom. Such hoods and ducts shall be constructed of sheetmetal conforming in general to 'Ductwork' details as shown above. Condenser fans shall be rated for the increased pressure drops.

2.21.4 Split Room A/C Units

2.21.4.1 Indoor Unit

The indoor unit shall consist of the evaporator coil, expansion valve, supply air fan and motor, thermostat and electric control gear.

The supply air outlet shall be at the lower part of the front side of the unit for high wall mounted units and on the edges of the ceiling panel on ceiling cassette units. The return air shall enter the unit from the front or sides of the unit for high wall mounted units, and the centre of the ceiling panel for ceiling cassette type units.

The cabinet shall be lined internally with sound absorbing material to ensure quiet operation.

The cabinet shall be manufactured from sheetmetal and shall be designed to allow for installation on a wall below the ceiling, or inside the ceiling void, as detailed.

Sufficient panels shall be removable for easy access to all components, especially the filter pad.

The drip pan and fan shroud shall be made either from plastic material or metal. If made from metal they shall be treated to resist corrosion.

2.21.4.2 Coils

The multi-pass coil shall be manufactured from adequately sized copper tubing with light gauge bonded aluminium fins or approved equivalent.

The evaporator coil shall be mounted above a driptray or pan with flexible drain hose to the outside of the cabinet of the indoor unit and shall be connected to the drainpipe.

2.21.4.3 Filters

Sufficient filtration shall be provided in the indoor unit to filter the recirculating air to avoid clogging of the coil fins.

Cleaning or exchanging the filters shall be possible without removal of the unit from the cabinet.

2.21.4.4 Louvres and Grilles

Adjustable louvres shall be provided in the indoor unit to control the deflection of the conditioned supply air.

The fascia of the indoor cabinet shall be designed to prevent short-circuiting of the supply air into the return air louvres.

2.21.4.5 Mounting of Indoor Units

The wall mounted type indoor units shall be fixed to the wall with rods or raw bolts or similar. The bottom of the units shall be 100 mm below ceiling level.

The cassette type units shall be mounted in the ceiling void, on an adequate support frame fixed to the roof trusses or concrete slab. The support frame is to be supplied and fixed under this contract. The face of the unit shall protrude from the lower side of the ceiling. Cassette units shall preferably have face dimensions to suit a 1200 x 600 ceiling grid.

2.21.4.6 Condensate Drainage

A 20 mm diameter copper or uPVC drain pipe shall be installed in positions shown for each unit with a slope to the outside, and taken down to ground level. Ceiling cassette type units shall be provided with condensate pumps to allow drainage to the outside as shown on the drawings.

2.21.4.7 Refrigerant Piping

The suction and liquid lines shall be suitably sized to allow maximum performance but shall also ensure proper return of lubricating oil.

All refrigerant lines shall be insulated with sleeved Armaflex type of insulation with a wall thickness of not less than 12 mm, and in the roof space shall be supported on GMS cable trays along their length.

Refrigerant pipes from the condenser units into the building shall run in GMS ducts, chased into the walls, supplied and fixed under this contract. No pipework shall be exposed to direct sunlight, or built into brickwork.

2.21.4.8 Controls

Each of the AC units shall be remotely controlled by means of a remote type control incorporating the following:

The temperature of the supply air shall be controlled by a thermostat with a calibrated setting dial. The thermostat shall control the running period of the compressor and condenser fan. The thermostat shall have a wide setting range and shall be continuously variable. The evaporator fan shall run continuously once the air-conditioner has been switched on. The speed of the evaporator fan shall be selected by means of a selector switch having a FAN-ONLY setting range also.

2.21.4.9 Noise Level

Low noise levels of indoor and outdoor units are imperative.

The noise level of the indoor units shall not exceed 45 dB(A) at the highest and 41 dB(A) at the lowest indoor fan speed setting.

The noise level of the outdoor units shall not exceed 49 dB(A).

2.21.5 Air Filters

2.21.5.1 Supply and install air filter banks in the positions as shown on the drawings, filtering the specified air quantity at the stated maximum velocity, pressure drop and dust holding capacity.

Removal of filter elements shall be either from the side of the filter banks or from the back.

Sufficient number and size of access doors shall be installed to provide adequate access for maintenance personnel.

2.21.5.2 Filter elements shall be fire resistant, washable and shall be of synthetic fibre.

Standard filter frames of a commercial range shall be installed and replacement elements shall be readily available.

Filter frames and surrounds shall be protected against corrosion. The support frames shall be manufactured from galvanised steel.

The filter holding frames and clips shall be of such a design and provided with adequate sealing strips to ensure that no dust bypasses the filters.

2.21.6 Axial Fans

2.21.6.1 Supply and install the axial fans required to supply the air quantities at system pressures as detailed.

The fan shall be of the aerofoil blade, direct driven type with the motor mounted in the casing, suitable for this particular type in installation.

The fans shall be selected to perform on the stable part of the fan curves with an efficiency of not less than 60% and with a noise level not exceeding the value specified in the Schedules below.

2.21.6.2 If a fan cannot be selected to comply with the noise requirements specified in the Project Specification, sound attenuation equipment shall be provided as may be necessary to comply with the specified noise level.

2.21.6.3 All necessary precautions shall be taken to avoid vibration transmission to the building structure, drumming of the fan casing and connected ducting.

2.21.6.4 The fan casing, flexible connections and connected ductwork, shall not leak.

2.21.6.5 The electrical motor shall be of the totally enclosed squirrel cage induction type. Motors shall be sized to operate continuously at any point from zero air quantity to cut off point for the fan wheel and blade setting supplied.

2.21.6.6 Fans shall be easily accessible for maintenance purposes.

Fans shall be provided with an access panel, either in the connected ductwork, or alternatively with a hinged casing, for inspection purposes and minor repair work.

2.21.6.7 Fans and accessories shall be corrosion protected. The minimum protection shall be hot dipped galvanised. All necessary care shall be taken to minimise electrolytic action between materials used in the installation.

2.21.6.8 All fans shall be furnished with a nameplate, stating make, type and model no., and basic fan and motor parameters.

2.21.6.9 Fans shall be provided with a local isolator, and wiring to the motor shall be protected from the air stream.

2.21.6.10 Connected ductwork before and after the fans shall be provided with capped test openings for pressure readings during commissioning.

2.21.6.11 Fans shall be statically and dynamically balanced in the factory.

2.21.6.12 Fan impellers shall be glass fibre reinforced polyester resin or aluminium alloy.

2.21.7 Propeller Fans

2.21.7.1 Supply and install the propeller fans as shown on the drawings and delivering air quantities at static pressure and noise level stated on the drawings and the Schedules.

2.21.7.2 The fans shall be of the propeller bladed direct driven type with the motor mounted by means of mounting brackets onto a diaphragm plate. The fans shall be suitable for the type of installation shown and shall be complete with all the necessary wire guards and weather louvres or grilles on the air entering and leaving sides respectively.

2.21.7.3 The fans shall be selected to perform on the stable part of the fan curves. Extrapolation of propeller fan curves will not be accepted.
All necessary precautions shall be taken to avoid vibration transmission to the building structure. The mounting brackets of the fan motors shall be mounted on rubber anti-vibration mountings.

2.21.7.4 The electrical motor shall be of the totally enclosed squirrel cage induction type. Motor shall be sized to operate continuously at any point of the fan curves from zero air quantity to the cut off point for the fan wheel supplied.

2.21.7.5 Fans shall be easily accessible for maintenance purposes.

Fans installed in ductwork shall be provided with an access panel.

2.21.7.6 Fans and accessories shall be corrosion protected. The minimum protection shall be hot dipped galvanised. All necessary care shall be taken to minimise electrolytic action between materials selected.

Connected ductwork before and after the fans shall be provided with capped test openings for pressure readings during commissioning.

2.21.7.7 All fans shall be furnished with a name plate stating make, type and model no. with basic fan and motor parameters.

2.21.7.8 Fans shall be provided with a local isolator, and wiring to the motor shall be protected from the air stream.

2.21.7.9 Fans shall be statically and dynamically balanced in the factory.

2.21.8 Centrifugal Fans

2.21.8.1 Supply and install as shown on the drawings centrifugal fans supplying or extracting the specified air quantities.

The fans shall be part of fan/filter units and shall either be part of a standard fan/filter unit, or shall be manufactured as per detailed drawings.

The fans shall be selected to perform on the stable part of the fan curves. Extrapolation of fan curves will not be accepted.

All necessary precautions shall be taken to avoid vibration transmission to the building structure. The fan motors shall be mounted on rubber anti-vibration mountings.

The critical speed of the fans shall be at least 30% higher than the selected operating speed.

2.21.8.2 The electrical motor shall be of the totally enclosed squirrel cage induction type. Motor shall be sized to operate continuously at any point on the fan curves from zero air quantity to the cut off point for the fan wheel supplied.

2.21.8.3 Fans shall be easily accessible for maintenance purposes.

Fans installed in ductwork shall be provided with an access panel.

Fans and accessories shall be corrosion protected. The minimum protection shall be hot dipped galvanised. All necessary care shall be taken to minimise electrolytic action between materials selected.

All fans shall be furnished with a nameplate stating the make, type and model no. with basic fan and motor parameters.

Connected ductwork before and after the fans shall be provided with capped test openings for pressure readings during commissioning.

2.21.8.4 Fans shall be provided with a local isolator, and wiring to the motor shall be protected from the air system.

2.21.8.5 Fans shall be statically and dynamically balanced in the factory.

2.21.9 Automatic Controlled Air Dampers

2.21.9.1 Supply and install automatic controlled dampers in the positions shown on the drawings suitable for the capacity and operating static pressure as listed in the Schedules.

2.21.9.2 The dampers shall be of the 100% shut-off type and if used between hot and cold air plenums they shall have felt or neoprene edges riveted to the sealing edges of the blades.

The dampers shall be selected to have a maximum pressure drop of 50 Pa at a velocity of 2,5 m/s based on the face area when 25% open.

The maximum size of dampers shall be a metre wide by two metres high. Larger dampers shall be made up of multiple smaller dampers.

2.21.9.3 The dampers shall be properly cleaned after installation and all debris shall be removed that may cause binding.

Dampers built into brick or concrete walls must be installed square and without any tension on the damper frame which may prevent smooth operation.

Where automatic control dampers are built into ducting, access doors shall be provided for easy access to damper linkages and damper motors.

2.21.9.4 Damper linkages shall be provided with positive stops to prevent dampers from opening more than 90 degrees.

Unless otherwise specified all dampers shall be of the opposed bladed type.
Damper shafts shall rotate on permanently lubricated sealed roller bearings.
Damper blades and frames shall be manufactured from galvanised sheet steel.

Damper control and drives shall be by geared electric motors with arm linkages, with operation controlled from the system control boards.

