KARATINA UNIVERSITY

PROPOSED LIBRARY

AIR CONDITIONING AND MECHANICAL VENTILATION SUB-CONTRACT

BILL OF QUANTITIES

TENDER NUMBER: KarU/OT/006/2020-2021

Project Consultants:

JKUATES LTD

P.O. BOX 62000-00200

NAIROBI

OCTOBER 2020

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KARATINA UNIVERSITY

Inspiring Innovation and Leadership

Kagochi, Karatina, Nyeri
P.O BOX 1957-10101 Karatina
Email: info@karu.ac.ke, Website: www.karu.ac.ke

INVITATION TO TENDER

OPEN TENDERS AND SUPPLIERS REGISTRATION

Karatina University invites tenders from interested eligible bidders for the under listed works and registration of suppliers.

ITEM	TENDER NUMBER	DESCRIPTION	ELIGIBILITY	CLOSING/ OPENING DATE	CLOSING/ OPENING DATE AND TIME
OPEN TENDERS					
1.	KarU/OT/004/2020-2021	Supply, delivery, installation, testing and commissioning of stand by generator	Open	10th November,2020	12.00 Noon
2.	KarU/OT/005/2020-2021	Structured Cabling, IP-PABX, CCTV and Access control installation works	Open	10th November,2020	2.30 PM
3.	KarU/OT/006/2020-2021	Air Condition and Mechanical ventilation works	Open	11th November,2020	12.00 Noon
REGISTRATION OF SUPPLIERS FOR 2020-2022 FINANCIAL YEARS					
4.	Various categories for good, works and services	Registration of suppliers for financial years 2020-2022	Refer to the invitation to tenderers in the bid document	12th November,2020	12.00 Noon

Interested and eligible contractors/suppliers may view and download tender documents free of charge from the University's website: **www.karu.ac.ke** or the PPIP tender portal: **www.tenders.go.ke** Enquiries may be sent via email to **procurement@karu.ac.ke**

Completed tender documents should be deposited in the Tender Box placed at the Administration Block at Karatina University (Main Campus) on or before the closing date and time as indicated above. Late submission will not be accepted.

The tenders **MUST** be submitted in two (2) copies, one marked ***'ORIGINAL"*** and the other one marked ***'COPY"***

Sealed tenders must be marked with the tender name and reference number and addressed to:

The Vice Chancellor, Karatina University
P.O Box 1957-10101, KARATINA

Tenders will be opened as scheduled above, opening will take place in the Conference Hall at the Main Campus, Kagochi, Karatina, in the presence of bidders or their representatives who wish to attend.

Further information is available at **www.karu.ac.ke**

NOTES, STANDARD FORMS AND PRELIMINARIES

SPECIAL NOTES

1. Tenders shall be submitted on the form of tender attached hereto and all blanks in this form and in the schedules attached to the specification shall be completed.

2. No alteration shall be made on the form of tender or in the specifications and schedules.

3. The tenderer (whether his tender is accepted or not) and all other recipients of the specification and documents shall treat the details of specification and the documents attached thereto as private and confidential.

4. The employer does not bind himself to accept the lowest or any tender and will not be responsible for or pay for expenses or losses which may be incurred by any tendered in the preparation of this tender.

5. It will be assumed that the tenderer will have visited the site, and to have taken into consideration any special difficulties and requirements not referred to herein but associated with the conditions of existing facilities, ground levels etc, as the case maybe, and to have made allowance for such in this tender

6. All items of additional information, issued to tenderers prior to the time for closing the bids, shall become a part of the Contract Documents and shall be included in the proposals.

7. The tenderer shall, where applicable, provide leaflets and catalogues giving technical and physical details of the fittings being offered by him as an integral part of his bid.

8. Unless otherwise specified in the particular specification, Tenderers shall assume that all fittings required will be import duty paid.

9. The Contractor is required to check the numbers of the pages of these Bills of Quantities against the contents stated on page (i) and should he find any missing, in duplicate or indistinct, he must inform the procuring entity at once and have the same rectified.

10. Should the Contractor be in doubt about the precise meaning of any item or figure, for any reason whatsoever, he shall inform the procuring entity in order that the correct meaning may be established before the date for submission of tenders.

11. No liability will be admitted or claim allowed in respect of errors in the Contractor's tender due to mistakes in the Bills of Quantities which should have been rectified in the manner described above.

12. The accurate ordering of materials is the sole responsibility of the contractor in accordance with the final drawings and the instructions from the Project Manager. No

claim for any loss or expense will be entertained for orders for materials based upon Bills of Quantities.

13. The successful tenderer shall be required to enter in a sub- contract agreement with the main contractor under the terms of the KABCEC conditions of subcontract.

14. The copyright of these Bills of Quantities is vested in the Project Manager and no reproduction in part or in whole may be carried out without their express or written consent.

FORM OF TENDER

TO: _____ *[Name of Employer)* _____ *[Date]*

_____ *[Name of Contract]*

Dear Sir,

1. In accordance with the Conditions of Contract, Specifications, Drawings and Bills of Quantities for the execution of the above named Works, we, the undersigned offer to construct, install and complete such Works and remedy any defects therein for the sum of Kshs._____*[Amount in figures]* Kenya Shillings_____ _____*[Amount in words]*

2. We undertake, if our tender is accepted, to commence the Works as soon as is reasonably possible after the receipt of the Project Manager's notice to commence, and to complete the whole of the Works comprised in the Contract within *the main contract program.*

3. We agree to abide by this tender until _____ *[Insert date; **90 days** from date of tender opening]*, and it shall remain binding upon us and may be accepted at any time before that date.

4. Unless and until a formal Agreement is prepared and executed this tender together with your written acceptance thereof, shall constitute a binding Contract between us.

5. We understand that you are not bound to accept the lowest or any tender you may receive.

   Dated this _____ day of _____20_____

   Signature _____in the capacity of_____

   Duly authorized to sign tenders for and on behalf of _____

   _____*[Name of Contractor]*

   of_____[*Address of Contractor]*

   Witness; Name_____

   Address_____

   Signature_____ Date_____

FORM OF TENDER SECURITY

WHEREAS_____ (hereinafter called "the Tenderer") has submitted his tender dated_____ for the construction of _____ (*name of Contract)*

KNOW ALL PEOPLE by these presents that WE _____having our registered office at _____ _____ (hereinafter called "the Bank"), are bound unto _____ (hereinafter called "the Employer") in the sum of Kenya shillings _____ (Kshs. _____) for which payment well and truly to be made to the said Employer, the Bank binds itself, its successors and assigns by these presents sealed with the Common Seal of the said Bank this_____ Day of_____20_____

THE CONDITIONS of this obligation are:

1. If after tender opening the tenderer withdraws his tender during the period of tender validity specified in the instructions to tenderers

   Or

2. If the tenderer, having been notified of the acceptance of his tender by the Employer during the period of tender validity:

   (a) fails or refuses to execute the form of Agreement in accordance with the Instructions to Tenderers, if required; or
   (b) fails or refuses to furnish the Performance Security, in accordance with the Instructions to Tenderers;

We undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to him, owing to the occurrence of one or both of the two conditions, specifying the occurred condition or conditions.

This guarantee will remain in force up to and including _____ [**thirty (30) days]** after the period of tender validity, and any demand in respect thereof should reach the Bank not later than the said date.

_____
_____
[Date] *[Signature of the Bank]*

_____
_____
[Witness] *[Seal]*

FORM OF PERFORMANCE BOND

To: _____(*Name of Employer*)_____*(Date)*
_____(*Address of Employer)*

Dear Sir,

WHEREAS _____(hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. _____ dated _____ to execute _____ (hereinafter called "the Works");

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognised bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of Kshs. _____(*amount of Guarantee in figures*) Kenya Shillings_____ _____(*amount of Guarantee in words*), and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of Kenya Shillings _____(*amount of Guarantee in words*) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change, addition or other modification of the terms of the Contract or of the Works to be performed thereunder or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this Guarantee, and we hereby waive notice of any change, addition, or modification.

This guarantee shall be valid until the date of issue of the Certificate of Completion.

SIGNATURE AND SEAL OF THE GUARANTOR _____

Name of Bank _____

Address _____

Date _____

QUALIFICATION INFORMATION

1. Individual Tenderers or Individual Members of Joint Ventures

1.1 Constitution or legal status of tenderer (attach copy or Incorporation Certificate);
Place of registration: _____

Principal place of business _____

Power of attorney of signatory of tender _____

1.2 Total annual volume of construction work performed in the last five years

Year	Volume	
	Currency	Value

1.3 Work performed as Main Contractor on works of a similar nature and volume over the last five years. Also list details of work under way or committed, including expected completion date.

Project name	Name of client and contact person	Type of work performed and year of completion	Value of contract (Kshs)

1.4 Major items of Contractor's Equipment proposed for carrying out the Works. List all information requested below.

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?)

1.5 Qualifications and experience of key personnel proposed for administration and execution of the Contract. Attach biographical data.

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

1.6 Financial reports for the last five years: balance sheets, profit and loss statements, auditor's reports, etc. List below and attach copies.

_____

_____

_____

_____

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 supportive documents.

_____
_____

_____

_____

1.8 Name, address and telephone, telex and facsimile numbers of banks that may provide reference if contacted by the Employer.

_____

_____

1.9 Statement of compliance with the requirements of Clause 1.2 of the Instructions to Tenderers.

_____
_____
_____

1.10 Litigation and arbitration history (attach affidavit)

_____
_____
_____

1.11 Proposed program (work method and schedule) for the whole of the Works.

2 Joint Ventures

2.4 The information listed in 1.1 – 1.10 above shall be provided for each partner of the joint venture.

2.5 The information required in 1.11 above shall be provided for the joint venture.

2.6 Attach the power of attorney of the signatory(ies) of the tender authorizing signature of the tender on behalf of the joint venture

2.7 Attach the Agreement among all partners of the joint venture (and which is legally binding on all partners), which shows that:

a) all partners shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms;

b) one of the partners will be nominated as being in charge, authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture; and

c) the execution of the entire Contract, including payment, shall be done exclusively with the partner in charge.

TENDER QUESTIONNAIRE

Please fill in block letters.

1. Full names of tenderer

   _____

2. Full address of tenderer to which tender correspondence is to be sent (unless an agent has been appointed below)

   _____

   Physical address _____

3. Telephone number (s) of tenderer

   _____
   __

4. Fax number(s) of tenderer

   _____

5. E-mail address of tenderer

   _____

6. Name of tenderer's representative to be contacted on matters of the tender during the tender period

   _____

7. Details of tenderer's nominated agent (if any) to receive tender notices. This is essential if the tenderer does not have his registered address in Kenya (name, address, telephone, telex)

   _____

_____
Signature of Tenderer

Make copy and deliver to:_____(*Name of Employer*)

CONFIDENTIAL BUSINESS QUESTIONNAIRE

You are requested to give the particulars indicated in Part 1 and either Part 2 (a), 2 (b) or 2 (c) and 2 (d) whichever applies to your type of business.

You are advised that it is a serious offence to give false information on this Form.

Part 1 – General

Business Name ……

Location of business premises; Country/Town…….

Plot No…… Street/Road ……

Postal Address…… Tel No……..

Nature of Business……..

