REPUBLIC OF KENYA

KISII COUNTY GOVERNMENT

ARAB BANK FOR ECONOMIC DEVELOPMENT IN AFRICA

SAUDI FUND FOR DEVELOPMENT

M I N I S T R Y O F H E A L T H

BIDDING DOCUMENTS

For Procurement of

PROPOSED CANCER CENTRE AT THE KISII TEACHING AND REFERRAL HOSPITAL
Mechanical Works
(PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS)

TENDER NO.: MOH/NCCP/ICB/012/2023-2024

1 OF 5

CLOSING DATE: 5TH APRIL 2024 AT 10.00 A.M. LOCAL TIME

SCHON ASSOCIATES

NARCO ENGINEERING CONSULTANTS

Issued on: 20th February 2024

PROPOSED KISII CANCER CENTER – AT KISII COUNTY

TECHNICAL SPECIFICATION AND BILLS OF QUANTITIES

FOR

PLUMBING AND DRAINAGE INSTALLATIONS

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INVITATION FOR TENDERS

COUNTRY:	**KENYA**
PROJECT NAME:	**CONSTRUCTION AND EQUIPPING OF A NEW CANCER DIAGNOSTIC AND TREATMENT CENTRE AT KISII TEACHING AND REFERRAL HOSPITAL**
TENDER NO:	**MOH/NCCP/ICB/0120/2023-2024**
TENDER NAME:	**PLUMBING, DRAINAGE AND FIRE FIGHTING EQUIPMENT INSTALLATIONS**
CLOSING DATE:	**5TH APRIL 2024 AT 10:00 A.M. KENYAN TIME**

1. The Government of the Republic of Kenya has obtained a loan from the Arab Bank for Economic Development in Africa and the Saudi Fund for Development to finance the Construction, Equipping and Commissioning of a new Cancer Diagnostic and Treatment Centre at Kisii Teaching and Referral Hospital and it is intended that part of the proceeds of the said loan will be applied towards the costs of the Works.
2. The Ministry of Health invites sealed Tenders from eligible Tenderers for the Construction, Equipping and Commissioning of a new Cancer Diagnostic and Treatment Centre at Kisii Teaching and Referral Hospital (hereinafter called the Works) and the remedying of any defects therein.
3. Eligible interested Tenderers may obtain further information, addendums or clarifications in respect to this Tender from the Ministry website www.health.go.ke. All eligible Tenderers are advised to regularly check the website during the bidding period.

4. A complete set of the Tender documents may be downloaded from the Ministry's website www.health.go.keor public procurement information portal: www.tenders.go.ke, free of charge. Eligible Tenderers downloading the Tender document MUST forward their company's details to procurement@health.go.ke so that any addendum/ clarifications can be sent to their email address.

   Requests for clarification to be sent either by mail to Principal Secretary, Ministry of Health P. O Box 30016 Nairobi, Kenya or through email address procurement@health.go.ke, at any time, but not later than 14 days before the closing date for submittal of bids.

   The Tender is comprised of the following:

Tender	Tender Number	Name of Tender
3.	MOH/NCCP/ICB/012/2023-2024	Plumbing, Drainage, and Fire Fighting Equipment Installations

   Interested bidders may participate on their own or as a joint venture. All partners of the joint venture shall be liable jointly and severally for the execution of the contract in accordance with the contract terms. A copy of the agreement entered into by the joint venture partners shall be submitted with the tender.

5. A Pre-Tender site visit will be held at the *site located opposite Kisii School along Kericho-Kisii Highway on* ***Monday, 11th March 2024 at 09:00 a.m****. The site has a conspicuous signpost that reads "Proposed Kisii Cancer Centre".*
6. The **original** and **one copy** of the Tender Document shall be placed inside of a sealed envelope, clearly marked with, "[Name of the TENDER] ", reference number with a warning "**Do Not Open until** [***5th April 2024*** *at* ***10.00 a.m.*** **(Kenyan Time**)].
7. If the envelopes and packages with the tenders are not sealed and marked as required, the Client will assume no responsibility for the misplacement, loss, or premature opening of the tender.
8. Every Tender must be accompanied by a **Tender Security of 2% of the Total Tender Amount** or equivalent amount in the currency of the Tender.
9. Tenders must be delivered to the address below,

   The Principal Secretary,
   Ministry of Health,
   Afya House Building, Cathedral Road,
   P.O. Box 30016-00100,
   NAIROBI.

   or be deposited in the Tender Box located on 1st Floor of Afya House, Ministry of Health, Cathedral Road, Nairobi, so as to be received on or before ***10:00 a.m. on 5th April 2024***.