2.22 ROOM AIR DISTRIBUTION EQUIPMENT

2.22.1 Constant Volume Ceiling Diffusers

2.22.1.1 Supply and install supply air terminals as shown on the drawings and as listed in the Schedules, delivering the air quantity at the stated static pressure loss and maximum sound power level, or as otherwise detailed.

2.22.1.2 The Contractor shall provide a portable air measuring device, specified by the air terminal manufacturer, to check the air quantity delivered by the air terminals.

2.22.1.3 All supply air diffusers shall be of enamel painted or epoxy powder-coated steel. Diffusers shall be square and shall fit the ceiling grid in both dimensions and mounting details unless detailed otherwise on the drawings. All diffusers shall be mounted independently from the ceiling grid, off the slab or roof structure above.

2.22.1.4 All diffusers shall be equipped with an opposing blade manual volume control damper, adjustable through the diffuser face. All diffusers shall be of the 4-way pattern unless stated otherwise.

2.22.1.5 Noise levels measured at 3 m from any diffusers shall not exceed NC37, or as detailed in Part 3.

Diffuser faces shall protrude approximately 10 mm below the ceiling when mounted against the ceiling panels. Colour shall be white unless specified otherwise.

2.22.2 Variable Volume Ceiling Diffusers

2.22.2.1 Supply and install variable volume ceiling diffusers as shown on the drawings and as listed in the Schedules. General specification of VAV diffusers shall be as for constant volume diffusers. All VAV diffusers shall be direct acting, electrically controlled. Thermostats shall be mounted in the positions shown, or shall be an integral part of the diffuser.

2.22.3 Return Air Terminals

2.22.3.1 Supply and install return air terminals as shown on the drawings and as listed in the Schedules, extracting the specified air quantity at the stated pressure drop and maximum sound power level, or as otherwise detailed.

2.22.3.2 The Contractor shall provide all necessary measuring instruments to check the air quantities extracted by the terminals as recommended by the manufacturer.

2.22.3.3 All return air grilles shall be of the rectangular type with individually adjustable horizontal blades and shall suit the dimensions of the ceiling grid. Colour shall be white unless specified otherwise.

No dampers on return air grilles shall be installed, unless detailed otherwise in the schedule.

All grilles and plenums shall be supported independently from the ceiling grid, from the slab or roof structure above.

2.22.4 Door and Wall Mounted Transfer Grilles

2.22.4.1 Supply and install door and wall mounted transfer grilles in positions as shown on the drawings and as listed in the Schedules, allowing the specified air quantity through the transfer grille with the stated pressure drop and maximum sound power level, or as otherwise detailed.

2.22.4.2 The grilles shall be anodised aluminium or steel painted white unless specified otherwise.

2.22.4.3 Extract Grilles

Supply and install extract grilles as shown on the drawings and as listed in the Schedules, extracting the specified air quantity at the stated static pressure drop and maximum sound power level or as otherwise detailed.

The extract grilles shall be finished in enamel to an approved colour as specified below.

2.23 MANUAL VOLUME CONTROL DAMPERS

2.23.1 Supply and install volume control and branch balancing dampers as shown on the drawings and as listed in the Schedules, delivering maximum and minimum air quantities stated, with noise level not exceeding the value specified, or as otherwise detailed.

2.23.2 The volume control dampers shall control within 10% the maximum and minimum air quantities stated in the schedule.

2.23.3 Replacement of components in the volume control dampers shall be possible without the use of special tools.

The Contractor shall ensure that the volume control damper is accessible and that installation and removal of the damper can be done by one person standing on a ladder. Sufficient space shall be left next to dampers to slide out components.

Connections to the volume control damper shall be by means of the standard duct flanges used throughout.

2.23.4 Test openings with rubber cap seals shall be provided before and after each volume control damper to take velocity pressure readings with a portable instrument.

2.24 FIRE DAMPERS

2.24.1 Supply and install fire dampers in the positions shown on the drawings suitable for the capacity and operating static pressure as listed in the schedules.

2.24.2 The dampers shall be of the very low leakage heat non-degradable type with friction free metal to metal seals incorporated into the blade and frame shapes. Use of gasketing such as plastic or neoprene strips to achieve low leakage performance is not acceptable.

2.24.3 The dampers shall be a fully catalogued product and the manufacturers/suppliers shall provide certified selection curves and detailed selection for the expected operating range.

2.24.4 The dampers shall be selected to have a maximum pressure drop of 20 Pa at a velocity of 10,0 m/s based on the face area when 100% open.

2.24.5 The maximum size of dampers shall be a metre wide by two metres high. Larger dampers shall be made up of multiple smaller dampers.

2.24.6 The dampers shall be properly cleaned after installation and all debris shall be removed that may cause binding.

2.24.7 Dampers built into brick walls or ductwork must be installed square and without any tension on the damper frame which may prevent smooth operation. Adequate allowance for thermal

expansion of the dampers shall be made when installing the frame.

Where dampers are built into ducting, access doors shall be provided for easy access to damper linkages and for resetting of the dampers.

2.24.8 Damper linkages shall be provided with positive stops to prevent dampers from opening more than 90 degrees.

All dampers shall be capable of opening to 90 degrees.

No damper shafts or bearing assemblies shall be allowed. The blades shall be so designed that a portion of the blade itself shall act as bearing by articulating on a section of the damper casing.

2.24.9 The Engineer reserves the right to call for:

a) Detailed calculations and materials selected for all parts.
b) Test reports from an independent testing authority such as the SABS or CSIR.

2.24.10 Operation shall be either by flexible link or by a reusable fire link of the bimetal type.

Blade release shall be at a temperature in excess of 75°C.

Dampers of the reusable link type shall be able to be reset externally by a quadrant.

2.23.11 Combination type fire and air dampers using the reusable bimetallic fire link may be offered for all positions where such combination is practical. In these cases, the fire link shall be the 'McCabe' link, and the damper offered shall also conform to the relevant clauses of 'Manual' and 'Automatic' air dampers detailed previously.

2.25 HEATING EQUIPMENT

2.25.1 Electric Duct Heater

2.25.1.1 Supply and install duct heaters as shown on the drawings with capacities as listed in the schedules.

2.25.1.2 The duct heaters may be of the finned tube element or tubular element type. If tubular elements are used they shall be of the low density type.

2.25.1.3 The duct heaters shall be a current catalogued product of a reputable make.

The duct heaters shall be installed in accordance with manufacturer's requirements.

2.25.1.4 The power wiring inside the duct heater terminal box shall be of the heat resistant type and shall be rated to withstand a continuous surrounding temperature of 90°C.

2.25.1.5 The duct heaters may be either of the slide-in duct type or the complete heater box may be flanged and bolted into the duct system. In the latter case provision shall be made for easy replacement of the heater elements.

2.25.1.6 The duct heaters shall be complete with:

a) Manual re-set cut-out device set between 80 - 100°C.
b) Air flow interlock by means of a pressure or flow switch.

2.25.1.7 The terminal box or duct heaters shall be provided with a wire mesh screen cover to allow for ventilation of the terminals and protection devices. The terminal box shall be painted signal red.

2.25.1.8 Duct heaters shall be internally insulated with 12 mm fibre cement sheet. The fibre cement lining shall continue in the ductwork 600 mm upstream as well as 600 mm downstream of the heater box.

2.25.1.9 Duct heater shall be provided with a nameplate stating the name, model and serial number, capacity and voltage.

2.25.1.10 A local isolator shall be installed by others near the duct heaters for isolation for maintenance purposes.

2.25.2 Electric Terminal Reheaters

2.25.2.1 Supply and install electric terminal reheaters as shown on the drawings with capacities as listed in the schedules.

2.25.2.2 The terminal reheaters shall in general conform to the specification for duct heaters, except that they shall be installed directly upstream of a terminal, or as an integral part of the terminal itself.

2.25.2.3 Control of reheaters shall be from room thermostats, mounted in positions shown on the drawings. Mounting heights shall be of 1600 affl unless specified otherwise.

2.26 AUTOMATIC CONTROL SYSTEM

The Contractor shall employ the services of an Automatic Control Contractor or make use of his own Controls Department who shall be responsible for the engineering, documentation, supply, installation, commissioning and maintenance of the automatic control system to provide the required control sequence as detailed on automatic control drawings supplied by the Specialist Contractor.

The automatic control systems shall be provided by a contractor regularly engaged in similar types of installations and who shall be able to issue documentation including control diagrams and descriptive pamphlets of all selected control equipment.

All equipment shall be installed by one contractor and shall be of one make wherever possible.

Documentation shall be suitable for inclusion in the Operating and Maintenance Manual.

Engineering and management provided by the Control Sub-contractor shall include duties as specified in the Project Specification.

Commissioning shall include all activities necessary to put the installation into operation and to prove that the automatic control system provided the correct control and sequence of operation.

2.26.1 General

2.26.1.1 <u>Documentation</u>

Submit documentation on all items of control equipment. Wiring diagrams of the controls

and electric circuits shall be co-ordinated by the Contractor's Project Engineer. Cross references shall be indicated on both the abovementioned type of diagrams and by submitting these drawings for approval. The Contractor's Project Engineer shall confirm that he has checked the operating sequence of the control system and that the operation will be as shown on the schematic control drawings. Any omission on the schematic control drawings does not relieve the Contractor from the responsibility to provide all items such as may be required for the proper functioning of the control system.

Schematic control drawings shall be updated to include all alterations that may have been necessary and "as-built" drawings shall be framed behind glass or fixed to a cardboard backing, plastic coated and hung on a properly lighted wall in the plantroom.

2.26.1.2 Training of Operator

The Contractor's Project Engineer together with the Control Contractor's Project Engineer will spend up to three days depending of the size of the installation, on site with the Employer's Operator to train him on all aspects of logging, operating and maintaining the system.

2.26.1.3 Maintainability

All items of the installation shall be readily accessible for quick and easy replacement. Adequate space shall be left around all items for the removal and replacement of parts.

2.26.1.4 Exposed Equipment

All equipment installed outside shall be weatherproof.

Controllers, relays and contactors shall be installed in dust proof enclosures.

2.26.1.5 Instrumentation

At all the positions as scheduled or as shown on the drawings, a thermometer shall be provided to indicate accurately the temperature in the relevant fluid. Sockets shall be provided for thermometers installed in pipes and tanks. Thermometer ranges shall be 15^{o}C higher and lower than the thermometer set point. Where remote probe or transmitters are installed for a thermostat, provide remote transmitters with accuracy of plus minus 0.5^{o}C for indicating thermometers.

2.26.2 Control Panels

Panel construction and general arrangement shall be as specified under the relevant clauses for electric panels. All gauges, switches, etc. shall be fixed to the back of the opening panel. All switchgear shall be rail mounted inside the panel.

The control panel may form part of the electrical board if applicable, but shall be housed in a separate compartment.