Current Trade Licence No…… Expiring date……

Maximum value of business which you can handle at any time: Kshs……..

Name of your bankers……

Branch……

Part 2 (a) – Sole Proprietor

Your name in full…… Age……

Nationality…… Country of Origin……

*Citizenship details ……

Part 2 (b) – Partnership

Give details of partners as follows:

Name in full	*Nationality*	*Citizenship Details*	*Shares*
1……			
2……			
3……			

Part 2(c) – Registered Company:

Private or public……

State the nominal and issued capital of the Company-

Nominal Kshs……

Issued Kshs……

Give details of all directors as follows:

Name in full . Nationality. Citizenship Details*. Shares.

1.……

2.……

3.……

4.……

Part 2(d) – Interest in the Firm:

Is there any person / persons in …… ……(*Name of Employer)* who has interest in this firm? Yes/No……(*Delete as necessary*)

I certify that the information given above is correct.

…… …… ……
(Title) *(Signature)* *(Date)*

- Attach proof of citizenship

ANTI-CORRUPTION DECLARATION FORM

Date …….

To (name and address of employer)

…….

…….

I/We, the applicant(s) i.e. (name and address) ……

……
declare that I/we:

a) Has/have not been debarred from participating in public procurement.

b) Has/have not been involved in and will not be involved in corrupt and fraudulent practices regarding public procurement.

…… …….. ……

Title Signature Date

(To be signed by authorized representative of contractor and officially stamped)

INSTRUCTIONS TO TENDERERS AND EVALUATION CRITERIA

1. General

1.1 The Employer as defined in the Appendix to Conditions of Contract invites tenders for Works Contract as described in the tender documents. The successful tenderer will be expected to complete the Works by the Intended Completion Date specified in the tender documents.

1.2 All tenderers shall provide the Qualification Information, a statement that the tenderer (including all members of a joint venture and subcontractors) is not associated, or has not been associated in the past, directly or indirectly, with the Consultant or any other entity that has prepared the design, specifications, and other documents for the project or being proposed as Project Manager for the Contract. A firm that has been engaged by the Employer to provide consulting services for the preparation or supervision of the Works, and any of its affiliates, shall not be eligible to tender.

1.3 In the event that pre-qualification of potential tenderers has been undertaken, only tenders from pre-qualified tenderers will be considered for award of Contract. These qualified tenderers should submit with their tenders any information updating their original pre-qualification applications or, alternatively, confirm in their tenders that the originally submitted pre-qualification information remains essentially correct as of the date of tender submission.

1.4 Where no pre-qualification of potential tenderers has been done, all tenderers shall include the following information and documents with their tenders , unless otherwise stated:

(a) copies of original documents defining the constitution or legal status, place of registration, and principal place of business; written power of attorney of the signatory of the tender to commit the tenderer,

(b) total monetary value of construction work 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, and details of work under way or contractually committed; and names and addresses of clients who may be contacted for further information on these contracts,

(d) major items of construction equipment proposed to carry out the Contract and an undertaking that they will be available for the Contract,

(e) qualifications and experience of key site management and technical personnel proposed for the Contract and an undertaking that they shall be available for the Contract.

(f) reports on the financial standing of the tenderer, such as profit and loss statements and auditor's reports for the past five years;

(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 tenderer's bankers;

(i) information regarding any litigation, current or during the last five years, in which the tenderer is involved, the parties concerned and disputed amount; and

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

1.5 Tenders submitted by a joint venture of two or more firms as partners shall comply with the following requirements, unless otherwise stated:

(a) the tender shall include all the information listed in clause 1.4 above for each joint venture partner;

(b) the tender shall be signed so as to be legally binding on all partners;

(c) all partners shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms;

(d) one of the partners will be nominated as being in charge, authorised to incur liabilities, and receive instructions for and on behalf of all partners of the joint venture; and

(e) The execution of the entire Contract, including payment, shall be done exclusively with the partner in charge.

1.6 To qualify for award of the Contract, tenderers shall meet the following minimum qualifying criteria;

(a) annual volume of construction work of at least 2.5 times the estimated annual cashflow for the Contract;

(b) experience as main contractor in the construction of at least two works of a nature and complexity equivalent to the Works over the last 10 years (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 as required for the Works;

(d) a Contract manager with at least five years' experience in works of an equivalent nature and volume, including no less than three years as Manager; 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 4 months of the estimated payment flow under this Contract.

(f) The figures for each of the partners of a joint venture shall be added together to determine the tenderer's compliance with the minimum qualifying criteria of clause 1.6 (a) and (e); however, for a joint venture to qualify, each of its partners must meet at least 25 percent of minimum criteria 1.6 (a), (b) and (e) for an individual tenderer, and the partner in charge at least 40 percent of those minimum criteria. Failure to comply with this requirement will result in rejection of the joint venture's tender. Subcontractors' experience and resources will not be taken into account in determining the tenderer's compliance with the qualifying criteria, unless otherwise stated.

(g) Tenders that shall unreasonably deviate from the official estimate by either being too high or too low (outside$\pm$10%) shall be considered unresponsive.

1.7 Each tenderer shall submit only one tender, either individually or as a partner in a joint venture. A tenderer who submits or participates in more than one tender (other than as a subcontractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the tenderer's participation to be disqualified.

1.8 The tenderer shall bear all costs associated with the preparation and submission of his tender, and the Employer will in no case be responsible or liable for those costs.

1.9 The tenderer, at the tenderer's own responsibility and risk, is encouraged to visit and examine the Site of the Works and its surroundings, and obtain all information that may be necessary for preparing the tender and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the tenderer's own expense.

2. Tender Documents

2.1 The complete set of tender documents comprises the documents listed below and any addenda issued in accordance with Clause 2.4.

(a) These Instructions to Tenderers
(b) Form of Tender and Qualification Information
(c) Specifications
(d) Drawings
(e) Bills of Quantities
(f) Forms of Securities

2.2 The tenderer shall examine all Instructions, Forms to be filled and Specifications in the tender documents. Failure to furnish all information required by the tender documents, or submission of a tender not substantially responsive to the tendering documents in every respect will be at the tenderer's risk and may result in rejection of his tender.

2.3 A prospective tenderer requiring any clarification of the tendering documents may notify the Employer in writing or by cable, telex or facsimile at the address indicated in the letter of invitation to tender. The Employer will only respond to requests for clarification received earlier than seven days prior to the deadline for submission of tenders. Copies of the Employer's response will be forwarded to all persons issued with tendering documents, including a description of the inquiry, but without identifying its source.

2.4 Before the deadline for submission of tenders, the Employer may modify the tendering documents by issuing addenda. Any addendum thus issued shall be part of the tendering documents and shall be communicated in writing or by cable, telex or facsimile to all tenderers. Prospective tenderers shall acknowledge receipt of each addendum in writing to the Employer.

2.5 To give prospective tenderers reasonable time in which to take an addendum into account in preparing their tenders, the Employer shall extend, as necessary, the deadline for submission of tenders, in accordance with Clause 4.2 here below.

3. Preparation of Tenders

3.1 All documents relating to the tender and any correspondence shall be in English language.

3.2 The tender submitted by the tenderer shall comprise the following:

(a) These Instructions to Tenderers, Form of Tender, Conditions of Contract, Appendix to Conditions of Contract and Specifications;

(b) Tender Security;

(c) Priced Bill of Quantities ;

(d) Qualification Information Form and Documents;

(e) Alternative offers where invited; and

(f) Any other materials required to be completed and submitted by the tenderers.

3.3 The tenderer 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 the tenderer will not be paid for when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities. All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause relevant to the Contract, as of 30 days prior to the deadline for submission of tenders, shall be included in the tender price submitted by the tenderer.

3.4 The rates and prices quoted by the tenderer shall only be subject to adjustment during the performance of the Contract if provided for in the Appendix to Conditions of Contract and provisions made in the Conditions of Contract. **NB: THE PRICES SHALL NOT BE ADJUSTED. THE CONTRACT SHALL BE FIXED PRICE.**

3.5 The unit rates and prices shall be in Kenya Shillings.

3.6 Tenders shall remain valid for a period of 90 days from the date of submission. However in exceptional circumstances, the Employer may request that the tenderers extend the period of validity for a specified additional period. The request and the tenderers' responses shall be made in writing. A tenderer may refuse the request without forfeiting the Tender Security. A tenderer agreeing to the request will not be required or permitted to otherwise modify the tender, but will be required to extend the validity of Tender Security for the period of the extension, and in compliance with Clause 3.7 - 3.11 in all respects.

3.7 The tenderer shall furnish, as part of the tender, a Tender Security for the amount specified in the invitation to tender. This shall be in the form of a bank draft or a bank guarantee from an established and reputable bank approved by the Employer.

3.8 The format of the Tender Security should be in accordance with the form of Tender Security included herein or any other form acceptable to the Employer. Tender Security shall be valid for 30 days beyond the validity of the tender.

3.9 Any tender not accompanied by an acceptable Tender Security shall be rejected. The Tender Security of a joint venture must define as "Tenderer" all joint venture partners and list them in the following manner: a joint venture consisting of"……","……",and "……".

3.10 The Tender Securities of unsuccessful tenderers will be returned within 28 days of the end of the tender validity period specified in Clause 3.6.

3.11 The Tender Security of the successful tenderer will be discharged when the tenderer has signed the Contract Agreement and furnished the required Performance Security.

3.12 The Tender Security may be forfeited

(a) if the tenderer withdraws the tender after tender opening during the period of tender validity;

(b) if the tenderer does not accept the correction of the tender price, pursuant to Clause 5.7;

(c) in the case of a successful tenderer, if the tenderer fails within the specified time limit to

(g) sign the Agreement, or

(ii) furnish the required Performance Security.

3.13 Tenderers shall submit offers that comply with the requirements of the tendering documents, including the basic technical design as indicated in the Drawings and Specifications. Alternatives will not be considered, unless specifically allowed in the invitation to tender. If so allowed, tenderers wishing to offer technical alternatives to the requirements of the tendering documents must also submit a tender that complies with the requirements of the tendering documents, including the basic technical design as indicated in the Drawings and Specifications. In addition to submitting the basic tender, the tenderer shall provide all information necessary for a complete evaluation of the alternative, including design calculations, technical specifications, breakdown of prices, proposed construction methods and other relevant details. Only the technical alternatives, if any, of the lowest evaluated tender conforming to the basic technical requirements shall be considered.

3.14 The tenderer shall prepare one original of the documents comprising the tender documents as described in Clause 3.2 of these Instructions to Tenderers, bound with the volume containing the Form of Tender, and clearly marked "ORIGINAL". In addition, the tenderer shall submit copies of the tender, in the number specified in the invitation to tender, and clearly marked as "COPIES". In the event of discrepancy between them, the original shall prevail.

3.15 The original and all copies of the tender shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the tenderer, pursuant to Clause 1.5 (a) or 1.6 (b), as the case may be. All pages of the tender where alterations or additions have been made shall be initialed by the person or persons signing the tender.