   Electronic bidding will *not* be permitted. Late tenders will be rejected.

10. Tenders will be opened immediately thereafter at the GTZ Boardroom located at Afya House Ground Floor.

Head Supply Chain Management Services

For: Principal Secretary

SECTION 1:
SIGNATURE PAGE & SPECIAL NOTES
PROPOSED KISII CANCER CENTER, KISII COUNTY

SUB-CONTRACTOR QUALIFICATION INFORMATION

BID ELIGIBILITY AND QUALIFICATION CRITERIA

The following criteria will be used in the evaluation of all bids. The submission of the required documents will be used in the determination of the Completeness and Suitability of the Bid. Bids that do not contain all the information required will be declared non-responsive and shall not be evaluated further.

A. MANDATORY EVALUATION

ITEM	MANDATORY REQUIREMENT	YES	NO
1	Copy of Certificate of Registration/Incorporation		
2	Copy of Valid Tax Compliance Certificate from Country of Residence		
3	Copy of valid business permit or International equivalent		
4	Copy of Valid Registration with National Construction Authority (NCA) for Mechanical (Class 1) or equivalent International standard, include relevant licenses, registration, and certifications		
5	Attach copies of Recommendation letters from three of your major clients having undertaken similar assignment		
6	Show proof of Local/Regional presence		
7	Certified copy of valid contractor's annual NCA practicing license for Mechanical works or equivalent International Standard		
8	Certified copy of Company Record showing shareholders (CR12 or Equivalent)		
9	Audited Accounts for the last four years		
10	Proof of having completed at least one relevant project valued at one million USD and above for plumbing, drainage and firefighting installation completed in the last 10 years. Attach relevant project documents to show proof of project completion.		
11	Technical specifications of all the equipment proposed as laid out in the Specifications and Drawings. Include Brochures and Catalogues.		
12	The Bidder shall provide details of line(s) of credit available to the bidder, including amount(s) and name of bank(s) making available such line(s) of credit		
13	The Bidder shall provide letter(s) authorizing the Employer to seek references from the bidder's bankers		
	PASSED (RESPONSIVE)		
	FAILED (NON-RESPONSIVE)		

NOTE: **Failure to comply with Mandatory requirements will lead to automatic disqualification.**

Only bidders who are successful at this stage will proceed to the next stage of evaluation.

PROPOSED KISII CANCER CENTER – AT KISII COUNTY

TECHNICAL SPECIFICATION AND BILLS OF QUANTITIES

FOR

PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

Preamble

Supplied as part of the Main Tender for Plumbing, Drainage and Fire Fighting Installations at PROPOSED KISII CANCER CENTER – AT KISII COUNTY

.

ISSUED BY:

The Principle Secretary
Ministry of Health
P.O. Box 30016 - 00100,
Nairobi, Kenya.

PREPARED BY:

Schon and Associates,
P.O. BOX 38601-00100,
Nairobi, Kenya.

The Tender for the above-mentioned works dated this_____ day of _____2024 by the undersigned parties refers to the Bills of Quantities consisting of the pages numbered on contents page.

.....	.....
SUB-CONTRACTOR	MAIN CONTRACTOR
Date 2024	Date 2024

SIGNATURE PAGE

PROPOSED KISII CANCER CENTER – AT KISII COUNTY

TENDER FOR PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

SPECIAL NOTES

1. The Tenderer shall tender for the above Works in accordance with the appended drawings, Technical Specification and Bills of Quantities.

2. The Tenderer is required to check the numbers of the pages of these Bills of Quantities against the contents stated on Page 1-i and should he find any missing, in duplicate or illegible he must inform the Engineer at once and have the same rectified.

3. Should the Tenderer be in doubt about the precise meaning of any item or figure, for any reason whatsoever, he must inform the Engineer in order that the correct meaning may be decided before the date for submission of the tenders.

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

5. The annexed Bills of Quantities must be fully priced in ink. The Tenderer shall not alter or otherwise qualify the text of these Bills of Quantities. Any alteration or qualification made without authority will be ignored and the text of the Bills of Quantities as printed will be adhered to.