Controllers and indicators shall be arranged in a logical way and sub-systems controls shall be grouped together so that readings from the gauges on the panel can easily be logged.

2.26.2.1 Relays

Electric relays shall be adequately rated for the breaking of load.

2.26.2.2 Controllers

Sensitivity and speed of response of all temperature and humidity controllers shall be adjustable and regulators shall be set in the field so that they will maintain steady conditions without hunting.

2.26.2.3 Room Thermostats and Humidistats

Room thermostats shall be mounted in positions as indicated on the drawings or 1600 mm above the floor level in a position where they will measure the general room temperature if not shown on the drawings.

Controllers i.e. thermostats, humidistats, etc., shall be of the proportional control type unless two position instruments are specifically specified. Room thermostats shall have a switching sensitivity of not more than 1,5 degrees and humidistats shall have a switching sensitivity of not more than 5 per cent.

Thermostats shall have bimetal, vapour pressure, liquid filled or resistance type sensitive probesd and humidistats shall be of the hygroscopic resistance type.

2.26.2.4 Duct, Pipe and Tank Thermostats

These thermostats shall generally be of the remote sensor type. Thermostats for the protection against fire may be of the rigid stem type. Sensing elements shall be installed in a position where they will respond to a representative temperature in the duct or tank.

Where the distance from the bulb to a panel exceeds the maximum recommended conductor length, a remote transmitter, mounted on the outside of the duct, shall be used between the probe and the display unit on the panel.

Where necessary to prevent physical damage, remote bulbs shall be mounted in perforated tube guards and conductor wires shall be protected by conduit or flexible conduit.

2.26.2.5 Multiple Temperature Indication

Where multiple temperatures must be indicated on a panel, provide one for the following:

continuous individual indication,
single indicator with selector switch or touch panel,
a combination of these two alternatives
or a temperature recorder (logger) with selector switch if specified.

2.26.2.6 Smoke Detectors

Where smoke detectors are to be provided as shown on the drawings in return or extract air ducts, these shall be of the IR or scattered light type able to function at the relevant air speed. Smoke detectors shall close down the relevant system when an (adjustable) concentration of smoke is detected in the air stream. One detector shall be mounted in the return air duct of each system, shall shut down the system when smoke is detected, and shall give an alarm indication (audible and visible) on the main and remote control panels.

2.26.3 Electrical and Electronic Systems

2.26.3.1 Transformers

Electric and electronic temperature control systems operating at voltages less than 220 V AC shall be provided with one or more transformers to supply power for equipment.

Transformers shall have primaries wound for the current available and secondaries wound for the correct control circuit voltage. Each transformer shall have ample capacity to operate simultaneously all apparatus connected to it and shall be capable of carrying a 25 per cent overload for one hour.

Transformers shall be of the open type with screw type terminals. One side of the secondary winding shall be earthed. The primary windings shall be protected by a miniature circuit breaker of suitable capacity. The secondary windings shall be protected by a fuse or thermal cut-out.

2.26.3.2 Relays

Relays shall be of the electronic type. All capacities shall be compatible with the loads controlled.

2.26.3.3 Motors

Motors shall function properly with a line voltage variation of plus or minus 20 per cent. Motor drives may be hydraulic or of the geared type. Gears shall be totally enclosed in dust proof housings and shall be oil immersed. High speed gears may be of a non-metallic composition to ensure quiet operation but all other gears shall be of steel or bronze. Two-position motors shall be of the single direction spring return or reversing type. Proportioning motors shall be of the reversing, shaded pole or capacitor type, capable of stopping at any point in the cycle and starting in either direction from any point. Limit switches shall be provided on all motors to limit the lever travel in either direction.

2.26.3.4 Panels

Electrical control panels shall be as specified under the relevant clauses under "Electrical System".

2.26.4 System Control

2.26.4.1 Each AC system shall be switched on or off by a 7 day timer switch. Each system shall be able to be set to Automatic (Timer), OFF or MANUAL, by means of a three position rotary switch. 'Manual' shall override the 'Timer' sequence. The timer shall be located in the main control board.

2.26.4.2 Temperature control of all ducted AC systems shall be by means of thermostats mounted in the return air ducts of each system unless specified otherwise in the Project Specification. These thermostats shall determine the status of the system, viz.: Ventilation only, Cooling or Heating. Cooling shall be by means of operating the refrigerating compressors, which shall cycle no more than laid down by the manufacturer. Stepwise capacity control shall be used. VRV systems shall be controlled at individual indoor unit level, including the selection of heating or cooling, by means of BS boxes for 3-pipe heat recovery systems, and at individual indoor unit level for thermostat settings, while zones are in either heating or cooling setting.

2.26.4.3 In ducted AC systems, heating shall be by means of duct or plenum mounted electric heaters. The heater banks shall be operated when room temperatures are lower than the set points and after the refrigerating compressors have been shut down.

2.26.4.4 Reheaters shall be controlled by room mounted thermostats which shall control only the reheaters. Reheater coils shall be provided in all supply air diffusers detailed.

2.26.4.5 Fresh air supply to all ducted systems shall be controlled by means of motorized or manual

volume dampers as scheduled. Minimum supply shall be as stated and maximum supply shall be 100% of the airflow to the conditioned spaces unless specified otherwise in the Project Specification. The proportions of fresh and recirculated air shall be determined by comparing the fresh air temperature with the room temperature.

Where an economiser cycle is specified, fresh air quantities shall be increased if:

a) Room temperature is above fresh air temperature, and cooling is required, but with the plant in the 'Ventilation only' mode.

b) Return duct air temperatures are higher than fresh air temperature, with the system in the 'Cooling mode'.

The main control board shall have the following monitoring facilities for each AC installation:

a) Temperature indication (db^{o}C) of ambient temperature.

b) Temperature indication for each system of supply and return air, measured at the evaporator coils.

c) Status of each system: Cooling, Heating, Ventilation (as applicable).

d) ON/OFF status of each electric motor: compressor, fans, dampers, etc., with switchable Voltmeter and Ammeter for each system.

e) ON/OFF status of each heater bank and reheater.

f) Fire condition for each system, ON/OFF, where specified.

g) Warning light indication with lamp test buttons for plant status.

2.27 ELECTRICAL SYSTEM

The Contractor shall employ the service of an Electrical Contractor or make use of his own electrical department who shall be responsible for the engineering, documentation, supply, installation, commissioning and maintenance of the electrical system as detailed in the specification and on the drawings. The electrical installation shall be in accordance with:

a) The SANS Code of Practice for the Wiring of Premises SANS 10142.

b) The local Electricity Supply Authority Bylaws.

c) SANS 10400 and amendments.

Wiring diagrams and control drawings must be submitted for approval before switchboards and control panels are ordered.

Commissioning shall include all the activities necessary to put the installation into operation and to prove that the electrical system provides the correct operating sequence. Commissioning shall also include the close co-operation of the Electrical Contractor, the Contractor and the Control Contractor to provide the results intended.

2.27.1 General

2.27.1.1 Documentation

Submit descriptive literature and detailed selection of all equipment. Documentation shall be compiled in a suitable form to be included in the Operating and Maintenance Manual.

Wiring and Control diagrams shall be framed behind glass or fixed to a cardboard backing and sprayed with a plastic film and hung on a properly lighted wall in the plantroom.

2.27.1.2 Environment

Electrical control panels exposed to the outside shall be completely waterproof.

Electrical panels shall be dust proof and vermin proof; all ventilation openings shall have wire gauze behind the openings.

2.27.1.3 Testing and Authorities

Switchboards and control panels shall be inspected and tested in the manufacturer's workshops. Tests shall be witnessed by the Contractor's Project Engineer and certificates shall be submitted to the Engineer within two weeks.

The Contractor shall pay all fees for tests and inspections and shall be responsible for delivering an installation in full conformance with all requirements of local by-laws.

Materials used in the electrical installation shall be in accordance with the relevant SABS and BS standards.

2.27.2 Power Distribution

2.27.2.1 Cables

Cables shall be PVC insulated 600/1000-volt grade in accordance with SANS 10150 and have copper conductors. Multicore cables shall be single wire armoured. Cable layouts must be planned in advance to minimise cable crossings. Cables must be installed parallel to one another and must be properly fixed. Jointing of cables will not be acceptable. All cables in plantrooms and roof spaces shall be laid on cable trays.

Each cable shall be identified with a metal tag bolted to the cable ends and identification numbers will be stamped on the tags.

2.27.2.2 Cable Connections

Cable ends must be finished off in the type of box as recommended by the manufacturers.

The steel wire cable protection must be properly clamped between conical bushes and held in position with lock nuts.

Cable ends must be properly earthed.

2.27.2.3 Cable Racks

Where cable racks are to be used the cables shall be laid on factory manufactured cable racks. Cable racks shall be current catalogued products of a reputable make complete with all bends, tee pieces, reductions, take offs and clamps.

Cables shall be properly fixed to cable racks with clamps so as to allow no movement of cables. Cable ends shall not have a radius less than specified by the manufacturers. All cable

racks shall be galvanised and painted with a zinc chromate primer and two coats of enamel paint of an approved colour.

Sufficient support brackets shall be provided to prevent sagging of cable racks.

2.27.2.4 Wiring Channels

Channels must be current catalogued products of a reputable make and shall be complete with bends, T-pieces, corner pieces, internal dividing plates, knock out sections, etc., and all other accessories as may be required for the installation.

Channels shall be galvanised or properly cleaned and painted with a lead primer and finished off with two coats of enamel paint with colour as approved by the Architect.
Wiring channels shall be provided with snap on lids or if channels are too wide lids will be neatly screwed on.

Knock out holes for conduits will be provided on the sides of wiring channels in positions as required.

2.27.2.5 Conduits

Generally, all conduits shall be of PVC, and shall bear the SABS mark. The minimum diameter of conduits used shall be 20 mm.

Exposed conduits shall be galvanised.

Conduits installed in damp areas shall be PVC.

PVC conduits must comply with the relevant SANS specification and may only be used as follows:

a) Wherever they are built into concrete or brickwork.

b) On-surface where temperatures will not rise above 35ºC.

c) In areas other than (a) and (b) with saddling at 500 mm centres

Conduits shall be screwed or socketed and bends shall be of the long radius type.

2.27.2.6 Drawboxes

Drawboxes shall be installed so that not more than two bends occur between a draw box and the end of the conduit or between two drawboxes.

2.27.2.7 Fault Level

The fault level of the distribution and protection system shall be in accordance with the fault level of the general electrical installation in the building.

2.27.3 Electric Motors

Motors shall be rated for the correct duty with due consideration of local altitude, ambient temperature and operating voltage.

Winding insulation shall be of at least class D unless specified otherwise.

Motors shall not only be sized for the full load requirements but motor capacity and starting characteristics shall match the inertia and "running up" time of the driven equipment.