4. Submission of Tenders

4.1 The tenderer shall seal the original and all copies of the tender in two inner envelopes and one outer envelope, duly marking the inner envelopes as "**ORIGINAL**" and "**COPIES**" as appropriate. **NB: TENDERERS TO PROVIED 1 ORIGINAL AND 1 COPY OF THE TENDER.** The inner and outer envelopes shall:

(a) be addressed to the Employer at the address provided in the invitation to tender;

(b) bear the name and identification number of the Contract as defined in the invitation to tender; and

(c) provide a warning not to open before the specified time and date for tender opening.

4.2 Tenders shall be delivered to the Employer at the address specified above not later than the time and date specified in the invitation to tender. However, the Employer may extend the deadline for submission of tenders by issuing an amendment in accordance with Sub-Clause 2.5 in which case all rights and obligations of the Employer and the tenderers previously subject to the original deadline will then be subject to the new deadline.

4.3 Any tender received after the deadline prescribed in clause 4.2 will be returned to the tenderer un-opened.

4.4 Tenderers may modify or withdraw their tenders by giving notice in writing before the deadline prescribed in clause 4.2. Each tenderer's modification or withdrawal notice shall be prepared, sealed, marked, and delivered in accordance with clause 3.13 and 4.1, with the outer and inner envelopes additionally marked "**MODIFICATION"** and "**WITHDRAWAL**", as appropriate. No tender may be modified after the deadline for submission of tenders.

4.5 Withdrawal of a tender between the deadline for submission of tenders and the expiration of the period of tender validity specified in the invitation to tender or as extended pursuant to Clause 3.6 may result in the forfeiture of the Tender Security pursuant to Clause 3.11.

4.6 Tenderers may only offer discounts to, or otherwise modify the prices of their tenders by submitting tender modifications in accordance with Clause 4.4 or be included in the original tender submission.

5. Tender Opening and Evaluation

5.1 The tenders will be opened by the Employer, including modifications made pursuant to Clause 4.4, in the presence of the tenderers' representatives who choose to attend at the time and in the place specified in the invitation to tender. Envelopes marked "**WITHDRAWAL**" shall be opened and read out first.

Tenderers' and Employer's representatives who are present during the opening shall sign a register evidencing their attendance.

5.2 The tenderers' names, the tender prices, the total amount of each tender and of any alternative tender (if alternatives have been requested or permitted), any discounts, tender modifications and withdrawals, the presence or absence of Tender Security, and such other details as may be considered appropriate, will be announced by the Employer at the opening. Minutes of the tender opening, including the information disclosed to those present will be prepared by the Employer.

5.3 Information relating to the examination, clarification, evaluation, and comparison of tenders and recommendations for the award of Contract shall not be disclosed to tenderers or any other persons not officially concerned with such process until the award to the successful tenderer has been announced. Any effort by a tenderer to influence the Employer's officials, processing of tenders or award decisions may result in the rejection of his tender.

5.4 To assist in the examination, evaluation, and comparison of tenders, the Employer at his discretion, may ask any tenderer for clarification of the tender, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable, telex or facsimile but no change in the price or substance of the tender shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered in the evaluation of the tenders in accordance with Clause 5.7.

5.5 Prior to the detailed evaluation of tenders, the Employer will determine whether each tender (a) meets the eligibility criteria defined in Clause 1.7;(b) has been properly signed; (c) is accompanied by the required securities; and (d) is substantially responsive to the requirements of the tendering documents. A substantially responsive tender is one which conforms to all the terms, conditions and specifications of the tendering documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the works; (b) which limits in any substantial way, inconsistent with the tendering documents, the Employer's rights or the tenderer's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other tenderers presenting substantially responsive tenders.

5.6 If a tender is not substantially responsive, it will be rejected, and may not subsequently be made responsive by correction or withdrawal of the nonconforming deviation or reservation.

5.7 Tenders determined to be substantially responsive will be checked for any arithmetic errors. Errors will be corrected as follows:

(a) where there is a discrepancy between the amount in figures and the amount in words, the amount in words will prevail; and

(b) where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will prevail, unless in the opinion of the Employer, there is an obvious typographical error, in which case the adjustment will be made to the entry containing that error.

(c) In the event of a discrepancy between the tender amount as stated in the Form of Tender and the corrected tender figure in the main summary of the Bill of Quantities, the amount as stated in the Form of Tender shall prevail.

(d) The Error Correction Factor shall be computed by expressing the difference between the tender amount and the corrected tender sum as a percentage of the corrected Builder's Work (i.e. Corrected tender sum less P.C. and Provisional Sums)

(e) The Error Correction Factor shall be applied to all Builder's Work (as a rebate or addition as the case may be) for the purposes of valuations for Interim Certificates and valuation of variations.

(f) The amount stated in the tender will be adjusted in accordance with the above procedure for the correction of errors and, with concurrence of the tenderer, shall be considered as binding upon the tenderer. If the tenderer does not accept the corrected amount, the tender may be rejected and the Tender Security may be forfeited in accordance with clause 3.11.

5.8 The Employer will evaluate and compare only the tenders determined to be substantially responsive in accordance with Clause 5.5.

5.9 In evaluating the tenders, the Employer will determine for each tender the evaluated tender price by adjusting the tender price as follows:

(a) making any correction for errors pursuant to clause 5.7;

(b) excluding provisional sums and the provision, if any, for contingencies in the Bill of Quantities, but including Dayworks where priced competitively.

(c) making an appropriate adjustment for any other acceptable variations, deviations, or alternative offers submitted in accordance with clause 3.12; and

(d) making appropriate adjustments to reflect discounts or other price modifications offered in accordance with clause 4.6

5.10 The Employer reserves the right to accept or reject any variation, deviation, or alternative offer. Variations, deviations, and alternative offers and other factors

which are in excess of the requirements of the tender documents or otherwise result in unsolicited benefits for the Employer will not be taken into account in tender evaluation.

5.11 The tenderer shall not influence the Employer on any matter relating to his tender from the time of the tender opening to the time the Contract is awarded. Any effort by the Tenderer to influence the Employer or his employees in his decision on tender evaluation, tender comparison or Contract award may result in the rejection of the tender.

5.12 Firms incorporated in Kenya where indigenous Kenyans own 51% or more of the share capital shall be allowed a 10% preferential bias provided that they do not sub-contract work valued at more than 50% of the Contract Price excluding Provisional Sums to a
non-indigenous sub-contractor.

6. Award of Contract

6.1 Subject to Clause 6.2, the award of the Contract will be made to the tenderer whose tender has been determined to be substantially responsive to the tendering documents and who has offered the lowest evaluated tender price, provided that such tenderer has been determined to be (a) eligible in accordance with the provision of Clauses 1.2, and (b) qualified in accordance with the provisions of clause 1.7 and 1.8.

6.2 Notwithstanding clause 6.1 above, the Employer reserves the right to
accept or reject any tender, and to cancel the tendering process and reject all tenders, at any time prior to the award of Contract, without thereby incurring any liability to the affected tenderer or tenderers or any obligation to inform the affected tenderer or tenderers of the grounds for the action.

6.3 The tenderer whose tender has been accepted will be notified of the award prior to expiration of the tender validity period in writing or by cable, telex or facsimile. This notification (hereinafter and in all Contract documents called the "Letter of Acceptance") will state the sum (hereinafter and in all Contract documents called the "Contract Price")that the Employer will pay the Contractor in consideration of the execution, completion, and maintenance of the Works by the Contractor as prescribed by the Contract.

The notification of award will constitute the formation of the Contract, subject to the tenderer furnishing the Performance Security in accordance with Clause 6.6 and signing the Agreement in accordance with Clause 6.4.

6.4 The Agreement will incorporate all agreements between the main contractor and the successful tenderer. The agreement shall be acceptable to the employer.

6.5 Within 21 days after receipt of the Letter of Acceptance, the successful tenderer shall deliver to the main contractor a performance Security in the amount

stipulated in the Appendix to Conditions of Contract and in the form stipulated in the Tender documents. The Performance Security shall be in the form of a Bank Guarantee, and shall be issued at the tenderer's option, by a reputable bank located in Kenya and acceptable to the Employer.

6.6 Failure of the successful tenderer to comply with the requirements of clause 6.5 shall constitute sufficient grounds for cancellation of the award and forfeiture of the Tender Security.

6.7 Upon the furnishing by the successful tenderer of the Performance Security, the Employer will promptly notify the other tenderers that their tenders have been unsuccessful.

APPENDIX TO INSTRUCTIONS TO TENDERERS

The following instructions for tender evaluation shall supplement, complement or amend the instructions to tenderers.

Where there is a conflict between the provisions of instructions to tenderers and this appendix, the provisions of the appendix herein shall prevail.

TENDER EVALUATION CRITERIA

A) Preliminary evaluation (Mandatory requirements)

To be deemed as responsive, tenders shall be checked for the following mandatory requirements:

Item	Description	Remark (X/√)
1	Form of tender dully filled (Original)	
2	Bid security of Kshs. Fifty Thousand (Kshs. 50,000.00) (Original)	
3	Company registrations or incorporation certificate (Copy)	
4	Current registration certificate as a contractor with National Construction Authority (NCA) for Mechanical Engineering Services (Refrigeration, Cold Rooms, Air Conditioning and Ventilation), Category 6 and above. (Provide copies of Current NCA registration and practicing license)	
5	VAT/PIN registration certificate (Copy)	
6	Valid tax compliance certificate (Copy)	
7	Filled anti-corruption declaration form (Original)	
8	Dully filled Tender Questionnaire and Confidential Business Questionnaire (Originals)	
9	All pages in the tender document to be serially numbered	
	Power of attorney where the signatory is not a director (Copies)	
10	Current form CR12 (for companies) and identity documents for the directors/proprietor (Copies)	
	CONCLUSIVE REMARK	

Tenders that do not meet any of the above requirements shall be disqualified and not considered for further evaluation.

B) Technical evaluation

Tenders meeting the mandatory requirements will be evaluated according to the following Evaluation Criteria.

Item	Parameter	Maximum points
1	Qualifications of key personnel	18
2	Contract Completed in the last Five (5) years	18
3	Schedules of on-going projects	10
4	Schedules of contractor's equipment	12
5	Audited Financial Reports for the last 3 years	12
6	Evidence of Financial Resources	18
7	Name, Address and Telephone of Bank reference	6
8	Litigation and Arbitration History	6
	TOTAL	100

The minimum score for Technical Evaluation is 70 percent.