6. **Fully priced Bills of Quantities must be accompanied by brochures and technical literature for the major mechanical and electrical items.**

7. The Tenderer shall be deemed to have made allowance in his prices generally to cover items of Preliminaries or additions to Prime Cost Sums or other items, if the Tenderer has not priced these where appropriate.

8. All items of measured work shall be priced in detail and tenders containing lump sums to cover trades or groups of work must be broken down to show prices of each item before they will be accepted. Lump sums to cover items of Preliminaries shall be likewise broken down if so required.

9. This tender shall be exempted from **all taxes and duties** as imposed by Kenya Revenue Authority or any other Statutory Authority in Kenya having jurisdiction over the works.

10. Under no circumstances will any expense incurred by Tenderers in preparation of this tender be allowed.

11. The copyright of these Bills of Quantities is vested in the Engineer and no part thereof may be reproduced without express permission given in writing by the Engineer.

12. The Tenderer is solely responsible for the accurate ordering of materials in accordance with the Drawings and Engineer's instructions and no claim for any loss or expense will be entertained for orders for materials based upon the Bills of Quantities.

13. The successful tenderer shall be appointed as a **NOMINATED SUB – CONTRACTOR under the FIDIC Conditions of sub-contract for construction for building and engineering works designed by the employer**

PROPOSED KISII CANCER CENTER – AT KISII COUNTY

TENDER FOR PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

CONDITIONS OF TENDERING

1.01 Each Tenderer must submit, enclosed in a plain sealed envelope clearly marked, "TENDER FOR PLUMBING, DRAINAGE, AND FIRE FIGHTING INSTALLATIONS FOR THE PROPOSED KISII CANCER CENTRE – KISII COUNTY". The Tenderer shall enter his tender sum on the prescribed Tender Form.

1.03 Each Tenderer must submit the name of a Surety who shall be an established Bank, willing to be bound to the Tenderer in the sum equal to ten per cent (10%) of the tender sum for due performance of the Contract and must submit together with his tender the form attached thereto duly filled in and signed by the proposed Surety agreeing to sign a Bond to that effect when and if called upon to do so. **A Surety from an insurance company will not be accepted**.

1.04 Tenders and all the Documents in connection therewith as specified above must reach the Address as advised and on the date stated in the covering letter accompanying these documents.

1.05 In the case of a tender not being delivered by hand, the Tenderer must arrange for his tender and other documents to be posted in time to reach the above office not later than the stipulated time.

1.06 Any tender delivered after the stipulated time, from whatever cause arising, will be disqualified.

1.07 In no case will any expense incurred by the Tenderer in the preparation of his tender be allowed.

1.08 Tenders shall remain valid for One Hundred and Twenty (120) days from the final date of submission of tenders stipulated in Paragraph 2.01 above, and no Tenderer may withdraw his tender after that period.

1.09 The Employer shall not be bound to accept the lowest or any tender and shall not be bound to give reasons for his decision.

1.10 The Engineer shall notify the accepted approved Tenderer (if any) of such acceptance by letter within One Hundred and Twenty (120) days during which, by Paragraph 3.01 thereof, the tender is to remain valid and the said Tenderer shall then within the time stated in the Form of Tender first execute the formal Contract Agreement and then on the same day his approved Surety shall sign the Bond. The Engineer however, reserves the right to extend the period for executing the formal Contract Agreement if satisfied that adequate reasons exist for so doing.

1.11 Every notice to be given to a Tenderer may be posted to the Tenderer's address as given in his tender and such posting shall be deemed to be good service of such notice.

1.12 The term "Electrical and Mechanical Engineer" wherever used in these Conditions and in all Contract, Documents shall be such person or persons as may be duly authorized to represent M/s Schon Associates.

1.12 The words "Approved Tenderer" in these Conditions shall mean that the Tenderer shall be approved by the Employer as having complied with these Conditions in every respect.

1.13 The word "Tenderer" in these Conditions shall be deemed where applicable to include two or more persons. The word "his" may also mean "their" and the word "he" may also mean "they".