Three phase electric motors shall comply with SANS 10948 Part 1 and single phase motors with SANS 1189.

Electric motors shall be provided with the following protection devices:

(a) Adjustable overload on all three phases.
(b) Single phasing protection.

Motors shall be TEFC type unless otherwise specified.

All motors shall be of the same make or of inter-changeable frame size wherever possible to minimise the number of spares to be kept.
Where motors are not inverter driven, they shall be started either direct on line, Star/Delta, or with soft-start, as detailed in the schedules.

2.27.4 Switchboards

2.27.4.1 Switchboards and control panels shall be made by approved specialist manufacturers and shall generally comply with SANS 1180. Modular boards are preferred.
Wiring diagrams and dimensioned drawings of the proposed layout and construction of switchboards and control panels showing the positions of all switches, instruments, bus bars, etc. shall be submitted for approval.

These drawings shall clearly show the size of busbars, method of fixing and clearances, cable entry details, earthing arrangements and fault level of all equipment.

Switchboards shall be of the floor standing or wall mounted type dependent on how specified in the quotation drawings and schedules.

Cable and conduit entry shall either be top or bottom depending upon where the switchboards are positioned.

2.27.4.2 The switchboards shall be constructed of at least 1.2 mm thick sheetmetal with folded edges and welded corners, smoothly finished so as not to show on the finished boards.

Sheetmetal work on switchboards shall be finished as follows:

a) Blast cleaned or wire brushed.
b) Acid cleaned to remove all rust.
c) One coat of zinc chromate primer.
d) Two coats of hard baked enamel of a standard colour. Interiors of boards shall be orange or white.

2.27.4.3 Instrumentation

All instruments, pilot lights, control switches, etc., shall be flush mounted.

2.27.4.3.1 Indicating Instruments

Ammeters, Voltmeters, Wattmeters, Hourmeters, Frequency indicators and Power Factor indicators shall be of the industrial type and shall comply with BS 89.

2.27.4.3.2 Pilot Lights

Pilot lights shall be flush mounted on panel doors and shall be LED's with the following colours:

RUN	:	Green
FAIL	:	Red
INDICATION	:	Amber

2.27.4.4 Starters, Contactors and Relays

Contactors shall be sized to make and break loads 50% higher than the actual imposed load.

Contactors shall also be able to withstand the following:

a) Over current and fault currents that may occur for the time required for its own tripping device to operate.
b) All fault currents until the back-up fuses or circuit breakers trip.
Starters employing more than one contactor switched in stages shall have automatic change overs and shall be interlocked.

Contactors shall be provided with adjustable overload and single phasing tripping devices and shall require manual resetting.

All contactors shall be provided with at least two auxiliary contacts for interlocking and indication.

Each control board shall be provided with an ammeter and a selector switch to indicate Amps drawn in any of the three phases. Ammeters shall be able to carry the starting current as well as any fault currents. Ammeters shall be selected so that the normal current is in the region of 60% of the full scale of the ammeter.

Starters, contactors and relays of a similar make and type shall be employed wherever possible to reduce the number of spares to be kept.

2.27.4.5 Labelling

All labels shall be of the engraved type with black letters on white background. Labels shall fit into purpose made slots and shall be screwed on with small self-tapping screws. Each compartment, switch, contractor and relay shall be labelled in accordance with the function of the equipment controlled. Terminal numbers and all labels shall be in accordance with the framed wiring diagrams mounted on the plantroom walls. All board wiring shall have plastic number markers fixed to both ends of wires and at intermediate points on very long wire runs.

2.27.4.6 Access

All equipment mounted in the electrical switchboards shall have sufficient space to be easily accessible for removal, repair and maintenance.

2.27.4.7 Wiring and Terminals

Copper stranded conductors with PVC insulation shall be used for all small wiring in the switchboard.

Wiring inside the compartments shall be neatly bundled together and fastened with PVC straps and shall run in neat horizontal or vertical lines wherever possible. Wiring from one

compartment to another shall be done in wiring channels with clip on lids.

No more than half of the cross sectional area of the wiring channel shall be filled with wiring.

Wiring shall be connected to terminal blocks and no more than two wires shall be connected to any one terminal. Provide 10% spare terminals for possible future extension or additions to the board. Identification of small wiring shall be in accordance with BS 158.

Wiring connected to panel doors shall be protected by a plastic spiral wrapped around the conductor bundle and sufficient slack or wire shall be provided to allow easy opening of doors without putting any strain on the terminal connections.

Multicore incoming cables shall be connected to the switchboard wiring. All cables entering the switchboard shall be neatly finished off.

2.27.4.8 Extra Space and Provision for Extension

Provision shall also be made to allow for extension of the switchboards to either side for future extensions.

2.27.4.9 Busbars of high conductivity copper shall be provided for all phases and neutral. Busbars shall run over the full length of the board in a separate compartment with removable panels providing access over the full length.

Busbars shall be taped in the phase colours over their length with plastic tape.

Busbars shall be rated for the full load rating of the main incoming isolator. All busbars shall be bolted to insulators, and provision shall be made for extension of the busbars. Cable connections to busbars shall be made by means of lugs bolted to busbars.

2.27.4.10 Earthing

A copper earth bar of 50% of the busbar rating shall be run along the length of the switchboard.

All equipment and all non-continuous sections of the switchboard shall be connected to the earth bar.

2.27.4.11 Panel doors shall be manufactured from steel plate with turned over edges and butt welded corners smoothly finished off so as not to show in the final product. Doors shall be provided with two chrome plated hinges and shall be closed dust proof with key operated fasteners. Provide two keys with each switchboard. Neoprene sealing strips shall be provided on the doors.

Each door shall be fitted with a lockable door isolator that will isolate the section of the board covered by the door.

Interlocks that may stay "alive" after opening of the door will be shrouded and clearly marked as such in red letters on white backing.

2.27.4.12 Switchgear

All switchgear shall comply with the relevant SABS and BS standards such as SANS 10152 and 10156, and BS 5419. A phase failure and reversal relay shall be provided in all switchboards.

All switchgear shall be similar or equivalent to ABB, Schneider or approved equivalent and shall match the switchgear installed under the Electrical Contract. Should other switchgear be offered, this must be stated in the Schedule of Deviations.

2.27.4.12.1 Isolators

All isolators shall be selected to be able to break the circuit under full load conditions and to make under the total system fault level.

Main switches shall be moulded case type isolators. Door isolators shall be of the rotary type with auxiliary contacts as may be required.

2.27.4.12.2 Fuse Switches

Fuse switch breaking capacities shall be approved by the Electrical Engineer.

Fuses shall be replaceable from the front and shall be isolated in the door open position with all necessary safety interlocks.

On/Off positions shall be clearly indicated.

2.27.4.12.3 Moulded Case Circuit Breakers

Moulded case circuit breakers shall be rated to suit the fault level of the system and the load and starting characteristics of the protected equipment.

2.27.4.13 Plenum Lights

Each plenum section of air-conditioners, if applicable, shall be provided with a watertight bulkhead type fitting. Switches with pilot light indication shall be provided on the outside of the plenum next to the plenum door.

The lighting circuit shall not be connected to the air-conditioning switchboard.

2.27.5 Electric Power Supply System

One power supply to the plant area or plantroom will be provided by others. Termination and connection to the air-conditioning equipment, and all power distribution, connection, control, etc., required under this contract, shall be done by the air-conditioning Contractor.

PART 2.2: PROJECT SPECIFICATION

2.2.1 GENERAL

If any requirements contained in this Part 2.2 are at variance with those of Part 2.1, the requirements of Part 2.2 shall rule.

2.2.2 SCOPE OF WORK

The scope of the works of this quotation is the supply, handling, installation, testing, commissioning and handover of one VRV system for the Student Care Centre (SCC) for the NSFAF Head Office Building in Eros, Windhoek.

The following is a detailed description of the work to be done:

1. Supply and installation of one heat recovery type VRV system for the Student Care Centre of the Head Office Building. The condenser unit is to be mounted on the roof slab, and eight (8) ceiling cassette units of 2.5 kW cooling/heating capacities are to be installed in open ceiling structure of the SCC on Ground Floor as detailed on the drawings issued with this tender document.
2. Testing and commissioning of the whole VRV system installation upon completion, and maintenance of the system for 12 months following the Practical Completion Inspection.
3. Minor Builder's and Electrical works required for the HVAC installation as detailed.

2.2.3 SITE DETAILS AND DESIGN CONDITIONS

The site is the new Head Office of the NSFAF and is located off Eros Road in Eros Park, Windhoek. The building is occupied and work will have to be done to ensure the minimum inconvenience for the NSFAF staff affected by the works.
Site access will be subject to conditions imposed by the NSFAF. Health & Safety procedures and regulations shall be strictly enforced to be in full compliance with the law.

Site altitude is approximately 1700m asl. Design ambient temperatures shall be taken as:

Summer	ºC db/ºwb	40,0 / 29,0
Winter	ºC db/ºwb	-3,0 / 1,0

Summer indoor conditions inside the SSC shall generally be 22.5ºC ± 1,5ºC. Winter indoor conditions inside the SSC shall generally be 20.5ºC ± 1,5ºC. No active humidity control is required.

The Second Floor roof level shall be taken to be 5.5m above the ceiling installation level of the indoor units.

2.2.4 WORK BY OTHERS AND CO-ORDINATION ON SITE

2.2.4.1 Builder's work

All builder's work necessary for this contract is to be done by the contractor appointed for the works. The contractor shall employ specialist subcontractors or tradesmen required for the various trades involved and shall be fully responsible for the quality of the work performed for this contract. Specifically, the building works include the following:

- Making access holes in the existing ceilings of Ground Floor where required for the installation of refrigeration and drain pipes.
- Making and fitting ceiling access hatches to match the existing to close the access holes formed, complete with frames.
- Steel support work per the architect's drawings in the SCC open ceiling to provide for supports for refrigeration and drain pipes to detail.
- Chasing and making good of existing plastered walls for vertical pipe runs and outlet boxes for A/C unit controls.
- Patching and painting all surfaces damaged or affected by the above work, painting to match existing.

2.2.4.2 Electrical Work

All electrical work necessary for this contract is to be done by the contractor appointed for the works. The contractor shall employ a qualified electrical subcontractor registered with the City of Windhoek to execute the necessary electrical work and shall be fully responsible for the quality of the work performed for this contract. Specifically, the electrical works include the following:

- Isolators or unswitched socket outlets rated for the duties for all indoor airconditioning units and VRV BS boxes, surface mounted in the ceiling spaces, at positions to be marked by the contractor in all cases. Power for the indoor units and BS boxes shall be taken from new mccb's to be installed in the nearest existing electrical DB on G Floor. No more than five (5) isolators/unswitched socket outlets are to be wired in any one circuit.
- For the outside condenser unit on the roof level, a new TP mccb of correct rating, SCR to match that of the other switchgear, is to be supplied and installed in the existing HVAC MCC. MCCB shall be of the same brand as the existing.
- All other electrical work necessary for the HVAC installation shall form part of this contract. This includes all tubing, outlet and draw boxes, wiring from MCC to condensing plant and indoor units, remote wired controllers, etc. Vertical wireways for unit controllers on walls in the SCC shall be installed under-surface.