The detailed scoring matrix is as shown in the table below:

Detailed scoring matrix for technical evaluation

Item	Description	Point Scored	Max. Point	
1	**Qualifications of Key Personnel (Attach evidence)**			**18**
	Director of the firm • Holder of degree or diploma in relevant Engineering field ---- 6 • Holder of certificate in relevant Engineering field ---------- 3 • Holder of trade test certificate in relevant Engineering field --1 • No relevant certificate ---------- 0		**6**	
	At least 1No. degree/diploma of key personnel in relevant field • With over 10 years relevant experience ---------- 6 • With over 5 years relevant experience---------- 3 • With under 5 years relevant experience ---------- 1		**6**	
	At least 1No certificate holder of key personnel in relevant field • With over 10 years relevant experience---------- 3 • With over 5 years relevant experience ---------- 2 • With under 5 years relevant experience ----------1		**3**	
	At least 2No artisan (trade test certificate in relevant field) • Artisan with over 10 years relevant experience ----------3 • Artisan with under 10 years relevant experience ---------- 2 • Non skilled worker with over 10 years relevant experience -- 0		**3**	
2	**Contracts completed in the last five (5) years (Max of 3 No. Projects**)- **<u>Provide Evidence</u>** • Project of similar nature, complexity and magnitude (6 Points per project) ---------- 18 • Project of similar nature but of lower value than the one in consideration (4 Points per project) ---------- 12 • No completed project of similar nature ----------0		**18**	

Item	Description	Point Scored	Max. Point	
3	**On-going projects – <u>Provide Evidence</u>** • No Project of similar nature, complexity and magnitude- 10 • Three and below Project of similar, nature complexity and magnitude –----------6 • Four and above project of similar, nature complexity and magnitude ----------4		**10**	
4	**Schedule of contractor's equipment and transport (proof or evidence of ownership/Lease)**			
	a) Relevant Transport • Means of transport (Minimum 1 Vehicle) ---------- 6 • No means of transport ---------- 0		6	**12**
	b) Relevant Equipment • Has relevant equipment (Minimum of tool box)------- 6 • No relevant equipment ---------- 0		6	
5	**Financial reports**			
	Audited financial report (last three (3) years (2017-2019) • Average Annual Turn-over equal to or greater than the tender sum ---------- 12 • Average Annual Turn-over above 50% but below 100% of the tender sum ---------- 6 • Average Annual Turn-over below 50% of the tender sum ---------- 3		**12**	
6	**Evidence of Financial Resources (cash in hand, lines of credit, over draft facility etc.)** • Has financial resources equal to or greater than the tender sum ----------18 • Has financial resources above 50% but below 100% of the tender sum ---------- 9 • Has financial resources below 50% of the tender sum----6 • Has not indicated sources of financial resources --------- 0		**18**	
7	**Name, Address and Telephone of Banks (Contractor to Provide)** • Information Provided ---------- 6 • No Information Provided ---------- 0		**6**	
8	**Litigation and Arbitration History** • Provided ---------- 6 • Not filled ---------- 0		**6**	
	TOTAL		**100**	

Only bidders who scores 70 points and above shall be considered for further evaluation

C) Financial evaluation

Stage 1
Tenders shall be checked for arithmetic errors, inconsistencies and frontloading and subjected to the requirements of clause 5.7 of instructions to tenderers.

Stage 2 and post qualification
The lowest evaluated tender having passed stage 1 above shall be the winning bid subject to the employer's right to exercise due diligence relating to confirmation of information submitted by the bidder. Any bidder who shall be found to have supplied false or misleading information shall be disqualified and the next lowest tender that has passed stage 1 shall be considered.

PARTICULAR SPECIFICATIONS

EMPLOYER

The "Employer" is the **KARATINA UNIVERSITY** whose address unless otherwise notified is **P.O. BOX 1957-10101 KARATINA**.

PROJECT MANAGER

The term "P.M." wherever used in the Bills of Quantities shall be deemed to imply the Project Manager as defined in the Conditions of Contract or such person or persons as may be duly authorized to represent him.

ARCHITECT

The term "Architect" shall be deemed to mean "The P.M." as defined above whose address unless otherwise notified is JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY ENTERPRISES LTD (JKUATES), P.O. BOX 62000-00200 NAIROBI.

QUANTITY SURVEYOR

The term "Quantity Surveyor" shall be deemed to mean 'The P.M." as defined above.

ELECTRICAL ENGINEER

The term "Electrical Engineer" shall be deemed to mean "The P.M." as defined above..

MECHANICAL ENGINEER

The term "Mechanical Engineer" shall be deemed to mean "The P.M." as defined above.

STRUCTURAL ENGINEER

The term "Structural Engineer" shall be deemed to mean "The P.M. as defined above.

THE CONTRACTOR OR MAIN CONTRACTOR

The term ‘contractor’ or ‘main contractor’ shall be deemed to mean the firm appointed by the employer to carry out the main building works . The terms ‘contractor’ and ‘main contractor’ shall be synonymous.

WORKS

The expression ‘work’ or ‘works’ shall mean all or any portion of the work, material and plant to be provided and the labour to be performed for the execution and in fulfillment of this contract, and whether the same may be on site or not.

THE SITE

The proposed works shall be situated at KAGOCI, MATHIRA SUB-COUNTY, NYERI COUNTY.

The tenderer is advised to visit the site and will be deemed to have satisfied himself with regard to the existing conditions thereof, the means of access, the risk of injury or damage to existing property and property adjacent to the site or to the occupiers of such property. No claim by the contractor will be allowed on the ground of any misunderstanding or misapprehension in respect of any such matter or otherwise.
The contractor must obtain the approval of the Engineer regarding the use of any materials found on the site.

GENERAL DESCRIPTION OF THE WORKS

The works comprise supply, installation and commissioning Cold Rooms and Extract ventilation Hood **installation**

SPECIFICATION

Shall mean the whole of the contract document including but not restricted to:-

a) This document comprising definitions and preliminaries, General specifications, particular specifications and schedules as contained herein.
b) The contract drawings.

BILLS OF QUANTITIES

Where the term ‘Bills of Quantities’ bears any relation to subcontract, it shall mean the ‘specification’ and the prices or any other schedules contained therein.

CONTRACT DRAWINGS

Shall mean those drawings listed in the schedules or referred to herein, forming part of this specification.

MANUFACTURER’S RECOMMENDATIONS

Shall mean the manufacturer's recommendation or instructions, printed or in writing and current at the time of execution of the works.

OR OTHER APPROVED
Shall mean that commodities of a manufacturer other than that specified by the proprietary name may be substituted provided they meet the standards specified and that express approval has been obtained from the Engineer. The rates of prices will be held to be of the commodity specified and current at the time of tender.

PROPRIETARY NAME

The phrase 'or other approved' shall be deemed to be included in every case where commodities are specified by proprietary name.

APPROVED, DIRECTED AND SELECTED

Shall mean approved, directed or selected by the Engineer and shall not be binding unless put in writing and signed by the Engineer.

ABBREVIATIONS

NO	-	shall mean number
m	-	shall mean metre
L.M	-	shall mean linear metre
mm	-	shall mean millimetre
kg	-	shall mean kilogramme
Ltr.	-	shall mean litre
S.S	-	shall mean stainless steel
G.M.S	-	shall mean galvanised mild steel
M.O.P.W	-	shall mean ministry of public works
B.S	-	shall mean the Current British standards specification published by The British standard Institution
C.P	-	shall mean the current British standard code of practice published together with the B.S
I.E.E	-	shall mean the Institute of Electrical Engineers, Savoy Place , London.
I.S.O	-	shall mean the International organization for standardization
K.B.S	-	shall mean the Kenya Bureau of Standards.
Ditto	-	shall mean the whole of the preceding description except as qualified in the description in which it occurs.

GENERAL SPECIFICATIONS

GENERAL

This section specifies the general requirements for plant, equipment and materials forming part of the Sub-Contract works and shall apply except where specifically stated elsewhere in the Specification or on the Contract Drawings.

QUALITY OF MATERIALS

All plant, equipment and materials supplied as part of the Sub-Contract Works shall be new and of first-class commercial quality, shall be free from defects and imperfections and where indicated shall be of grades and classifications designated herein.

All products not manufactured by the Sub-Contractor shall be the products of reputable manufacturers and so far as the provisions of the Specifications is concerned shall be as if they had been manufactured by the Sub-Contractor.

The Sub-Contractor, as called for by the Specification and Contract Drawings, shall supply materials and apparatus required for complete installation, unless mention is made otherwise.

Materials and apparatus supplied by others for installation by the Sub-Contractor shall be carefully examined on receipt and stored. Should any defects be noted, the subcontractor shall immediately notify the Engineer.

Defective equipment or that damaged in the course of installation or tests shall be replaced or repaired to the approval of the Engineer.

REGULATIONS AND STANDARDS

The Sub-Contract Works shall comply with the current editions of the following: -

(a) Kenya Government Regulations.
(b) The United Kingdom Institution of Electrical Regulations for the electrical equipment of buildings.
(c) The United Kingdom Chartered Institution of Building Services Engineers.
(d) British Standards Codes of Practice as published by the British Standards Institution.
(e) The local council By-laws.
(f) The Electricity Supply Authority By – laws.
(g) The Kenya Building Regulations.
(h) Fire Offices' Committee Regulations

ELECTRICAL REQUIREMENTS

Plant and equipments supplied under this Sub-Contract shall be complete with all necessary motors starters, control boards and other control apparatus. Where control panel is incorporating several starters, they should be complete with a main isolator.
The supply power up to and including the local isolators will be provided and installed by the Electrical Sub-Contractor. All wiring shall be described in part "C" the particular Specifications.

The Sub-Contractor shall supply three copies of all schematic, cabling and wiring diagrams for the approval of the Engineer.

The Starting current of all electric motors and equipments shall not exceed the maximum permissible starting currents described in the Kenya Power and Lighting Company By-laws.

All electrical plant and equipments supplied by the Sub-Contractor shall be rated for the supply voltage and frequency obtained in Kenya, that is 415 volts, 50HZ, 3-phase or 240 volts, 50HZ, single phase as specified in part 'C'- the particular Specification.

The Engineer may reject any equipment that is not rated for the above voltage and frequencies.

TRANSPORTS AND STORAGE

All plant and equipment shall, during transportation be suitably packed, crated and protected to minimize the possibility of damage, and to prevent corrosion or other deterioration.

On arrival at the site all plant and equipment shall be examined and any damage to the parts and protective priming coats made good before storage or installation.

Adequate measures shall be taken by the Sub-Contractor to ensure that plant and equipment do not suffer any deterioration during storage.

Prior to installation all piping, plant and equipment shall be thoroughly clean.

If, in the opinion of the Engineer any equipment has deteriorated or been damaged to such an extent that it is not suitable for installation, the Sub-Contractor shall replace this equipment at his own cost.

SITE SUPERVISION

The Sub-Contractor shall ensure that there is an English-speaking supervisor on the site at all times during normal working hours.

INSTALLATION

Installation of all special plant and equipment shall be carried out by the Sub-Contractor under adequate supervision from skilled staff provided by the plant equipment manufacturer or his appointed agent, in accordance with the best standards of modern practice and to the relevant regulations and standards described under clause 2.3 of this section.

TESTING

GENERAL

All testing shall be carried out to the entire satisfaction of the Engineer.
The following sub-clauses are intended to define the Sub-Contractor's responsibilities with regard to testing and inspection.

Materials Tests

All materials for plant and equipment to be installed under this sub-contract shall be tested, unless otherwise directed, in accordance with the relevant B.S. specification concerned.

For materials where no B.S. Specifications exist tests are to be made in accordance with be best modern commercial methods to the approval of the Engineer having regard to the particular type and application of the material concerned.

The Sub-Contractor shall prepare specimens and performance tests and analysis to demonstrate conformance of the various materials with the applicable standards.

If stock materials, which has not been specifically manufactured for the plant and equipment specified is used, the Sub-Contractor shall submit satisfactory evidence to the Engineer such materials conform to the requirements stated herein in which case test of materials may be partially or completely waived.

Certified mill test report of plates, piping and other materials shall be deemed acceptable.