1.14 If it is found on the examination of a tender that there is a discrepancy between the Total

Amount of the tender and the amount arrived at by valuing the quantities set out in the Bills of Quantities at the rates or prices set against them by the Tenderer, then the figures shall be corrected arithmetically and the differences between the tender and the corrected total shall be applied as a percentage adjustment or addition or omission on all the rates, so that the original tender amount remains unaltered. When calculating the percentage adjustment, the total cost of the Preliminaries, Provisional and P.C. Sums, Contingencies and any other items of a similar nature shall be excluded.

1.15 If it is found on examination, that any rates for the work appear to be unreasonable then the attention of the Tenderer shall be drawn to any such items. If as a result of this, the Tenderer asks for any rates to be changed, then the arithmetical effect of any change will be adjusted in accordance with sub-paragraph 8.01 above.

1.16 Non-compliance with the above Conditions in any respect shall render the tender liable to rejection.

FORM OF TENDER

To:

Principle Secretary
Ministry of Health,
P.O. Box 30016- 00100
Nairobi, Kenya.

Sirs,

PROPOSED KISII CANCER CENTER – AT KISII COUNTY

TENDER FOR PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

1.01 Having visited the site and examined the tender documents for the execution for the above works I/We

……

(Names) under and subject to the Conditions of Tendering annexed hereto, hereby tender and offer to execute and perform the works and provisions and supply all labour and materials and everything of every kind respectively named, shown, described and alluded to in, or to be inferred from the **FIDIC Conditions of sub-contract for construction for building and engineering works designed by the employer**, the General Conditions of Sub-Contract, Specification and Bills of Quantities, Drawings and conditions of contract to be executed and supplied on the part of the Sub-Contractor, for the Works above described for the Sum of:-

Fixed /Non Fluctuating Price Tender (Adjusted fluctuating price to allow for future price changes). Tender figure, Prime Cost & Provisional sums and Contingencies.

Amount in figures (USD): . . . .

Amount in words (USD): . …… . . . . . .

. . . . ……

1.02 I/We agree to phase the sub-contract work in accordance with the building programme to be agreed with the main Contractor at the time of letting the Main and Sub-Contracts.

1.03 I/We further agree to be bound by and submit to the said General Conditions of Sub-Contract and priced Specification and Bills of Quantities which shall form a basis for valuation of interim Certificates and any extra or omitted work which may from time to time be ordered by the Architect.

1.04 We have examined all the documents, which will form part of this contract and have no further questions relating to them.

2.01 I /We submit the name of ……

Address ……

as a Surety who is willing to be bound to the Main Contractor in an amount equal to 10% of the Sub-Contract amount for the due performance for the Sub-Contract up to the date of completion of the Works as certified by you, and who will, when and if called upon, sign a Bond to that effect without limitations on the same day as the Sub-Contract Agreement is signed, but thereafter, and in the event of the Surety named herein not being approved by you, the undersigned agree(s) to furnish

within seven (7) days another Surety to your approval.

3.01 Whereas it is understood that you reserve to yourself the right to accept or to refuse this tender whether it be lower or higher than any other tender, or of the same amount, the undersigned agree(s) that this tender shall remain valid and shall not be withdrawn within One Hundred and Twenty (120) days from the final date for the submission of Tenders stipulated in the Conditions of Tendering.

4.01 And further, the undersigned agree(s), in the event of your acceptance of this tender, to execute the formal Sub-Contract Agreement within seven (7) days from posting, or delivery if by hand, of notification of acceptance.

Signature of Tenderers: ……

Name of Tenderer: ……..

Address: ……..

Date: ……

Signature of Witness: ……...

Name of Witness: ……

Address: ……..

Date: ……..

NOTE: Tenderers are not required to attach the Surety Undertaking, duly signed by the Surety, to this Form of Tender. However, a performance bond will be executed on being successful before contract signature.

DECLARATION ON AVAILABILITY OF MATERIALS, PLANT, SUPERVISION AND SKILLED LABOUR

To: The Principle Secretary
Ministry of Works
P. O. Box 30016 – 00100
Nairobi, Kenya

Sirs,

PROPOSED KISII CANCER CENTER – AT KISII COUNTY

TENDER FOR PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

In connection with the attached tender for the above Sub-Contract, I/We have made full enquiries with manufacturers and/or distributors of the relevant materials and plant required to be incorporated or used in the Works and I/We hereby declare that I/We will have available: -

*(a) all the necessary
or *(b) a proportion of the necessary

Materials, plant, tools and equipment, supervision and skilled labour

*(a) from stocks in hand
or *(b) from sources of supply available to me/us
for use as and when they are required for the Works.