2.2.5 VRV SYSTEM

One heat recovery type VRV system is to be supplied and installed in the SSC area of the Ground Floor of the building to provide high quality airconditioning for summer and winter conditions.
The VRV refrigeration pipework with Refnet joints and with BS boxes for the system is shown on the drawings, as are the positions and details of all indoor and outdoor units. The HVAC Schedules detail the types, capacities and dimensions of indoor units and condensing units per system. Best practise for the installation of the VRV system is to be applied, and tenderers are to state names and

experience of the intended refrigeration technicians and mechanics who will do the refrigeration installation work in the tender document.

2.2.6 STANDS, SUPPORTS AND HANGERS

The VRV condenser unit shall be mounted on Tico pads without bolts into the existing concrete plinth so that the water proofing membrane installed by the MC is not damaged, and to provide vibration isolation. The unit shall be installed next to the existing VRV condenser units, using a robust and non-corrodible stand and standard fasteners as specified.
No holes are to be made through the roof slab water proofing membrane without express instruction by the engineer.

Frames and support brackets are to be painted white per the Standard Specification.

2.2.7 CONTROLS

VRV System
Unit control of the each indoor unit shall be by a unit controller with thermostat, wall mounted at the same height as the light switches, and located next to the light switches of the each conditioned room or area. Wireways shall be PVC conduit with round drawboxes installed under plaster in walls, exact runs and positions to be decided on site.
The controller shall feature set-point selection, Fan/Cooling/Heating selection and indication and On/Off switching. Each indoor unit shall allow individual choice of cooling, ventilation or heating throughout the year.

2.2.8 SCHEDULE OF EQUIPMENT

The following items are specified on the drawings and shall be supplied and installed by the contractor. As all of the existing VRV systems in the building are Daikin equipment, no alternative to the specified equipment shall be accepted.

1. GROUND FLOOR STUDENT CARE CENTRE

VRV SYSTEM HEAT RECOVERY TYPE AS DAIKIN

		Unit Model
CONDENSER UNIT	SSC GF	REYQ 10 U

INDOOR UNITS

Unit No.s	Room Number and Description	Unit Model
1 - 8	Student Care Centre	FXFQ-25B

Decorative ceiling panel: Daikin BYCQ140EB (Black)

SECTION V PART 3 Schedule of Information

Bidders shall complete the following schedule, and add technical brochures for any items which differ from those specified in Part 2 above and the drawings.

SCC VRV SYSTEM

1.1 VRV INDOOR UNITS OF THE CEILING CASSETTE TYPE

1. (a) Make, Model and cooling capacity (EQUIVALENT TO Daikin FXFQB)

   Nom cooling cap 2.5 kW .....

   (b) Country of origin …… .....

2. Cooling capacity derating factor of units to be applied for site conditions:

   % reduction of nominal capacity.....%

   At a condenser air entering temperature of ..... °C

   Evaporator air entering temperature of ..... °C

   Evaporator air leaving temperature of..... °C

3. Power requirement

   2.5 kW unit ..... V ..... Hz ..... Amp .....kW

   .....

4. Detail of indoor cabinet construction and material .....

   .....

5. Decorative panel code number and colour:.....

6. Detail of hangers and fittings .....

1.2 VRV OUTDOOR UNIT

1.2.1 VRV HEAT RECOVERY TYPE

1. Make and Model .....
2. Unit Capacity kW cooling.....

3. Unit capacity kW heating .....

4. Is the unit offered a heat recovery type unit? .....

5. Compressor types.....

6. Capacity control: detail.....

7. Finish and colour of outdoor unit.....

8. Other colours available.....

9. Detail of refrigerant interconnecting piping .....

   .....

   .....

10. Details of thermal insulation .....

    .....

    .....

    .....

11. Noise level of outdoor unit at maximum fan speed at 3m distance.....dB(A)

12. Overall dimensions of Outdoor unit.....

13. Derating (nominal capacity) conditions of the unit offered (detail).....

14. Power supply required: ……A, ……V, ……phase, 50 Hz

1.3 DERATING FACTORS USED

1. For altitude .....%

2. For ambient temperature .....%

PART 3 – Conditions of Contract and Contract Forms

Section VI - General Conditions of Contract

Table of Clauses

General Conditions of Contract

A. General

1. Definitions 1.1 Boldface type is used to identify defined terms.

(a) The Accepted Contract Amount means the amount accepted in the Notification of award for the execution and completion of the Works and the remedying of any defects.

(b) The Activity Schedule is a schedule of the activities comprising the construction, installation, testing, and commissioning of the Works in a lump sum contract. It includes a lump sum price for each activity.

(c) The Adjudicator is the person appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in GCC 23.

(d) Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid.

(e) Compensation Events are those defined in GCC Clause 41 hereunder.

(f) The Completion Date is the date of completion of the Works as certified by the Project Manager, in accordance with GCC Sub-Clause 53.1.

(g) The Contract is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in GCC Sub-Clause 2.3 below.

(h) The Contractor is the party whose Bid to carry out the Works has been accepted by the Employer.

(i) The Contractor's Bid is the completed bidding document submitted by the Contractor to the Employer.

(j) The Contract Price is the Accepted Contract Amount stated in the Notification of award and thereafter as adjusted in accordance with the Contract.

(k) Days are calendar days; months are calendar months unless otherwise stated.

(l) Dayworks are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant.

(m) A Defect is any part of the Works not completed in

accordance with the Contract.

(n) The Defects Liability Certificate is the certificate issued by Project Manager upon correction of defects by the Contractor.

(o) The Defects Liability Period is the period **named in the SCC** pursuant to Sub-Clause 33.1 and calculated from the Completion Date.

(p) Adjudicator means the single person appointed under Clause 23.

(q) Drawings means the drawings of the Works, as included in the Contract, and any additional and modified drawings issued by (or on behalf of) the Employer in accordance with the Contract, include calculations and other information provided or approved by the Project Manager for the execution of the Contract.

(r) The Employer is the party who employs the Contractor to carry out the Works, **as specified in the SCC**.

(s) Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

(t) "In writing" or "written" means hand-written, type-written, printed or electronically made, and resulting in a permanent record;

(u) The Initial Contract Price is the Contract Price listed in the Employer's Notification of award.

(v) The Intended Completion Date is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is **specified in the SCC**. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order.

(w) Materials are all supplies, including consumables, used by the Contractor for incorporation in the Works.

(x) Plant is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.

(y) The Project Manager is the person **named in the SCC** (or any other competent person appointed by the Employer and notified to the Contractor, to act in replacement of the Project Manager) who is responsible for supervising the execution of the Works and administering the Contract.

(z) SCC means Special Conditions of Contract

(aa) The Site is the area **defined as such in the SCC**.

(bb) Site Investigation Reports are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

(cc) Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager.

(dd) The Start Date is **given in the SCC**. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

(ee) A Subcontractor is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.

(ff) Temporary Works are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.

(gg) A Variation is an instruction given by the Project Manager which varies the Works.

(hh) The Works are what the Contract requires the Contractor to construct, install, and turn over to the Employer, **as defined in the SCC**.

2. Interpretation

2.1 In interpreting these GCC, words indicating one gender include all genders. Words indicating the singular also include the plural and words indicating the plural also include the singular. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Project Manager shall provide instructions clarifying queries about these GCC.

2.2 If sectional completion is **specified in the SCC**, references in the GCC to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

2.3 The documents forming the Contract shall be interpreted in the following order of priority:

(a) Agreement,

(b) Notification of award,

(c) Contractor's Bid,

(d) Special Conditions of Contract,

(e) General Conditions of Contract,

(f) Specifications,

(g) Drawings,

(h) Bill of Quantities, and

(i) any other document **listed in the SCC** as forming part of the Contract.

3. Language and Law

3.1 The language of the Contract must be English and the law governing the Contract is the Law of Namibia.

4. Project Manager's Decisions

4.1 Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Employer and the Contractor in the role representing the Employer.

5. Delegation

5.1 Otherwise **specified in the SCC**, the Project Manager may delegate any of his duties and responsibilities to other people, except to the Adjudicator, after notifying the Contractor, and may revoke any delegation after notifying the Contractor.

6. Communications

6.1 Communications between parties that are referred to in the Conditions shall be effective only when in writing to the addresses **specified in the SCC.** A notice shall be effective only when it is delivered.

7. Subcontracting

7.1 The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations.

8. Other Contractors

8.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of Other Contractors, as **referred to in the SCC.** The Contractor shall also provide facilities and services for them as described in the Schedule. The Employer may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification.

9. Personnel and Equipment

9.1 The Contractor shall employ the key personnel and use the equipment identified in its Bid, to carry out the Works or other personnel and equipment approved by the Project Manager. The Project Manager shall approve any proposed replacement of key personnel and equipment only if their relevant qualifications or characteristics are substantially equal to or better than those proposed in the Bid.

9.2 If the Project Manager asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

10. Employer's and Contractor's Risks

10.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

11. Employer's Risks

11.1 From the Start Date until the Defects Liability Certificate has been issued, the following are Employer's risks:

(a) The risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to

(i) use or occupation of the Site by the Works or for the purpose of the Works, which is the unavoidable result of the Works or

(ii) negligence, breach of statutory duty, or interference with any legal right by the Employer or by any person employed by or contracted to him except the Contractor.

(b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.

11.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Employer's risk except loss or damage due to

(a) a Defect which existed on the Completion Date,

(b) an event occurring before the Completion Date, which was not itself an Employer's risk, or

(c) the activities of the Contractor on the Site after the

Completion Date.

12. Contractor's Risks

12.1 From the Starting Date until the Defects Liability Certificate has been issued, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Works, Plant, Materials, and Equipment) which are not Employer's risks are Contractor's risks.

13. Insurance

13.1 The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles **stated in the SCC** for the following events which are due to the Contractor's risks:

(a) loss of or damage to the Works, Plant, and Materials;

(b) loss of or damage to Equipment;

(c) loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and

(d) personal injury or death.

13.2 Policies and certificates for insurance shall be delivered by the Contractor to the Project Manager for the Project Manager's approval within 21 days after issue of notification of award. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

13.3 If the Contractor does not provide any of the policies and certificates required, the Employer may effect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.

13.4 Alterations to the terms of insurance shall not be made without the approval of the Project Manager.

13.5 Both parties shall comply with any conditions of the insurance policies.

13.6 The policies which are in the joint names of the Contractor and the Employer shall contain a clause to include a waiver of subrogation of the Contractor's rights to the insurance carrier against the Employer.