Manufactured Plant and Equipment – Work Tests

The rights of the Engineer relating to the inspection, examination and testing of plant and equipment during manufacture shall be applicable to the Insurance Companies or Inspection Authorities so nominated by the Engineer.

The Sub-Contractor shall give two weeks' notice to the Engineer of the Manufacturer's intention to carry out work tests and inspection shall be borne by the Sub-Contractor.

Six copies of all test and inspection certificates and performance graphs shall be submitted to the Engineer for his approval as soon as possible after the completion of such test and inspections.

Plant and equipment which is shipped before the relevant test certificate has been approved by the Engineer shall be shipped at the Sub-Contractor's own risk and should the test and inspection not be approved, new tests may be ordered by the Engineer at the Sub-Contractor's expense.

Pressure Testing

All pipework installation shall be pressure tested in accordance with the requirements of the various sections of this specification. The installation may be tested in sections to suit the

progress of work but all work must be carried out before the work is buried or concealed behind buildings finishes. The Engineer or his representative must witness all tests and the Sub-Contractor must give 48 hours notice to the Engineer of his intention to carry out such test.

Any pipework that is Buried or concealed before witnesses pressure test have been carried out shall be specified test and applied.

The Sub-Contractor shall prepare Test Certificates for signature by the Engineer and shall give a progressive and up to date certificate of sections of the pipework that has been tested.

COLOUR CODING

Unless stated otherwise in the particular Specification all pipework shall be colour coded in accordance with the latest edition of B.S. 1710.

WELDING

Preparation

Joints to be made by welding shall be accurately cut to size with edges sheared, flame cut or machined to suit the required type of joint. The prepared surface shall be free from any visible defects such as laminations, surface imperfections due to shearing or flame cutting operations etc. and shall be free from rust scale grease and other foreign matter.

Method

All welded joints shall be carried out by electric process using covered electrodes in accordance with B.S 639

Gas welding may be employed in certain circumstances provided that prior approval is obtained From the Engineer.

Welding Codes and Construction

All welded joints shall be carried out in accordance with the following Specification: -

(a) **Pipe Welding**

All pipes welds shall be carried out in accordance with requirements of B.S. 806.

(b) **General Welding**

All welding of mild steel components other than pipework shall comply with the general requirements of B.S. 5135: 1974.

Welder's Qualifications

Any welder employed on this sub-contract shall have passed the trade tests as laid down by the government of Kenya.

The Engineer may require to see the appropriate certificate obtained by any welder and should it be proved that the welder does not have the necessary qualifications the Engineer may instruct the Sub-Contractor to replace him by a qualified welder.

PARTICULAR SPECIFICATIONS FOR COMFORT AIR CONDIONING & MECHANICAL VENTILATION INSTALLATIONS

1.0 Location of Site

The site of the proposed works shall be situated in Karatina University, Nyeri County

2. 0 Description of project

The works comprise of installation of mechanical ventilation systems for the basement parking areas, the toilet ventilation systems and fire staircase pressurization systems among other systems.

3.0 Commencement of works

The sub-contractor in submitting his tender shall be deemed to have included for commencing any necessary work on site at such time as will comply with the main Contractor's programme.

4.0 Climate Conditions

The following climatic conditions apply at the site of the works and all plant, equipment, materials and installations shall be suitable for these conditions.

Mean Maximum temperature	28.7ºC
Mean Minimum temperature	12.8ºC
Mean temperature range	13.7ºC
Relative humidity range	48-93%
Altitude	Approximately 1798mm above sea level
Mean Rainfall	897mm

The sub-contractor shall be deemed to have taken account of the above details in his prices and his planning of the execution of the works.

Unless otherwise stated, all ratings of plant, equipment and apparatus shall be interpreted as site rating and not sea level or other ratings.

5 .0 ORDERING

The sub-contractor shall order materials from quantities taken from his own approved working drawings and not quantities shown in the specification.

6.0 SCOPE OF WORK

The sub-contract shall comprise the supply, delivery, installation, setting to work, testing and commissioning of all the materials and equipment called for in this specification or shown on the drawings and some equipment supplied by the client.

The sub-contractor shall include for all appurtenances and appliances, not necessarily called for in this specification or on the contract drawings but which are necessary for the completion and satisfactory functioning of the works.

No claims for extra payments will be accepted from the sub-contractor because of his non-compliance with the above requirements.

If in the opinion of the Sub-contractor, there is a difference between the requirements of the Specification and the contract drawing, he shall clarify this difference with the engineer before tendering.
All works shall be performed in a straightforward manner by competent workmen under skilled supervision to the entire satisfaction of the engineer.

7.0 PLANT AND EQUIPMENT TO BE SUPPLIED BY TENDERER

General: The following plant and equipment specification covers the specific requirements of equipment to be used throughout this sub-contract works and shall be read in conjunction with the Bills of quantities and contract drawings.

7.1 AIR CONDITIONING UNITS

PACKAGE UNIT

This shall be as TRANE or CARRIER or approved equivalent, consisting of a centrifugal fan, Panel filters or bag filters, dampers mixing box heating and cooling coils.
The unit shall be constructed from heavy gauge zinc coated steel. Structural channel supports shall be provided in strategic areas to ensure a rigid unit.
The fan shall be centrifugal type, forward curved wheel constructed from galvanised mild steel and balanced.
The filters shall be panel or bag filters. Filter cells shall be mounted in galvanised steel frames and held tightly in position against a sealing strip by spring wire clips. The filter medium shall be washable.
The compressor shall be protected by isotherms and thermistor in the motor windings and with manual reset, thermo-magnetic circuit breakers. It shall be mounted on vibration absorbers to minimise transmission o vibration through pipework and discharge gas mufflers to absorb discharge gas pulsations. It shall also be of robust construction and high reliability.

THE SPLIT UNITS, MULTI SPLIT UNITS AND VRFS

This shall be as SAMSUNG OR Equal and Approved, with Cooling Capacities as indicated in the Price Schedules.
The air conditioning units shall be completely factory assembled and tested, piped and internally wired fully charged with R134A or any non-ozone depleting refrigerant and compressor oil. All outdoor units shall be suitable for ground installation and inside units on walls at high level or low level or ceiling as specified.
The equipment shall be fully tropicalized. The external casing of the equipment shall be phosphatized, zinc coated steel with epoxy resin primer and baked enamel finish. The screws shall be coated with zinc plus zinc chromate and with neoprene washers where sealing is required.
Hinged access doors shall provide access to control components, filters, outside/return air dampers, and evaporator coil and supply the exhaust fan sections.
The condenser shall be provided with drain points. Each unit shall have lifting lugs to accept chains or cables for rigging.

The casework of both the Indoor Unit and Outdoor Unit) shall be galvanised steel with polyester paint finish. The evaporator coil in the Indoor Unit shall be manufactured from copper tube mechanically bounded or expanded into aluminium fins.
The compressor shall be of robust construction and high reliability. It shall be suitable for use with Refrigerant R134A or any non-ozone depleting refrigerant. The condenser shall be of steel copper tube with aluminium fins.

Electrical /Electronic Controls.

The units shall be suitable for use on single phase, 240 volts 50 HZ power supply While the Ducted system units shall be suitable for use on three phase, 415 volts 50 HZ. It shall be the responsibility of others to provide all electrical wiring upto the isolator. The sub-contractor shall be responsible for all electrical wiring between the isolator and all items of equipment.
The sub-contractor shall also provide a control switch and all wireless remote controllers and signal receiving units and shall be responsible for fixing and satisfactory operation.
The control and power cables shall be run in firmly fixed steel conduits where concrete encased conduits are not provided.

ROOM OR SPACE THERMOSTATS

These shall be located in the extract duct immediately after the air conditioned space and wired to the air conditioner control system. The thermometer shall have a range of 15° C to 35°. The thermostat shall be set at required room temperature and should maintain the temperature with a differential of 1°.

TEMPERATURE AND HUMIDITY CONTROL

The temperature and humidity control overriding on humidity shall be effected from detectors mounted in the return air duct. The resultant signal from control unit shall cause the motorised step controller on A-C unit to step up or down accordingly.

8.0 FANS

General

Fans shall be capable of giving the specified performance when tested in accordance with BS 848. Although estimated values of the resistance to airflow of items of equipment may be indicated, this does not relieve the Contractor to the responsibility of providing fans capable of delivering the required air volume through the system.
The make and design of fans shall be approved by the Engineer and evidence supporting noise levels and fan efficiencies shall be provided. When fans are supplied with noise attenuation, full details of the attenuation shall be given.
Belt driven fans shall be fitted with pulleys suitable for V-belts; pulleys of taper lock type may be used for drivers up to 30Kw output. Alternatively, and in any case above 30kW output, pulleys shall be secured to the fan and the motor shafts by keys fitted into the machined keyways. Pulleys shall be keyed to the fan shaft in the overhang position. Keys shall be easily accessible so that they can be withdrawn or tightened and they shall be accurately fitted in the fan base plate when the nuts are tightened.

Any fan which is too large or too heavy for safe manhandling shall be provided with eyebolts or any other lifting facilities to enable mechanical lifting of equipment to be used.
Axial flow fans shall be of either the single stage type or the multi-stage contra-rotating type with each impeller mounted on an independent motor. Casing shall be rigidly constructed of mild steel stiffened and braced to obviate drumming and vibration. Cast iron of fabricated steel feet shall be provided where necessary for bolting to the base or supports. Inlet and outlet ducts shall terminate in flanged rings for easy removal. The length of the fan(s) and motor(s) shall also terminate in flanges in order that the complete section may be removed without disturbing adjacent ductwork.. Electrical connection to the motor(s) shall be through an external terminal box secured to the casing. Impellers shall be of steel or aluminium, the blades shall be secured to the hub or the blades and the hub shall be formed in one piece. The hub shall be keyed ro a substantial mild steel shaft and the whole statically balanced. Blades shall be of aerofoil section. Shafts shall be carried in two bearings which may be ball, roller or sleeve type. Lubricators shall be extended to the outside of the casing.
Where axial flow fans are driven by a motor external to the casing, the requirements for pulleys and for V-belt drives and guards shall be met. Unless otherwise indicated a guard is not required for any part of a drive within the fan casing. An access door of adequate size shall be provided.
Where axial flow of the bifurcated type is indicated, the motors shall be out of the airstream. Motors may be placed between the two halves of the casing in the external air or may be placed within the fan casing provided that effective ventilation is given to the motor. Where hot gases or vapours are being handled the motor and the bearings shall be suitable for operation at the temperature they may experience.
Indicated values of resistance to air flow of items of equipment, ductwork and/or the total distribution system are approximate. The Contractor shall verify these values based on the actual equipment and distribution system installed and provide fan capable of delivering the required air volume flow rate when operating against the actual total system resistance. Fans shall be type tested to B.S. 848 type A/B/C/D as indicated and selected to give the air flow volume rate specified. The indicated sound power level shall not be exceeded.

All fans shall be able to withstand the pressure and stresses developed during continuous operation at the selected duty starting stopping and /or speed and duty changes where indicated. Additionally, all belt driven fans shall be capable of being up-rated to run continuously at 10% in excess of the selected duty speed. Fan motors, fan drives and fan starters shall be rated for the selected duty speed.