Signature of Tenderer …….

Name of Tenderer ……...…….

Address ……...……...

Date…….

NOTES: -

1. *Delete whichever is not applicable.
2. *The Tenderer may be required before approval

(a) To disclose the (i) actual quantities of the various materials and (ii) plant available for immediate use and, (iii) To submit names and CV's and academic certificates of available supervision personnel and team leader being a mechanical engineer with over 10 years' experience, (iv) Skilled labour.

b) To give details of the arrangements which have been made by the Tenderer for the obtaining and delivery to the site of the further materials and plant and employment of supervision and skilled labour required to complete the works.

3. Failure to satisfy the Engineer that adequate arrangements have been made to provide or obtain the whole of the materials, plant, tools and equipment necessary to complete the Works within the contract period or such extended period as may be authorized, may render the Tenderer liable to be considered in default.

SURETY UNDERTAKING

PROPOSED KISII CANCER CENTER – AT KISII COUNTY
TENDER FOR PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

We …… (Surety)

of P.O. Box ……

hereby undertake to provide a guarantee in the form of Performance Bond supplied with these tender documents, under seal if so required, for the due performance of the contract to the extent to ten percent (10%) of the awarded contract sum in the event of

……(tenderer)

of (address) ……..

being awarded the tender for construction and completion of the project including twelve (12) months maintenance.

We further agree to execute a Performance Bond under the forgoing terms within FOURTEEN (14) DAYS of being called upon to do so.

Should the said tenderer not be awarded the contract, it is understood that this offer shall become null and void.

Signed for and on behalf of surety …….. (Authorised signatory)

Name & address of surety (official rubber stamp)

……

Date signed ……..

CONFIRMATION OF SUFFICIENCY OF INFORMATION PROVIDED / SITE VISIT

This is to certify that we _____
(Name of Tenderer)

of the firm of _____

(Name of firm tendering)

Having studied the contract documents, have made our selves familiar with all local conditions likely to influence the works and cost thereof.

We undertake to treat all provided information with strict confidentiality.

We further certify that we are satisfied with the description of the works and explanations given and confirm as follows:

We visited the site on _____and confirmed all necessary information.

We did not visit the site but confirm sufficiency of provided information:

_____ _____

Signed (Name & Signature of Tenderer)

PERFORMANCE BANK GUARANTEE

PROPOSED KISII CANCER CENTER – AT KISII COUNTY
TENDER FOR PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

To:

(Name of Employer)

(Date)

Dear Sir,

WHEREAS…… (Hereinafter called "the Contractor") has undertaken, in pursuance of Contract for …… to execute (herein after 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 recognized bank for a 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 USD…….

(Amount of Guarantee in figures) USD…… ……

(amount of Guarantee in words), and we undertake to pay you, up to your first written demand and without cavil or argument, any sum or sums within the limits of USD …… …….. (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 there under 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.

SECTION 2:

PRELIMINARIES

KISII CANCER CENTRE - KISII COUNTY, KENYA

PROPOSED KISII CANCER CENTER – AT KISII COUNTY

TENDER FOR PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

PRELIMINARIES

PRELIMINARIES

A ABBREVIATIONS

Throughout these Bills, units of measurements and terms are abbreviated and shall be interpreted as follows: -

"m^3"	Shall mean Cubic Metre
"m^2"	Shall mean Square Metre
"Lm or m"	Shall mean Linear Metre
"Lbs."	Shall mean Pounds Weight Avoirdupois.
"kg"	Shall mean Kilogram.
"No."	Shall mean Number.
“P.Sum”	Shall mean Provisional Sum
“Sum”	Shall mean Lump Sum
"Prs."	Shall mean Pairs.
“LV”	Shall mean Low Voltage

"Do." or “ Ditto” Shall mean the whole of the preceding description except as qualified in the description in which it occurs. Where it occurs in descriptions of succeeding items it shall mean the same as in the first description concerned. Where it occurs in brackets it shall mean the whole of the preceding description which is contained within the appropriate brackets. Where it is underlined it shall mean the whole of that part of the preceding description which is underlined.