14. Site Data

14.1 The Contractor shall be deemed to have examined any Site Data **referred to in the SCC**, supplemented by any information available to the Contractor.

15. Contractor to Construct the Works	15.1	The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.
16. The Works to Be Completed by the Intended Completion Date	16.1	The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program submitted by the Contractor, as updated with the approval of the Project Manager, and complete them by the Intended Completion Date.
17. Approval by the Project Manager	17.1	The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Project Manager, for his approval.
	17.2	The Contractor shall be responsible for design of Temporary Works.
	17.3	The Project Manager's approval shall not alter the Contractor's responsibility for design of the Temporary Works.
	17.4	The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.
	17.5	All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Project Manager before this use.
18. Safety	18.1	The Contractor shall be responsible for the safety of all activities on the Site.
19. Discoveries	19.1	Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the Employer. The Contractor shall notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them.
20. Possession of the Site	20.1	The Employer shall, after receiving the Performance security, the insurance covers and the Program for the Works all as per requirements, give possession of all parts of the Site to the Contractor within thirty days for execution of works in accordance to the Program for the Works. If possession of a part is not given by the date **stated in the SCC,** the Employer shall be deemed to have delayed the start of the relevant activities, and this shall be a Compensation Event.
21. Access to the Site	21.1	The Contractor shall allow the Project Manager and any person authorized by the Project Manager access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.

22. Instructions

22.1 The Contractor shall carry out all instructions of the Project Manager which comply with the applicable laws where the Site is located.

22.2 The Contractor shall permit persons appointed by the Employer to inspect the Site and/or the accounts and records of the Contractor and its sub-contractors relating to the performance of the Contract, and to have such accounts and records audited by auditors appointed by the Employer if required by the Employer. The Contractor's attention is drawn to Sub-Clause 57.1 which provides, inter alia, that acts intended to materially impede the exercise of the inspection and audit rights provided for under Sub-Clause 22.2 constitute a prohibited practice subject to contract termination.

23. Appointment of the Adjudicator

23.1 The Adjudicator shall be appointed jointly by the Employer and the Contractor, at the time of the Employer's issuance of the Notification of award. If, in the notification of award, the Employer does not agree on the appointment of the Adjudicator, the Employer will request the Appointing Authority **designated in the SCC**, to appoint the Adjudicator within 15 days of receipt of such request.

23.2 Should the Adjudicator resign or die, or should the Employer and the Contractor agree that the Adjudicator is not functioning in accordance with the provisions of the Contract; a new Adjudicator shall be jointly appointed by the Employer and the Contractor. In case of disagreement between the Employer and the Contractor, within 30 days, the Adjudicator shall be designated by the Appointing Authority **designated in the SCC** at the request of either party, within 30 days of receipt of such request.

24. Procedure for Disputes

24.1 If the Contractor believes that a decision taken by the Project Manager was either outside the authority given to the Project Manager by the Contract or that the decision was wrongly taken, the decision shall be referred to the Adjudicator within 15 days of the notification of the Project Manager's decision.

24.2 The Adjudicator shall give a decision in writing within 30 days of receipt of a notification of a dispute.

24.3 The Adjudicator shall be paid by the hour at the **rate specified in the SCC,** together with reimbursable expenses of the types **specified in the SCC**, and the cost shall be divided equally between the Employer and the Contractor, whatever decision is reached by the Adjudicator. Either party may refer a decision of the Adjudicator to an Arbitrator within thirty (30) days of the Adjudicator's written decision. If neither party refers the dispute to arbitration within the above thirty (30) days, the Adjudicator's

decision shall be final and binding.

24.4 The arbitration shall be conducted in accordance with the arbitration procedures published by the institution named and in the place specified **in the SCC.**

B. Time Control

25. Program

25.1 Within the time **stated in the SCC**, after the date of the Notification of award, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works. In the case of a lump sum contract, the activities in the Program shall be consistent with those in the Activity Schedule.

25.2 An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.

25.3 The Contractor shall submit to the Project Manager for approval an updated Program at intervals no longer than the period **stated in the SCC.** If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount **stated in the SCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted. In the case of a lump sum contract, the Contractor shall provide an updated Activity Schedule within 15 days of being instructed to by the Project Manager.

25.4 The Project Manager's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Project Manager again at any time. A revised Program shall show the effect of Variations and Compensation Events.

26. Extension of the Intended Completion Date

26.1 The Project Manager shall extend the Intended Completion Date if a Compensation Event(as defined in GCC 41) occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.

26.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a

delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

27. Acceleration

27.1 When the Employer wants the Contractor to finish before the Intended Completion Date, the Project Manager shall obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Employer accepts these proposals, the Intended Completion Date shall be adjusted accordingly and confirmed by both the Employer and the Contractor.

27.2 If the Contractor's priced proposals for acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.

28. Delays Ordered by the Project Manager

28.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.

29. Management Meetings

29.1 Either the Project Manager or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

29.2 The Project Manager shall record the business of management meetings and provide copies of the record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken shall be decided by the Project Manager either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

30. Early Warning

30.1 The Contractor shall warn the Project Manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price, or delay the execution of the Works. The Project Manager may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible.

30.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.

C. Quality Control

31. Identifying

31.1 The Project Manager shall check the Contractor's work and

Defects

notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Project Manager may instruct the Contractor to search for a Defect and to uncover and test any work that the Project Manager considers may have a Defect.

32. Tests

32.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, the test shall be a Compensation Event.

33. Correction of Defects

33.1 The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion, and is **defined in the SCC.** The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

33.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.

34. Uncorrected Defects

34.1 If the Contractor has not corrected a Defect within the time specified in the Project Manager's notice, the Project Manager shall assess the cost of having the Defect corrected, and the Contractor shall pay this amount.

D. Cost Control

35. Contract Price

35.1 In the case of an admeasurement contract, the Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to calculate the Contract Price. The Contractor will be paid for the quantity of the work accomplished at the rate in the Bill of Quantities for each item.

35.2 In the case of a lump sum contract, the Activity Schedule shall contain the priced activities for the Works to be performed by the Contractor. The Activity Schedule is used to prepare interim valuations of works done.

Any errors or inconsistencies including front loading detected in the Activity Schedule at any time during the execution of the project shall be resolved as directed as by the Project Manager.

36. Changes in the Contract Price

36.1 In the case of an admeasurement contract:

(a) If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 1 percent of the Initial Contract Price, the Project Manager

shall adjust the rate to allow for the change.

(b) The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent, except with the prior approval of the Employer.

(c) If requested by the Project Manager, the Contractor shall provide the Project Manager with a detailed cost breakdown of any rate in the Bill of Quantities.

36.2 In the case of a lump sum contract, the Activity Schedule shall be amended by the Contractor to accommodate changes of Program or method of working made at the Contractor's own discretion. Prices in the Activity Schedule shall not be altered when the Contractor makes such changes to the Activity Schedule.

37. Variations

37.1 All Variations shall be included in updated Programs, and, in the case of a lump sum contract, also in the Activity Schedule, produced by the Contractor.

37.2 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Project Manager shall assess the quotation, which shall be given within seven (7) days of the request or within any longer period stated by the Project Manager and before the Variation is ordered.

37.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs.

37.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

37.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

37.6 In the case of an admeasurement contract, if the work in the Variation corresponds to an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in Sub-Clause 38.1 or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of

new rates for the relevant items of work.

38. Cash Flow Forecasts

38.1 When the Program, or, in the case of a lump sum contract, the Activity Schedule, is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast.

39. Payment Certificates

39.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously.

39.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor.

39.3 The value of work executed shall be determined by the Project Manager.

39.4 The value of work executed shall comprise:

(a) In the case of an admeasurement contract, the value of the quantities of work in the Bill of Quantities that have been completed; or

(b) In the case of a lump sum contract, the value of work executed shall comprise the value of completed activities in the Activity Schedule.

39.5 The value of work executed shall include the valuation of Variations and Compensation Events.

39.6 The Project Manager may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

39.7 Unless **otherwise specified in the SCC** Interim Payment may be made for Plant and Material delivered on site ready for incorporation within reasonable period of time in the permanent works, subject to the Contractor transferring ownership to the Employer and providing, where applicable, the right of the transfer of ownership vested upon the Contractor by its supplier.

Notwithstanding the transfer of ownership the responsibility for care and custody thereof together with the risk of loss or damage thereto shall remain with the Contractor until taking over of the works or part thereof in which such Plant and Materials are incorporated and shall make good at its own cost any loss or damage that may occur to the works or part thereof from any cause whatsoever during such period prior to the taking over.

40. Payments

40.1 Payments shall be adjusted for deductions for advance payments and retention. The Employer shall pay the Contractor the

amounts certified by the Project Manager within 30 days of the date of each certificate. If the Employer makes a late payment, the Contractor shall be paid interest on the late payment in the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made at the prevailing rate of interest at the legal rate.

40.2 If an amount certified is increased in a later certificate or as a result of an award by the Adjudicator or an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.

40.3 Unless otherwise stated, all payments and deductions shall be paid or charged in the proportions to the Contract Price.

40.4 Items of the Works for which no rate or price has been entered in shall not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

41. Compensation Events

41.1 The following shall be Compensation Events:

(a) The Employer does not give access to a part of the Site by the Site Possession Date pursuant to GCC Sub-Clause 20.1.

(b) The Employer modifies the Schedule of Other Contractors in a way that affects the work of the Contractor under the Contract.

(c) The Project Manager orders a delay or does not issue Drawings, Specifications, or instructions required for execution of the Works on time.

(d) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects.

(e) The Project Manager unreasonably does not approve a subcontract to be let.

(f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Notification of award from the information issued to bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.

(g) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Employer, or

additional work required for safety or other reasons.

(h) Other contractors, public authorities, utilities, or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.

(i) The advance payment is delayed.

(j) The effects on the Contractor of any of the Employer's Risks.

(k) The Project Manager unreasonably delays issuing a Certificate of Completion.

(l) In situations of Force Majeure which makes the contractor's performance of its obligations under the Contract impossible or so impractical as to be considered impossible under the circumstances. Such events shall be limited to:

(a) reason of any exceptionally adverse weather conditions (as specified in the BDS) and

(b) reason of civil commotion, strike or lockout affecting any of the trades employed upon the Works or any of the trades engaged in the preparation, manufacture or transportation of any of the goods or materials required for the Works.

41.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Project Manager shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.

41.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast cost has been provided by the Contractor, it shall be assessed by the Project Manager, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Project Manager shall adjust the Contract Price based on the Project Manager's own forecast. The Project Manager shall assume that the Contractor shall react competently and promptly to the event.

41.4 The Contractor shall not be entitled to compensation to the extent

that the Employer's interests are adversely affected by the Contractor's not having given early warning or not having cooperated with the Project Manager.