Fans shall be installed using bolts, nuts and washers with all nuts properly locked and secured.All ‘as cast’ bearing surfaces for bolt heads and washers shall be counterfaced. Holding down bolts for fans and motors shall be provided with means to prevent the bots turning when the nuts are tightened. Fans greater than 20kg shall be provided with eyebolts or other purpose made lifting facilities.
Axial flow fan casings shall be rigidly constructed of mild steel or aluminium alloy, stiffened and braced where necessary to minimize drumming and vibration. Mounting feet shall be

provided where necessary for bolting to a base or supports. Inlet and outlet connections shall be flanged. For in-duct mounting fans the length of the fan casing shall be greater than the combined length of impeller(s) and motor(s). Electrical supply to the motor shall be through an external terminal box secured to the casing.

Impellers shall be of steel, aluminium or plastic and the hub shall be keyed to the shaft. Blades shall be aerofoil section and capable of pitch adjustment where indicated.

Motors are mounted external to casing drives and guards shall be provided in accordance with Section 8. Unless otherwise indicated, a guard is not required for any part of the drive which is inside the fan casing. A removable access panel, sized to facilitate maintenance and incorporating purpose made air seals, shall be provided in the fan casing.
Where axial flow fans having variable pitch impellers are indicated or approved by the Engineer, the fans shall be stable in performance over the required range of operation. Impeller pitch shall be variable by manual adjustment prior to fan operation or shall be continuously adjustable during operation by automatic means as indicated.
Where fans are provided with variable pitch impeller blades the contractor shall include in each Maintenance and Operation Instruction Manual a copy of the manufacture's operation curves which detail performance over the complete range of pitch angles employed.
Ceiling sweep fans of the non-ducted ceiling mounting type together with their associated control units shall comply with B.S. 4934 and B.S. 5060.

9.0 DUCTWORK

All seams, joints and connections to plant shall be so made as to reduce air leakage to a minimum. Internal roughness and obstruction to airflow shall not be accepted. Sharp edges and corners on the outside of the ductwork, flanges, supports etc will not be accepted. Any part of galvanized ductwork where galvanizing is damaged during manufacture or erection shall be painted with two coats of aluminum, zinc or any other corrosion resisting paint to the approval of the Engineer.
Where ducts pass through roofs (and external walls where applicable) these shall be fitted with angle flanges and weather gravats to ensure a weatherproof fitting to the building structure.
Connection to equipment shall be made with angle flanged joints. Ductwork which may have to be removed to enable plant to be removed shall incorporate flanged joints. For long duct runs, angle flanged joints shall be included at intervals to facilitate any subsequent alterations.
Bends and offsets shall have a minimum throat radius equal to the width of the duct. Where short radius elbows are indicated or agreed by the Engineer as necessary due to site limitations the dimensions and internal vane(s) shall be in accordance with HVCA publication DW/121.
Ductwork shall be constructed by galvanized, cold rolled, closed annealed patent flattened sheets. Test holes shall be provided in branch ducts from grilles and there shall be three or four test holes on side of duct according to duct depth at test position. At branch position there shall be one test hole. Air tight swivel type metal covers shall be fitted over the test holes in a manner they shall be readily removed as required.

9.1 Fabrication of Ductwork

Construction of ductwork shall be as per the following quidelines:

- Upto 300mm long side – 22 S.W.G
- Over 300mm and upto 460mm longer side – 20 S.W.G
- Over 460mm and upto 900mm longer side 18S.W.G (stiffening to be 25mm x 25mm x 3mm M.S angle at 900mm spacing)
- Over 900mm and upto 1370mm longer side 16S.W.G (stiffening to be 30mm x 30mm x 3mm M.S angle at 900mm spacing)
- Over 1370mm longer side 14S.W.G (stiffening to be 40mm x 40mm x 5mm M.S angle at 900mm spacing)

Ductwork constructed from 22 and 20 S.W.G sheet shall have folded locked seams and ductwork constructed from 18, 16 and 14 S.W.G shall have riveted seams with 8 S.W.G rivets at 2'' pitch.

Joints for ductwork having a side greater in width than 610mm shall be flanged by means of 30mm x 30mm x 3mm mild steel angles.

Mild steel used as flanges or stiffeners shall be riveted to the ductwork, with 8 S.W.G rivets at 2'' pitch. The joints faces of the flanges shall be drilled for 10mm bolts at 75mm pitch.

Air tight access doors shall be provided on the ductwork wherever indicated on the drawings. The access doors of sufficient heavy construction to avoid distortion, complete with handles, shall be secured by brass wing nuts screwed into studs provided, on galvanized mild steel stiffening frames riveted, or bolted to the ductwork. The access door shall be provided with felt or gaskets to ensure that when closed they are perfectly tight.

The ductwork shall be installed with all joints air tight and adequately stiffened and brazed. Shall have the largest radius possible with a minimum throat radius of one diameter if possible. Square or miter elbows will only be allowed where shown on the drawings. Turning vanes shall be fitted in square or miter elbows.

Transformer pieces except where situated on fan suction shall be constructed so that the angle on any side does not exceed 15^0 to the axis of the duct as possible.

Branch ducts shall enter main ducts expansion sections where possible. Where branch ducts occur, at taper or transformation pieces, the length of such pieces in the main duct shall be symmetrical about the axis of the branch.

9.2 BRACKETS AND SUPPORTS

Supports and brackets for ductwork shall be made adjustable for heights, spaced to ensure support and where practical shall be fitted at each joint of the duct. Vertical ductwork shall be supported at each floor level, horizontal ducts at intervals not exceeding 2280mm and adjacent to fans, canvas joints and other equipment. All members of supports in contact with metal ductwork shall be galvanized after fabrication. Socketed joints shall have a minimum overlap of 50mm in the direction of flow. The joint shall be made with an approved type jointing compound with bolts and rivets at centers not exceeding 50mm. Where access cannot be made for riveting or bolting self tapping screw of the shortest length which will give a satisfactory joint shall be used in lieu of rivets and bolts, on size or diameter upto 530mm. All slip joints on

circular ductwork are to have a spigot carefully swaged damper leaves shall be multi leaf type. The quadrants shall be of robust construction and securely fixed to the ductwork. The leaves shall be linked with a connecting rod and the ends of the spindle shall be housed in bearings. Dampers are to indicate the full and closed positions and are to be marked and then locked after air volume has been set.

9.3 JOINTS

Flexible Joints

Flexible joints shall be provided on the fan inlet and outlet connections and elsewhere on the ductwork where indicated. They shall be over the full cross sectional area of the mating fan inlet or outlet section. The end of the duct and fan connection shall be inlet line.

Flexible joints shall consist of or be protected by, material having a fire penetrating time of at least fifteen minutes when tested in accordance to BS 476 part 1 Section 3. The material shall be of the glass fiber cloth type, canvas or other approved material. The width of the joints from metal edge shall not be less than 80mm and more than 250mm.

All flexible joints other than fan inlet connection shall be between flanged ends. The flexible material flange shall be backed by an angle or flat iron flange and the flexible joint flat iron bar used with fan inlets shall not be less than 5mm thick.

Flexible Connections

Where flexible connections are indicated or required between rigid ductwork and particular components or items of equipment, the internal diameter of the flexible duct shall be equal to the external diameter of the rigid ductwork and of the spigot type. The use of flexible duct between rigid sections of sheet metal duct to change direction or plane will not be permitted except where indicated or expressly authorized by the Engineer.

The flexible duct shall have a liner cover of tea resistant fabric equal in durability and flexibility to glass fire and shall be impregnated and coated with plastics. It shall be reinforced with a bonded galvanized spring steel wire helix or fiber glass cord or equal and shall be bonded to cover to ensure regular convolutions.

Alternatively the flexible duct shall consist of flexible corrugated metal tubing of stainless steel, aluminum, tinplated steel or aluminum coated steel. The metal may be lined on the inside or outside or both with plastics materials.

The joints to rigid spigots shall be sealed with a brush coat of pipe jointing paste or mastic compound. Ducts upto 150mm diameter shall be secured with a worm drive type hose clip complying with BS 3628. Ducts over 150mm diameter shall be secured with band clip.

The frictional resistance to air flow per unit length of the flexible duct shall not exceed 50% more than the frictional resistance per unit length of galvanized steel ducts of equivalent diameter. The radius ratio R/D for bends shall not be less than 2, where R is the centre line radius and D is the diameter of the flexible duct.

Flexible ducts shall be suitable for an operating temperature range of 18oc to 1200c and shall comply with BS 476 part 1, section 2, and clause 7 (clause 1; surface of very low flame spread).

9.4 FINISH PAINTING

Upon completion of the installation and after all tests have been carried out to the satisfaction of the Engineer, the plant, equipment, supports, etc shall be examined and all priming coats damaged during erection shall be made good.
Any plant or equipment, ductwork, etc., which is to be insulated, shall have had the priming paint protection made good before the application of insulation. Afet the above procedures have been carried out to the satisfaction of the Project Manager, the various surface shall be given the necessary preparation as recommended by the paint and insulation manufacturers and finish painted in colours agreed between the Subcontractor and the Project Manager, at a later date. For the purpose of the Specification, however, it shall be deemed that the subcontractor's tender price was based on the identification of the requirements for the various services detailed in Code of Practice DW/161 Identification of ductwork as published by H.V.A.

9.4 AIR INTAKES AND OUTLETS

Unless otherwise indicated, fixed louvers on external walls will be fitted at the air intake and outlet positions. A galvanized steel wire mesh screen of 20mm diamond mesh and at 2mm diameter wire and complete with a frame of galvanized steel rod with securing lugs or of flat iron shall also be fitted on the inner side of the louvers,

9.6 DAMPERS

General

Sufficient dampers shall be provided to regulate and balance the system. Dampers on grilles or diffusers shall be used as secondary control. All dampers shall be sufficiently rigid to prevent fluttering. Unless otherwise indicated, the air leakage past dampers in fully closed position shall not exceed 5% of the maximum design air flow in the duct. All duct dampers except fire dampers and self closing flaps shall be fitted with locking devices and positions indicators. Dampers shall be generally in accordance with the appropriate HVCA Specifications.
Each primary control damper shall be fitted with a non corrodible label stating the actual flow in m^3/s and the cross sectional area. Alternatively these figures shall be painted in a visible position on the adjoining ductwork or insulation. The position of the damper set after final regulation and balancing be indelibly marked on the damper quadrant.

Butterfly Dampers

Butterfly dampers shall each consist of two plates edge seamed, and of the same thickness of material as that from which the associated duct is made, and rigidly fixed to each side of a mild steel operating spindle, the ends of which shall be turned and housed in non ferrous bearing.

Bifurcating Dampers

Bifurcating dampers shall be of 2mm thick sheet for sizes for 450mm square. For larger sizes the thicknesses shall be as indicated. Damper plates shall be rigidly fixed to square section mild steel spindles the end of which shall be turned and housed in non-ferrous bearings.

Multi-leaf Dampers

Multi-leaf dampers shall consist of two plates of material of the same thickness as the associated duct and rigidly fixed to each side of an operating spindle, the ends of which shall be housed in brass, nylon, oil impregnated sintered metal, PTFE impregnated or ball bearings. The ends of the spindles shall be linked such that one movement of the operating handle shall move each leaf and equal amount. An inspection door shall be provided adjacent to each multi-leaf damper. On low velocity systems only, multi-leave damper blades may be of a single plate, at least 1.6mm thick and suitably stiffened, and the blade linkages may be within the duct. Those dampers shall have bearings and inspection doors as specified above.