The full titles of the Standards referred to in this document are as follows:

BS	- British Standards
IEC	- International Electrotechnical Commission
IEE	- Institution of Electrical Engineers
ISO	- International for Standardization Organization
CIE	- International Standard on Illumination
EN	- European Committees for Standardization
CECC	- European Committee for Electrotechnical Standardization
DIN	- Deutsches Instut fur Norming
KEBS	- Kenya Bureau of Standards

A ALTERATIONS TO TEXT ETC.

Any unauthorised alteration or qualification made to the text of this document may cause the tender to be disqualified and will, in any case, be ignored.

Each item in the Bills of Quantities must be priced and tenders containing Lump Sums to cover groups of work must be broken down to show the price of each item before they are accepted. Lump Sums to cover any items of Preliminaries shall be broken down if so required by the Engineer.

B DEFINITION OF TERMS

(i) "SELECTED, DIRECTED, APPROVED", ETC

Wherever the words "Selected", "as directed", "as required" or words of similar meanings are used in the Bills of Quantities, it is to be understood that the selections, direction or requirements of the Engineer are intended. Similarly, the words "approved" "satisfactory" or other synonymous words shall mean "approved by" or "satisfactory to" the Architect and the Engineer's approval must first be obtained before the materials are ordered or the works to which the words refer are put in hand.

(ii) "NECESSARY, PROPER" ETC.

Wherever the words "necessary", "proper" or words of similar meaning are used in these Bills of Quantities with respect to the extent, conduct, character or works described, it is to be understood that they shall mean that the said works shall be executed to the extent, must be conducted in a manner or be of a character which is "necessary" or "proper" in the opinion of the Engineer.

(iii) SINGULAR AND PLURAL

Words importing the singular only wherever used hereinafter and in all contract Documents shall also include the plural and vice versa where the context requires.

(iv) EMPLOYER

The Employer is Ministry of Health P.O. Box P.O Box 30016-00100, Nairobi, Kenya. The terms "Employer" and "Client" wherever used in these Contract document shall be synonymous.

(v) ARCHITECT

The term "Architect" shall be deemed to mean the firm of Messrs Schon and Associates P.O Box 38601 - 00100 Nairobi, Kenya

(vi) CIVIL / STRUCTRUAL ENGINEER

The term "The Engineer" shall be deemed to mean the firm of Messrs. Schon and Associates P.O.Box 38601 - 00100, Nairobi, Kenya.

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(vii) ELECTRICAL & MECHANICAL ENGINEER

The term "The Engineer" shall be deemed to mean the firm of Messrs. Schon and Associates P. O. Box 38601 -00100,Nairobi, Kenya.

(viii) QUANTITY SURVEYOR

The term "The Quantity Surveyor" shall be deemed to mean the firm of Messrs Schon and Associates, P.O. Box 38601 - 00100, Nairobi, Kenya.

(ix) MAIN CONTRACTOR

The term "Main Contractor" shall be deemed to mean the person or persons, partnership, firm or company whose tender for the Main Contract works has been accepted, and who has or have signed the Main Contract and shall include his or their heirs, executors, administrator, assignees, successors and duly appointed representatives.

(x) SUB-CONTRACTOR

The term “Subcontractor” shall be deemed to mean the person or persons, partnership firm or company who’s tender for this work has been accepted and who has or have signed this Sub-Contract and shall include his or their heirs, executors, administrator, assignees, successors and duly appointed representatives.

A SITE

The site of the Proposed Kisii cancer centre is in Kisii County, Kenya On plot LR No. ……..

The Tenderer is recommended to visit the site and if unable to locate he shall apply to the Engineer for directions. The Tenderer shall be deemed to have examined and fully acquainted himself with the site and its nature and position, means of access, existing water and electricity supplies, etc. and make all necessary allowances and provisions for overcoming any difficulties which may arise therefrom as no claim for lack of knowledge in this or any other respect will be allowed.

No claims will be allowed for travelling or any other expenses which may have been incurred by the Sub-Contractor in visiting the site or preparing the tender for the Works.

B PRICING OF PRELIMINARIES AND BILLS OF QUANTITIES

Wherever in the Tenderer's priced Preliminaries and Bills of Quantities no price appears against an item, the value of such item shall be deemed to be included in his rates for the other items which have been priced by him.