42. Tax

42.1 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the date 30 days before the submission of bids for the Contract and the date of the last Completion certificate. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are not already reflected in the Contract Price or are a result of GCC Clause 44.

43. Currencies

43.1 Where payments are made in currencies other than the currency of the Employer's country **specified in the SCC,** the exchange rates used for calculating the amounts to be paid shall be the exchange rates stated in the Contractor's Bid.

44. Price Adjustment

44.1 Prices shall be adjusted for fluctuations in the cost of inputs only if **provided for in the SCC.** If so provided, the amounts certified in each payment certificate, before deducting for Advance Payment, shall be adjusted by applying the respective price adjustment factor to the payment amounts due in each currency. A separate formula of the type indicated below applies to each Contract currency:

$$\mathbf{P_c = A_c + B_c\ Imc/Ioc}$$

where:

P_c is the adjustment factor for the portion of the Contract Price payable in a specific currency "c."

A_c and B_c are coefficients[2] **specified in the SCC,** representing the nonadjustable and adjustable portions, respectively, of the Contract Price payable in that specific currency "c;" and

Imc is the index prevailing at the end of the month being invoiced and Ioc is the index prevailing 28 days before Bid opening for inputs payable; both in the specific currency "c."

44.2 If the value of the index is changed after it has been used in a calculation, the calculation shall be corrected and an adjustment made in the next payment certificate. The index value shall be deemed to take account of all changes in cost due to fluctuations in costs.

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[2] *The sum of the two coefficients A_c and B_c should be 1 (one) in the formula for each currency. Normally, both coefficients shall be the same in the formulae for all currencies, since coefficient A, for the nonadjustable portion of the payments, is a very approximate figure (usually 0.15) to take account of fixed cost elements or other nonadjustable components. The sums of the adjustments for each currency are added to the Contract Price. [To be transferred to the User Guide]*

45. Retention

45.1 The Employer shall retain from each payment due to the Contractor the proportion **stated in the SCC** until Completion of the whole of the Works.

45.2 Upon the issue of a Certificate of Completion of the Works by the Project Manager, in accordance with GCC 53.1, half the total amount retained shall be repaid to the Contractor and half when the Defects Liability Period has passed and the Project Manager has certified that all Defects notified by the Project Manager to the Contractor before the end of this period have been corrected. The Contractor may substitute retention money with an "on demand" Bank guarantee.

46. Liquidated Damages

46.1 The Contractor shall pay liquidated damages to the Employer at the rate per day **stated in the SCC** for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount **defined in the SCC.** The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.

46.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in GCC Sub-Clause 40.1.

47. Bonus

47.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day **stated in the SCC** for each day (less any days for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.

48. Advance Payment

48.1 The Employer shall make advance payment to the Contractor of the amounts **stated in the SCC** by the date **stated in the SCC,** against provision by the Contractor of an Unconditional Bank Guarantee in a form and by a bank acceptable to the Employer in amounts equal to the advance payment. The Guarantee shall remain effective until the advance payment has been repaid, but the amount of the Guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest shall not be charged on the advance payment.

48.2 The Contractor is to use the advance payment only to pay for Equipment, Plant, Materials, and mobilization expenses required specifically for execution of the Contract. The Contractor shall demonstrate that advance payment has been used in this way by

supplying copies of invoices or other documents to the Project Manager.

48.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, Bonuses, or Liquidated Damages.

49. Securities

49.1 The Performance Security shall be provided to the Employer no later than the date specified in the Notification of award and shall be issued in an amount **specified in the SCC,** by a bank and denominated in the Namibian Dollars. The Performance Security shall be valid until a date 30 days from the date of issue of the Certificate of Completion in the case of a Bank Guarantee.

49.2 (a)Where the contractor has benefitted from the application of the Margin of Preference for employment of local manpower, it shall:

(i) in the execution of the contract, fulfill its obligation of maintaining local manpower force for 80 % or more of the man-days deployed in the execution of the Works with which it satisfied the criteria of eligibility for being awarded the contract in application of the Margin of Preference; and

(ii) concurrently with the above performance security, provide a preference security to guarantee it will fulfill its obligation in that respect.

(b) For contracts above N$ 5 M, the preference security shall be in the form of an “on demand” bank guarantee for an amount in a convertible currency equivalent to the difference between its bid price and the bid price of the lowest bid if the Margin of Preference was not applicable. It shall be issued by a commercial bank located in the Republic of [Insert name of country].

(c) For contracts up to N$ 5 M, an amount equal to the value of the preference security shall be retained from progressive payments to the contractor, to constitute the guarantee for the preference security.

(d) The preference security shall be valid until the Contractor has completed the Works and a Completion Certificate has been issued by the Employer’s Representative as per GCC 53.

(e) The cost of providing the security shall be borne by the Contractor.

49.3 Where a Preference Security is applicable:

(i) the Employer's Representative shall monitor the employment of local manpower throughout the execution of the contract and shall from time to time request a report from the contractor on the percentage of total men-days deployed using local manpower.

(ii) the Contractor shall submit the local manpower employment reports as often as it is reasonably requested by the Employer's Representative.

(iii) the Employer's and Contractor's representatives shall consult each other to ensure that the Contractor's obligation towards local manpower employment is met during the Works execution.

(iv) At the time of works completion, the Contractor shall submit a certified audited report to the Employer to substantiate the actual percentage of local manpower employed throughout the execution of the works.

(v) The preference security shall be forfeited by the employer in case of failure on the part of the contractor to employ at least 80% of the local manpower in the execution of the Works.

50. Dayworks

50.1 If applicable, the Dayworks rates in the Contractor's Bid shall be used only when the Project Manager has given written instructions in advance for additional work to be paid for in that way.

50.2 All work to be paid for as Dayworks shall be recorded by the Contractor on forms approved by the Project Manager. Each completed form shall be verified and signed by the Project Manager within two days of the work being done.

50.3 The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.

51. Cost of Repairs

51.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

52. Labour Clause

52.1 (a) The rates of remuneration and other conditions of work of the employees of the Contractor shall not be less favorable than those established for work of the same character in the trade concerned-

(i) by collective agreement applying to a substantial proportion of the workers and employers in the trade

concerned;

(ii) by arbitration awards; or

(iii) by Remuneration Regulations made under the Labour Act, 2007.

(b) Where remuneration and conditions of work are not regulated in a manner referred to at (a) above, the rates of the remuneration and other conditions of work shall be not less favourable than the general level observed in the trade in which the contractor is engaged by employers whose general circumstances are similar.

52.2 No Contractor shall be entitled to any payment in respect of work performed in the execution of the contract unless he has, together with his claim for payment, filed a certificate:

(a) stating the rates of remuneration and hours of work of the various categories of employees employed in the execution of the contracts;

(b) stating whether any remuneration payable in respect of work done is due;

(c) containing such other information as the Chief Executive Officer of the Public Body administering the contract may require to satisfy himself that the provisions under this clause have been complied with.

52.3 Where the Chief Executive Officer of the Public Entity administering the contract is satisfied that remuneration is still due to an employee employed under this contract at the time the claim for payment is filed under subsection 39.1, he may, unless the remuneration is sooner paid by the Contractor, arrange for the payment of the remuneration out of the money payable under this contract.

52.4 Every Contractor shall display a copy of this clause of the contract at the place at which the work required by the contract is performed.

E. Finishing the Contract

53. Completion

53.1 The Contractor shall request the Project Manager to issue a Certificate of Completion of the Works, and the Project Manager shall do so upon deciding that the whole of the Works is completed.

54. Taking Over

54.1 The Employer shall take over the Site and the Works within seven days of the Project Manager's issuing a certificate of Completion.

55. Final Account

55.1 The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 60 days of receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 60 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.

56. Operating and Maintenance Manuals

56.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates **stated in the SCC.**

56.2 If the Contractor does not supply the Drawings and/or manuals by the dates **stated in the SCC** pursuant to GCC Sub-Clause 55.1**,** or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount **stated in the SCC** from payments due to the Contractor.

57. Termination

57.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

57.2 Fundamental breaches of Contract shall include, but shall not be limited to, the following:

(a) the Contractor stops work for 30 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Project Manager;

(b) the Project Manager instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within 30 days;

(c) the Employer or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(d) a payment certified by the Project Manager is not paid by the Employer to the Contractor within 60 days of the date of the Project Manager's certificate;

(e) the Project Manager gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Project Manager;

(f) the Contractor does not maintain a Security, which is required;

(g) the Contractor has delayed the completion of the Works by

the number of days for which the maximum amount of liquidated damages can be paid, as **defined in the SCC**; or

(h) if the Contractor, in the judgment of the Employer, has engaged in corrupt or fraudulent practices in competing for or in executing the Contract, pursuant to GCC Clause 57.1.

57.3 When either party to the Contract gives notice of a breach of Contract to the Project Manager for a cause other than those listed under GCC Sub-Clause 56.2 above, the Project Manager shall decide whether the breach is fundamental or not.

57.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

57.5 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.

58. Fraud and Corruption

58.1 If the Employer determines that the Contractor has engaged in corrupt, fraudulent, collusive, coercive or obstructive practices, in competing for or in executing the Contract, then the Employer may, after giving 15 days' notice to the Contractor, terminate the Contractor's employment under the Contract and expel him from the Site, and the provisions of Clause 57 shall apply as if such expulsion had been made under Sub-Clause 57.5 [Termination by Employer].

58.2 Should any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or obstructive practice during the execution of the Works, then that employee shall be removed in accordance with Clause 9.

58.3 For the purposes of this Sub-Clause:

(i) "corrupt practice" is the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;

(ii) "fraudulent practice" is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

(iii) "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

(iv) "coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

(v) "obstructive practice" is

(a) deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede an investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or

(b) acts intended to materially impede the exercise of an inspection and audit rights provided for under Sub-Clause 22.2.

59. Payment upon Termination

59.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as **indicated in the SCC.** Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.

59.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.

60. Property

60.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer if the Contract is terminated because of the Contractor's default.

61. Release from Performance

61.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer or the Contractor, the Project Manager shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which a commitment was made.