Damper Quadrants and Operating Handles

Quadrants and operating handles shall be of die-cast aluminium with the words 'OPEN' and 'SHUT' cast on the quadrants. Quadrants shall be securely fixed to the damper spindles and shall be close fitting in the quadrants hub to prevent any damper movement when the damper levers are locked.

Self Closing Dampers

Self closing dampers shall be designed so as to prevent the minimum of resistance to air flow under running conditions, to take up a firm non-fluctuating position under running conditions and to give a tight shut when closed. They shall incorporate rubber stops to prevent rattling and to give shut off when closed. They shall incorporate rubber stops to prevent rattling.

Sliding Dampers

Sliding dampers shall be provided only where indicated. They shall be of 2mm. thick sheet steel for size up to 450mm square. For larger sizes the thickness shall be as indicated. They shall run in guides lined with felt.

Iris type Dampers

Iris type dampers may be used in ducting up to 600mm, diameter or 450mm square. The control shall be on the outside of the damper. The design shall be such that the leaves of the damper can be easily moved for adjustment.

9.7 GRILLES

Supply & Return Registers

Supply registers shall be manufactured from high grade, extruded aluminium sections with lacquered finish and fixing shall be 32mm with beveled edges.

The registers shall have a front set of blades parallel to the long dimension, and rear set of blades parallel to the short dimension, the blades being at 17mm centres and individually adjustable with opposed blade dampers.

Extract Grilles

Extract grilles shall be similar to the supply registers described above with the exception that they have only one set of blades parallel to the long dimension.

Fresh Air Grilles

This shall be manufactured from sheet steel with steel fixing flanges and shall be galvanized after manufacture. An insect screen shall be fixed downstream.

Diffusers

These shall be manufactured from high grade extruded sections with lacquered finish, beveled flanges and removable core. Fixing shall be by self taping screws through the duct into the neck of the diffuser.

Louvres

Discharge and fresh air intake louvers shall be manufactured from mild steel and be galvanized after manufacture. A screen shall be fixed to the back of the louvers.

9.8 ATTENUATORS

General

Purpose made attenuators and sound absorbing material shall be designed to air flow, have adequate strength and cohesion to resist corrosion by air flow and do not produce dust. They shall be free from odour and proof against rot, damp and vermin and comply to requirements as to fire and smoke hazards. Adhesives shall be compatible with the sound absorbent material and should preferably be non-flammable.

Where sound absorbent material and or special attenuatos are indicated, they shall either reduce the sound level in the space, due to the equipment, to the specified value or shall give the specified sound attenuation level over the specified range of frequencies. Purpose made attenuators shall be tested in accordance with HVRA Laboratory Report No.55 (Code for the measurement of performance of the unit silencers). The insertion loss and generated noise level for each octave band and the pressure loss of the silencer shall be stated. Attenuators shall be suitable for air pressure of $100N/m^2$ air stream temperature of 40^oC and free air stream erosion for velocities upto 25m/s. The mineral wool lining shall rot vermin and fire proof. Attenuator casing shall be pre-galvanised sheet steel with galvanized pre-drilled flanges.

Rectangular Attenuators

These shall be rectangular in section with splitters forming air passages in parallel. The mineral wool lining shall be resin bonded.

Circular Attenuators

Circular section attenuators will have a central pod. The mineral wool lining shall be retained by expanded steel. The end flanges shall be matched drilled to suit the fan which they are fixed.

Acoustic Lining

Where indicated on the contract drawing, the ductwork shall be acoustically lined. The lining shall consist of resin bonded mineral wool 25mm thick fixed to the ductwork by a suitable adhesive.

9.9 INSTRUMENTS

General

The instruments, gauges etc, detailed in this section shall be provided in addition to those associated with the specific item of plate detailed elsewhere, they shall be mounted in accessible position and shall be easily read.

Sytem Static Pressure Gauge

A system static pressure gauge shall be provided for the system. It shall consist of a small inclined manometer gauge similar to a filter gauge. The edge of the guage shall be connected to the system and the other end shall be left open to the plant room but where fluctuation of the static pressure in the plant room may occur the gauge shall be connected across the main fan. Such fluctuations may be caused by wind pressure affecting large open air intakes to the plant room.

9.10 VIBRATION, NOISE AND SOUND INSULATION

Anti-Vibration Mountings

Fans, compressors, motors, and any other vibration inducing equipment shall be isolated from the building structure by anti-vibration mountings which shall be compressed machinery cock, spring or rubber/metal bearers as indicated.

Noise

The noise induced by the installation in the spaces served, in any adjacent building and in the open air surrounding the plant rooms shall be kept as low as possible. This shall be specially considered in the selection of fan motors, grilles and the internal finish and arrangements of extraction ducting.

Noise level information on the fan based on octave analysis data shall be stated. The reference level and the testing technique shall be stated.

The sound level in the spaces served, due to equipment shall comply with the recommended design criteria given in the IHVE QUIDE (Table 13.1 of 1965 Edition). The maximum sound pressure level due to ventilation system must not exceed value mentioned below measured by a reference value $2 \times 10 \times 10^{-5}$ N/M^2 transferred to a logarithmic scale, and measured at any point 1.5m above the floor level and 1m from the walls.

The maximum sound pressure level at any point 4m from the extract point must not exceed 55Db.

The maximum sound pressure level at any point 4m from the fans must not exceed 60Db.

9.11 THERMAL INSULATION

General Description

All heated, cooled, and recirculated air ductwork shall be insulated.

Insulation shall be of 25mm thick expanded polystyrene sheet or spray applied polyurethane foam to a uniform thickness of 25mm. Polystyrene shall be fixed so that the edges butt closely without gap and the insulation shall overlap at corners by the thickness of insulation. The sheet shall be fixed by means of a suitable adhesive and plastic impingement pines attached to the ductwork.

Ductwork In Plant Room

The insulation described above in Clause 16, 1 above shall be finished by application of a 15mm thick layer of hard setting finish. The insulation shall be beveled thick to angle 45^0 at all connecting flanges. Access hatches and all other places where operation or maintenance is likely to cause the breaking of the insulation.

The insulation shall then be given a vapour sealing by the application of two coats of anti-condensation paint.

Ductwork External to Plant Rooms

The insulation described in clause 16.2 shall be finished by application of two coats of bitumastic paint

10.0 ELECTRICAL EQUIPMENT AND WIRING

Scopes

The responsibility for electrical equipment and wiring shall be defined as follow:-

An on-off starter shall be provided and placed in the appropriate position for connection of the fans required for the installation and within a time agreed with the Engineer fully detailed wiring diagrams for all connection to them shall be availed.

The installer shall be responsible for accuracy of all wiring diagrams provided by him and for the correct internal wiring of all prewired equipment supplied. The installer shall reimburse the full cost of abortive or remedial work from any error in this aspects.

General

Unless otherwise indicated all electrical equipment and installation shall be suitable for use in ambient temperature up to 40^0C and relative humidity of up to 90%. For tropical climates, electrical equipment shall be suitable for use in the temperature and humidity as indicated; it shall be proof against atmospheric corrosion, including that of saline air where relevant, and materials shall not be susceptible to mould growth or attack by termite and similar hazards.

Electrical Motors

Electrical motors shall comply with BS 170 2048 or with BS 2613 and BS 3979 as appropriate. All motors shall have class E insulation (BS2757) and can be continuously rated.

They shall be screen protected (BS2817) unless otherwise indicated. All motors larger than 0.75kW output shall be three phase, for fans above 15Kw output, the type of motor and method of starting shall be such as to limit the starting and run-up currents to three times the rated full

load currents unless otherwise indicated. No motor shall rum more than 25revs/s unless otherwise indicated.

11.0 INSPECTION, COMMISSIONING AND TESTING

General

Unless otherwise indicated, tests shall be carried out in accordance with appropriate BS and CP. Test certificates for work tests, site tests and tests required by the BS shall be submitted in duplicate to the Engineer.

Testing

Where an individual inspection or tests take place at outside the site of the works, a representative of the Engineer will be required to be present.

Unless otherwise indicated, the contract shall include the cost of all tests, necessary instruments, plant supervision and labour both at work and on site. The accuracy of the instruments shall be demonstrated where so directed by the Engineer.

The site tests shall be of at least six hours duration. Any defects or workmanship, material and performance maladjustment or other irregularities which become apparent during the tests shall be rectified by the Sub-contractor at his own expense. And tests shall be repeated at his expense to the satisfaction of the Engineer.

The Supplier/Installer's representative present at the site tests shall be fully conversant with the operations of the thermostatic controls and shall be expected to explain the operation and safety controls forming part of the installation to the Employer's representative. **Site Tests**

The installer shall supply all instruments and equipment necessary to carry out site tests and shall arrange with other parties for the testing of associated equipment which may affect the performance of the plants installed under these works.

Site Tests – Fans

All fans shall be charged with suitable lubricants and shall be tested upon completion of auxiliary system erection to ascertain that the performance of each fan complies with requirements of the specification.

Completion of Works – Balancing and Commissioning

Following the site tests and prior to hand over, Mechanical Ventilation and Air Conditioning systems shall be balanced by means of grilles, dampers and other special controls installed so as to give the required air flow rates and where applicable the required temperatures, pressures, and humidity conditions in all areas served by the said system.

The complete system shall be balanced and commissioned as a whole. Sectional balancing and commissioning on any part of the system where this excludes the final complete system balancing and commissioning shall not be accepted.

Test volumes within ducts shall be within +5% of the design volume, and volumes at the grilles and at diffusers shall be within +10% of the design volumes.

When the system has been balanced to the satisfaction of the project manager, it shall be run under complete automatic control for 72 hours continuous operation to ascertain any fault in operation before acceptance and handover. Any faults discovered during this time shall be corrected and another test or tests of 72hours duration shall be carried out to ensure satisfactory operation, all at the expense of the Supplier/Installer.
During this phase, particular attention shall be paid to:_

- The maintenance of cleanliness of all plant and extraction system during construction and ensuring that the extraction system are cleaned through as part as part of commissioning.
- The protection of plant, particularly sensitive or fragile items, from the activities or other trades during construction and from dirt and mal-operation during commissioning.
- The protection of electrical equipment from damp during construction and commissioning.

11.0 CONTROL SYSTEM

Particular attention shall be paid to the following features:

- Satisfactory operation of any automatic or manually operated sequence to be used in the event of fire.
- Safety in the event of failure and of sudden resumption of electricity supply.
- Satisfactory operation of safety interlocks designed for the protection of personnel such as those associated with the high voltage electrically operated plant.

The following items shall be checked and/or tested and recorded on the site test certificate:-

- Set device value of all control devices
- Satisfactory operation of equipment protection devices.
- Satisfactory operation of all sequencing operation and alternate working selection and automatic or manual change-over of duplicate plant.
-

12.0 NOISE AND SOUND CONTROL

Sound level reading shall be taken with a simple sound level meter using the ‘A’ scale weighting network. The spaces in which readings shall be taken shall be as agreed with the Engineer, but will in general be the following.