C FORM OF SUB-CONTRACT

(i) The successful Tenderer will be appointed as nominated Sub-Contractor to the Main Contract under **Clause No. 5.2 of the conditions of Contract for Building and Engineering Works Designed by the Employer (Second Edition (2017) published by International Federation of Consulting Engineers (FIDIC).**

(ii) He will be required to enter into a Sub-Contract with the Contractor indemnifying him against the same liabilities in respect of the Sub-Contract as those for which the Contractor is liable to indemnify the Employer under this contract.

(iii) The Nominated Sub-Contractor will be required to enter into a written Sub-Contract Agreement with the Main Contractor on the latest edition of the ***FIDIC Conditions of sub-contract for construction for building and engineering works designed by the employer***, a signed copy of which must be deposited with the Engineer.

(iv) Copies of the Main Contract Agreement, Conditions of Contract, Bills of Quantities for the Main Contract, Form of Bond, Drawings and the General Specification are available for inspection at the offices of the Engineer on any working day until the time appointed for the submission of the tenders.

(v) If the Tenderer considers that compliance with any of the Condition of Sub-Contract of which the headings are set out hereunder involves him in expense which is not included elsewhere in his prices he shall set down opposite any such condition the value he attaches thereto. The Clause headings of the Schedule of Conditions are set out hereunder but do not in any way affect or restrict the full meaning of the Conditions as printed.

Clauses

1. Sub-Contract Sum
2. Notice of the Main Contract to the Sub-Contractor
3. Execution of the Sub-Contract Works
4. Sub-Contractor's liability under incorporated provisions of the Main Contract
5. Insurance against injury to persons and property
6. Damage by Fire
7. Policies of Insurance
8. Variations, etc
9. Completion
10. Defects, shrinkages, etc
11. Sub-Contract Sum - Valuation of Variations
12. Certificate and Payments
13. Interim Payments to the Sub-Contractor
14. Retention Money
15. Dispute as to Certificate
16. Right of Sub-Contractor to suspend execution of Sub-Contract Works
17. Special Interim Payment
18. Final Payment to the Sub-Contractor
19. Sub-Contractor's claim to Rights and Benefits under the Main Contract
20. Contractor's right to deduction or set off
21. Right of Access of Contractor and Architect
22. Subletting of Sub-Contract Works
23. Provisions of Water etc for Sub-Contract Works
24. Temporary workshops etc
25. Sub-Contractor's use of scaffolding
26. Contractor and Sub-Contractor not to make wrongful use of or interference with the property of the other
27. Plant, tools etc of Sub-Contractor
28. Determination of this Sub-Contract by the Contractor
29. Determination of this Main Contract
30. Wages and Conditions
31. Bond
32. Fluctuations in Duties and Exchange Rates
33. Arbitration

Carried to Collection USD.

A PARTICULARS OF INSERTIONS TO BE MADE IN APPENDIX TO THE SUB – CONTRACT AGREEMENT.

The following are the insertions to be made in the Appendix to the Sub-Contract Agreement:-

Clause 4.2	Sub contract performance security	10% of Contract Sum
Clause 8.1	Commencement of sub-contract works	To be advised
Clause 8.2	Sub – contract time for completion	To be advised
Clause 11.2	Sub contract defects notification period	Twelve (12) months
Clause 14.2	Sub – contract advance payment	To be advised
Clause 14.6	Sub – contract payments	To be advised

B COMPLETION PERIOD

The Date of Completion for the Sub-Contract will be the same as the Date of Completion for the Main Contract.

Carried to Collection USD.

A BOND & STAMP CHARGES

All tenderers will submit the name of an approved Surety who will be willing to be bound to the Main Contractor in an amount as required in the Main Contract Conditions. The Sub-Contractor shall allow for payment of all stamp charges in connection with Surety Bond and Sub-Contract Agreement.

B LICENSING & SUBLETTING

The tenderers for this Sub-Contract must be fully licensed Contractors under the Ministry of Public Works Regulations and must be currently registered as approved Mechanical Contractors Category A with the Contract and Quantities Branch of the Ministry. They must also be registered under the Ministry of Energy as Electrical Contractors as Class A licence. No sub-letting or assignment by non-registered firms will be authorised by the Architect.