Section VII. Special Conditions of Contract

[Except where otherwise indicated, all SCC *should be filled in by the* Employer *prior to issuance of the Bidding Documents. Schedules and reports to be provided by the* Employer *should be annexed]*

These clauses should be read in conjunction with the General Conditions of Contract

A. General	
GCC 1.1 (r)	The Employer is **NAMIBIA STUDENTS FINANCIAL ASSISTANCE FUND**,
GCC 1.1 (v)	The Intended Completion Date for the whole of the Works shall be within 45 day after acceptance of contract.
GCC 1.1 (y)	The Project Manager is V Fischer-Buder Consulting Engineers, represented by Mr V Fischer-Buder, 0811285088, volker@vfbce.com.
GCC 1.1 (aa)	The Site is located at: **746, Eros Road, PO Box 23053, Windhoek** and is defined in drawings as listed in Section V Part 1
GCC 1.1 (dd)	"The Start Date shall be 22 June 2024
GCC 1.1 (hh)	The Works consist of Supply and Installation of air conditioners at the Student Care Centre of the NSFAF Head Office and related electrical and small builders' work.
GCC 2.2	Sectional Completions are: N/A
GCC 2.3(i)	The following documents also form part of the Contract: Drawings as listed in Section V Part 1 of the document; Appendix 1 Bills of Quantities
GCC 5.1	The Project manager may delegate any of his duties and responsibilities.
GCC 6.1	Delivery address for notices is: Employer: **NSFAF, 746, Eros Road, PO Box 23053, Windhoek** Contractor: *[Insert contracts full address]*
GCC 8.1	Schedule of other contractors: None
GCC 13.1	Except for the cover mentioned in (d)(i) hereunder, the other insurance covers shall be in the joint names of the Contractor and the Employer and the minimum insurance amounts shall be:

	(a) for the Works, Plant and Materials: (for *the full amount of the works including removal of debris, professional fee etc...)* (b) for loss or damage to Equipment: (*for the replacement value of the equipment that the contractor intends to use on site until the taking over by the Employer.* (c) for loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract for an amount limited to N$ 500 000.00. (d) for personal injury or death: (i) of the Contractor's employees:*[The Contractor shall take an adequate insurance cover for its employees for any claim arising in the execution of the works]*. (ii) of other people: N$ 2 million public liability (e) for loss or damage to materials on-site and for which payment have been included in the Interim Payment Certificate, where applicable. The Contractor shall choose to take the insurance covers indicated above as separate covers or a combination of the Contractor's All Risks coupled with the Employer's liability and First Loss Burglary, after approval of the Employer. All insurance covers shall be of nil or the minimum possible deductibles at sole expense of the contractor.
GCC 14.1	Site Data are: N/A
GCC 20.1	The Site Possession Date(s) shall be: N/A
GCC 23.1 & GCC 23.2	Appointing Authority for the Adjudicator: **No Adjudicator shall be appointed for this Contract.**
GCC 24.	In case a dispute of any kind arises between the Employer and the Contractor in connection with, or arising out of, the contract or the execution of works or after completion of works and whether before or after repudiation or other termination of Contract, including any dispute as to any opinion, instruction, determination, certificate or valuation of the Employer's Representative, the matter in dispute shall, in the first place, be referred in writing to the employer's representative, with a copy to the other party. The Employer and the Contractor shall make every effort to resolve the dispute amicably by direct informal negotiation. If, after thirty (30) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the Public Entity or the Contractor may give notice to the other party of its intention to refer the matter to: "commence arbitration, as hereinafter provided, as to the matter in

	dispute, and no arbitration in respect of this matter may be commenced unless such notice is given".
GCC 24.3	Hourly rate and types of reimbursable expenses to be paid to the Adjudicator: **Not applicable.**
GCC 24.4	**" Not Applicable"**
B. Time Control	
GCC 25.1	The Contractor shall submit for approval a Program for the Works within 21 days from the date of the Notification of award.
GCC 25.3	The period between Program updates is **45** days. The amount to be withheld for late submission of an updated Program is *N$ 5 000.00*
C. Quality Control	
GCC 33.1	The Defects Liability Period is: 365 days.
GCC 39.7	Interim Payment for Plant and Material on site **is** applicable.
D. Cost Control	
GCC 41.1 (l**)**	*N/A*
GCC 43.1	The currency of the Employer's country is: **Namibian Dollars.**
GCC 44.1	The Contract *is not* subject to price adjustment in accordance with GCC Clause 44, and the following information regarding coefficients **does not** apply. The coefficients for adjustment of prices are: (a) For currency *[insert name of currency]*: (i) *[Insert percentage]* percent nonadjustable element (coefficient A). (ii) *[Insert percentage]* percent adjustable element (coefficient B).

	(b) For currency *[insert name of currency]*: (i) *[Insert percentage]* percent nonadjustable element (coefficient A). (ii) *[Insert percentage]* percent adjustable element (coefficient B). The Index I for local currency shall be *[insert index]*. The Index I for the specified international currency shall be *[insert index]*. *[These proxy indices shall be proposed by the Contractor, subject to acceptance by the* Employer*]* The Index I for currencies other than the local currency and the specified international currency shall be *[insert index]*. *[These proxy indices shall be proposed by the Contractor, subject to acceptance by the* Employer.*]*
GCC 45.1	The proportion of payments retained is: 10% of progress value up to a maximum of 5% of contract value until Practical Completion is certified, after which the retention is reduced to 2.5% of final contract value, released on completion of the 12 months' retention period.
GCC 46.1	The liquidated damages for the whole of the Works are 1% per week to a maximum of 10% of the contract amount.
GCC 47.1	The Bonus for the whole of the Works is N$ 0.00 per day. The maximum amount of Bonus for the whole of the Works is 0% of the final Contract Price.
GCC 48.1	The Advance Payments shall be: None.
GCC 49.1	The Performance Security amount is 10% of the contract amount. (a) Bank Guarantee: 10% of contract amount
E. Finishing the Contract	
GCC 55.1	The date by which as-built drawings, operating and maintenance manuals are required is 14 days after the date of Practical Completion.
GCC 55.2	The amount to be withheld for failing to produce "as built" drawings and/or operating and maintenance manuals by the date required in GCC 58.1 is N$ 10 000.00 plus 15% VAT.
GCC 56.1	Operating and maintenance manuals should be supplied to the employer by the contractor no later than: see *above*
GCC 56.1	Amount to be withheld should the maintenance and operation manuals not

	be provided is: *see above*
GCC 57.2 (g)	The maximum number of days is: 90 days.
GCC 59.1	The percentage to apply to the value of the work not completed, representing the Employer's additional cost for completing the Works, is 20%.

Section VIII - Contract Forms

[This Section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.]

Table of Forms

Contract Agreement

THIS AGREEMENT made on the . . . . . .day of . . . . . ., ..., between . . . . . ***[name of the*** Employer***]***. . . . . (hereinafter "the Employer"), of the one part, and . . . . . ***[name of the Contractor]***. . . . .(hereinafter "the Contractor"), of the other part:

WHEREAS the Employer desires that the Works known as . . . . . ***[name of the Contract]***. . . . . .should be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects therein,

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents**.**

(a) the Notification of award

(b) the Bid

(c) the Addenda Nos . . . . . ***[insert addenda numbers if any]***. . . . .

(d) the Appendix to the General Conditions of Contract

(e) the General Conditions of Contract;

(f) the Specification

(g) the Drawings*;* and

(h) the completed Schedules,

3. In consideration of the payments to be made by the Employer to the Contractor as indicated in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of Namibia on the day, month and year indicated above.

Signed by: .....
for and on behalf of the Employer

in the presence of: .....
Witness, Name, Signature, Address, Date

Signed by: .....
for and on behalf the Contractor

in the presence of: .....
Witness, Name, Signature, Address, Date

APPENDIX TO CONTRACT

PERFORMANCE SECURITY (BANK GUARANTEE)

[The bank, as requested by the successful Bidder, shall fill in this form in accordance with the instructions indicated]

Date: *[insert date (as day, month, and year) of Bid Submission]*

Procurement Reference No. and title*: [insert no. and title of bidding process]*

Bank's Branch or Office: *[insert complete name of Guarantor]*

Beneficiary: *[insert complete name of Purchaser]*

PERFORMANCE GUARANTEE No.: *[insert Performance Guarantee number]*

We have been informed that *[insert complete name of Supplier]* (hereinafter called "the Supplier") has entered into Contract No. *[insert number]* dated *[insert day and month], [insert year]* with you, for the supply of *[description of goods and related services]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a Performance Guarantee is required.

At the request of the Supplier, we hereby irrevocably undertake to pay you any sum(s) not exceeding *[insert amount(s*[3]*) in figures and words]* upon receipt by us of your first demand in writing declaring the Supplier to be in default under the Contract, without cavil or argument, or your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

This Guarantee shall expire no later than the *[insert number]* day of *[insert month] [insert year]*,[4] and any demand for payment under it must be received by us at this office on or before that date.

.....Bank's seal and authorized signature(s)

.....

[3] *The Bank shall insert the amount(s) specified in the SCC and denominated, as specified in the SCC, in the currency of the Contract.*

[4] *Dates established in accordance with Clause 18.4 of the General Conditions of Contract ("GCC"), taking into account any warranty obligations of the Supplier under Clause 16.2 of the GCC intended to be secured by a partial Performance Guarantee. The Purchaser should note that in the event of an extension of the time to perform the Contract, the Purchaser would need to request an extension of this Guarantee from the Bank. Such request must be in writing and must be made prior to the expiration date established in the Guarantee. In preparing this Guarantee, the Purchaser might consider adding the following text to the Form, at the end of the penultimate paragraph: "We agree to a one-time extension of this Guarantee for a period not to exceed [six months] [one year], in response to the Purchaser's written request for such extension, such request to be presented to us before the expiry of the Guarantee."*

Invitation for Bids (IFB)

Republic of Namibia

Name of Project: The Supply and Installation of Airconditioners at the Student Care Centre, NSFAF Head Office in Windhoek

IFB Title: The Supply and Installation of Airconditioners at the Student Care Centre, NSFAF Head Office in Windhoek

IFB Number - W/ONB/NSFAF-01/2024

1. Bids are invited through Open National Bidding (ONB) procedures for The Supply and Installation of Airconditioners for the Student Care Centre of the Head Office of NSFAF in Windhoek and the invitation is open to all Namibian bidders.

2. Interested eligible bidders may obtain further information from *procurement management unit at* Procurement@nsfaf.na and inspect the Bidding Documents at the address given below from *7h30-17h00 hours Monday to Thursday and 7h30-12h00 Friday*.

3. Qualifications requirements include: proven expertise in the HVAC installation field with certified VRV installation qualifications and other requirements as listed in the document. A margin of preference for certain goods manufactured domestically shall not be applied. Additional details are provided in the Bidding Documents.

4. A complete set of Bidding Documents in English may be purchased by interested bidders on the submission of a written application to the address below and upon payment of a non-refundable fee of N$ 0.00. The method of payment will be cash or bank transfer. The Bidding Documents will be sent by email unless collected by the interested bidder at the address below.

5. Bids must be delivered to the address below at or before 12H00 on 3 June 2024. Electronic bidding will not be permitted. Late bids will be rejected. Bids will be opened in the presence of the bidders' representatives who choose to attend in person or on-line at the address stated below at 12H00 on 3 June 2024. All bids must be accompanied by *"Bid-Securing Declaration."*

6. The address(es) referred to above is(are):

No 746, Eros Road, PO Box 25053, Windhoek
Attention: Procurement management unit

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