- Plant rooms
- Occupied rooms adjacent to plant rooms
- Outside plant rooms facing air intakes and exhaust to assess possible nuisance to adjacent accommodation if the adjacent accommodation is a private residential building.
- Test may be required at night
- In the space served by the first grille or diffuser after a fan outlet.

- In any space where, by the addition of special silencing or techniques of by classification of use, a low level of noise is clearly required.

Alternatively, sound level reading shall be taken using a sound analyzer to give an octave band analysis of the ground spectrum and to pinpoint the frequency value of peak sound levels. The spaces in which readings shall be taken shall be agreed with the Engineer but will in general be as detailed in paragraph above.

13.0 OPERATION AND MAINTENANCE INSTRUCTION

The supplier/Installer shall demonstrate and explain the plant and the method of starting, running and stopping to such staff as the Engineer may nominate.

He shall provide three sets of operating and maintenance instructions which shall be enclosed in durable covers. The operating and maintenance instructions shall include:-

- A brief outline of the operation of the plant
- Instructions of how to start and stop the plant, noting any safety and or sequence arrangements.
- Details of required maintenance with suggested frequency of action.
- Details of all lubricating oils and greases required and filter replacement
- Details of each item of plant including the name and address of the manufacturer, type and model, serial number, duty and rating.

The operating and maintenance instruments shall be handed to the Engineer not later than at the end of the commissioning period.

14.0 SPARE PARTS

The Installer shall submit a priced list of any extra material which he recommends should be purchased for the Ventilating and Air Conditioning Plant and all associated equipment and control gear and extras not supplied as standard. He shall be required to give a guarantee that he will hold sufficient running stock of spare parts for the maintenance of the equipment.

TECHNICAL SCHEDULE

1. General Notes to the Tenderer

1.1 The tenderer shall submit technical schedules for all materials and equipment upon which he has based his tender sum.

1.2 The tenderer shall also submit separate comprehensive descriptive and performance details for all plant apparatus and fittings described in the technical schedules. Manufacturer's literature shall be accepted. Failure to comply with this may have his tender disqualified.

1.3 Completion of the technical schedule shall not relieve the Contractor from complying with the requirements of the specifications except as may be approved by the Engineer.

TECHNICAL SCHEDULE

The tenderer must complete in full the technical schedule. Apart from the information required in the technical schedule, the tenderer **MUST SUBMIT** comprehensive manufacturer's technical brochures and performance details for all items listed in this schedule (fill forms attached).

ITEM	DESCRIPTION	**MANUFACTURER**	**COUNTRY OF ORIGIN**	**REMARKS (Catalogue No. etc.)**
A	Air conditioning units			
B	Kitchen extract Fan			
C	Silencer/Attenuator			
D	Grease Filters			

Catalogue must be attached for all the items in the schedule of material above

CONDITIONS OF SUB-CONTRACT AND APPENDIX

The successful tenderer shall be required to enter in a sub- contract agreement with the main contractor under the terms of the standard KABCEC conditions of subcontract which shall be amended and completed as follows:

Clause 28: Fluctuations; Sub-clause 28.2-28.4 shall be omitted. The contract shall be a fixed price contract.

The appendix shall be completed as follows:

APPENDIX	**Clause**
Name of sub-contractor's insurers	6.0.....
Name of sub-contractor's surety	7.0.....
Amount of surety	7.0: …..**10% of contract sum**
Period of possession of site	8.1.....
Date of commencement of works	8.2.....
Date for practical completion	8.2.....
Interval for application of payment certificates	23.1.....**1 month**
Minimum amount of payment certificate	23.4..... **Kshs. 500,000.00**
Percentage of certified value retained	23.6..... **10%**
Limit of retention fund, if any	23.6.....**5%**
Name of the sub-contractor's bank for purposes of interest calculation.	23.7, 23.8.....
Defects liability period	23.11..... **6 Months**
Period of final measurement and valuation	23.12..... **6 Months**
Damages of delay in completion	27.1 at the rate of Kshs.....
	.. **As per Main contract**

BILL OF QUANTITIES

(i) The Tenderer shall complete all the BQ unit rates schedules. The BQ unit rates schedule shall be read in conjunction with the specifications and the drawings.

(ii) The total prices in the main summary of price schedules shall be deemed to include all obligations under the Contract including and not limited to supply of materials equipment, apparatus, fittings, spares, tools, insurance, delivery to site, storage, installation, testing and commissioning in accordance with this specification.

(iii) Any prices omitted from any section or part of price schedule shall be deemed to have been included in another item, section or part.

(iv) All prices shall be duty paid and shall also be inclusive of all taxes current at the time of tendering.

(v) Where client wishes to supply some items of work the contractor will be required to quote for labor rate for fixing the item.

ITEM NO	DESCRIPTION	QTY	UNIT	RATE Kshs	AMOUNT Kshs
1.0	PRELIMINARIES				
A	Provide insurance as required in the sub contract conditions.	Item	1		
B	Provide performance bond as required in the sub contract conditions.	Item	1		
C	Preparation of working drawings, Shop drawings and "As installed" record drawings for approval by the Engineer	Item	1		
D	Allow for 3sets of Blue prints/ paper copies of as installed drawings.	Item	1		
E	Provide four sets of Equipment instruction and maitanance manual for all equipments installed	Item	1		
1	Total carried to Summary				

ITEM No.	DESCRIPTION	QTY	UNIT	RATE Kshs	AMOUNT Kshs
2.0	AIR CONDITIONING				
A	SPLIT UNITS - SERVER ROOM SAMSUNG (CAC) High wall mounted split air conditioning unit, cooling capacity 7.1 kW (24,000Btu/hr). Indoor unit model AC071FCADEH/EU complete with outdoor unit Model AC071JBRPEH/EU. Refrigerant: R410A. As Samsung or equal and approved. Electrical load: 2.21kW, single phase 240V, 50hz. Connected to 30A SP Isolator wired in 4.0mm cables provided by others. Approximate dimensions: Indoor unit-1065 x 298 x 218mm,Outdoor unit- 880x 798x 285mm Prices to include:- all the necessary refrigerant pipes, condensate pipes, pvc sleeves, clips, tapes, cables, steel supports for the unit, wired remote controller and all the necessary accessories for the installations.	2	No.		
B	SPLIT UNITS - Four way cassette SAMSUNG (CAC) four way split air conditioning unit, cooling capacity 5.2 kW. Indoor unit model AC052NN4SEC/EA complete with outdoor unit Model AC052NX4SEC/EA. Refrigerant: R410A. As Samsung or equal and approved. Electrical load: 1.7kW, single phase 240V, 50hz. Connected to 20A SP Isolator wired in 2.5mm cables provided by others. Prices to include:- all the necessary refrigerant pipes, condensate pipes, pvc sleeves, clips, tapes, cables, steel supports for the unit, wired remote controller and all the necessary accessories for the installations.	4	No.		
C	TOTAL FOR AIR CONDITIONING C/F TO SUMMARY				

ITEM No.	DESCRIPTION	QTY	UNIT	RATE Kshs	AMOUNT Kshs
3.0	KITCHEN EXTRACT SYSTEM				
A	The following in galvanised sheet steel ductwork inclusive of all joints, bracing, and gaskets support stiffeners, turning vanes, splitters and any other equipment to completion. Straight Lengths, Radius Bends and Transformation Pieces Ductwork material thickness 0.8mm	5m	20		
B	**Kitchen Hood** Extract Hood Size 2,750 x 1,700mm x 607mm deep hood constructed from 16 swg stainless steel sheet folded at the bottom on the inside to form a 75mm wide, 25mm deep drainage channel all round. The hood shall be supported from above by suitably sized mild steel rods at each of the four corners.	1	No.		
C	**Plenum** Supply, fabricate and install plenum fromm 16 swg stainless steel sheet sizes 2000 x 686 x 550mm as per the design drawings.	1	No.		
D	**Grease Filter** Double sided V- bank grease filters with four panels size 1000 x 686 x 565mm of capacity 8610m³/hr as VOKES DS 20/4 or equal and approved. It shall be mounted on a purpose made filter framework made of 16 s.w.g anodized aluminium sheet mounted to the hood as shown in the contract drawings.	3	No.		
E	**Extract Fan** Inline Cenrifugal Extract Fan capable of handling 2.5m^3/s at 940rpm and 200 pa static pressure. To be as "S&P" Model ILHT/6-630 MV. The fan shall be continuously rated. Power rating 1.5kW , three phase, 415V, 50Hz. Complete with all accessories including electronic speed regulators, phase failure protection, anti-vibration mountings, air operated non return dampers, isolation switch or equal and approved.	1	No.		
F	**Silencer** A Silencer capable of reducing sound attenuation in the system to NC 35 shall be supplied and installed. The silencer shall be as "Woods" . OR equal and approved.	1	No.		
G	**Flexible Connection** The fan shall be connected to ductwork through a flexible connections of approved material.	Item	Sum		
H	**Anti-vibration Mounting** The fans shall be installed on anti-vibration mountings so as to isolate vibrations from the buildings structure.The mountings shall be selected from those manufactured by "WOODS" of Colchester for the specified or equal and approved.	Item	Sum		
I	**Fire Damper** Supply and install double rebaye type fire damper, with a 2 hour standard and shall be complete with fusible link or other suitable devise and set to close the damper automatically at 68 degrees centigrade. A micro- switch to be operated by the damper blade shall switch off the fan when the blade shuts off the airflow. Access opening of the damper blade and the micro- switch shall be provided. The damper to fit a duct section of size 550 x 550mm	1	No.		
	Total carried to next page				

ITEM No.	DESCRIPTION	QTY	UNIT	RATE Kshs	AMOUNT Kshs
	Total brought down from previous page				
A	**Ductwork**				
	Supply, fabricate and install ductwork form 18 swg galvanised mild steel sheet as per the design drawings.	33	Sm		
	Electrical Connection				
B	Allow for fans final power connection from isolator (provided by others) to fan motors including power surge protectors, overload/under voltages phase failure relays wiring and conduits.	Item	Sum		
C	Allow for any other item necessary for efficient operation of the kitchen extract system. (Specify).	Item	Sum		
	Testing and Commissioning				
D	Allow for setting to work, testing and commissioning to the approval of the Engineer.	Item	Sum		
J	Total carried to summary page 63				

ITEM No.	DESCRIPTION	AMOUNT Kshs
	SUMMARY PAGE	
A	Total for Kitchen Ventilation B/F from page 62	
B	Provisional Sum for fire suppression for kitchen hood	250,000.00
D	TOTAL AMOUNT FOR KITCHEN VENTILATION TOTAL C/F TO SUMMARY	

ITEM No.	DESCRIPTION	AMOUNT Kshs
	SUMMARY PAGE	
A	Total for Preliminaries B/F from page 59	
B	Total for Air Conditioning B/F from page 60	
C	Total for Kitchen Ventilation B/F from page 63	
D	SUB -TOTAL	
E	CONTINGENCY SUM	200,000.00
F	TOTAL FOR AIR CONDITIONING AND MECHANICAL VENTILATION INCL. VAT C/F TO FORM OF TENDER	

Amount in words:.....
.....

r's Name and Stamp:.....

Signature:.....

PIN NO:.....VAT CERTIFICATE NO:.....

Witness:.....Address:.....

Signature:.....

Date:.....