C PROGRAMME

All Sub-Contract Works must be programmed and co-ordinated with the approval of the Main Contractor and the Architect. The successful tenderer will be required to submit a programme within two (2) weeks of the acceptance of his tender to Main Contract and to the Architect for approval.

The works are associated with supply and installation of electrical systems, transport to site, offloading, labour installation, fixing, connecting, commissioning and delivering up clean and in working order in every detail.

D SANITATION OF THE WORKS

The sanitation of the Sub-Contract Works shall be maintained by the Sub-Contractor to the satisfaction of the Government and/or Local Authorities, Labour Department and the Architect.

Carried to Collection USD.

A ATTENDANCE BY MAIN CONTRACTOR

The Main Contractor shall be responsible for Nominated Subcontractors in every respect and in particular it shall be the Main Contractor's responsibility to ensure that each Sub-Contractor commences and completes the work in such a manner and is ready on the site with his materials, labour and special plant at such time so as to conform with the completion programme, as previously specified, and to ensure satisfactory progress.

The Main Contractor shall accept liability for and bear the cost of General and Specific Attendance on Nominated Sub-Contractors which shall be deemed to include for:

- Allowing the use of standing scaffolding, retention of all scaffolding until such time as all relevant Sub-Contract works are complete and removal of all scaffolding on completion.

- Providing of space for office accommodation, and for storage of plant and materials; use of sanitary accommodation; the supply of all necessary water, and lighting; and clearing away all rubbish with reasonable assistance from the Nominated Sub-Contractor.

The Main Contractor shall also accept liability for and bear the cost of Special Attendance of Nominated Sub-Contractors which shall include for one or more of the following:

- Unloading, storing, hoisting, and placing in position, providing power, provision of special scaffolding.

- Cutting away for and making good after the work as may be required will be measured and valued separately by the Quantity Surveyor.

Carried to Collection USD.

B PAYMENTS

The Nominated Sub-Contractor will be entitled to payment from time to time for materials and/or any work carried out under this Sub-Contract, the value of which shall be determined by the Consultant Engineer and included in Payment Certificate to the Main Contractor under the Main Contract. The Nominated Sub-Contractor will be informed by the Quantity Surveyor when such payments are certified and should he not receive from the Main Contractor the payment due within the period stipulated in the Conditions of Sub-Contract he should immediately report to the Architect and the Engineer.

C MATERIALS ON SITE

Unless otherwise agreed by the Architect all materials relating to this Sub-Contract must be delivered to the site before payment for such items may be certified.

Carried to Collection USD.

A RETENTION

Ten Percent (10%) of the value of work done will be held as retention in the valuation for each Interim Payment for this Sub-Contract. The first moiety of five percent (5%) retention money will be released on practical completion of the Sub-Contract works and the second moiety will be released on satisfactory completion of the maintenance works at the end of the six months Defects Liability Period.

B LIQUIDATED & ASCERTAINED DAMAGES

If the Nominated Sub-Contractor fails to complete the works tendered for or any section of it within the agreed period of completion or within any extension period granted by the Architect, he will be required to allow or pay to the Main Contractor a sum equivalent to any loss or damages suffered or incurred to the Main Contractor caused by or resulting from such failure.

C DEFECTS

The Nominated Sub-Contractor shall be liable to make good at his own cost all defects or other faults occurring in the Sub-Contract works within a period of six months from date completion as defined herein and shall bear any expenses reasonably incurred by the Main Contractor as a direct consequence of such defects. Provided that such defects have not been caused as a result of defective workmanship or material for which the Main Contractor is responsible. Any work or section of the Sub-Contract works which are badly affected by such defects, etc and in the opinion of the Architect cannot be satisfactorily made good by repairs, etc shall be carried out again by the Nominated Sub-Contractor at his own cost within a reasonable time of being required to do so in writing by the Architect or the Main Contractor.

Carried to Collection USD.

A **UNAVOIDABLE DELAYS IN IMPORTED MATERIALS**

During the progress of the works where delays are anticipated in obtaining imported materials or locally manufactured materials requiring imported components, the Architect should be informed in writing as early as possible. An application for extension(s) of time must also be made in writing at the same time. Where the accepted Sub-Contractor can fully substantiate with documentary evidence that every effort has been made and the correct procedures followed for obtaining the materials or where applicable the import licences and the delays are unavoidable, the Architect will, if satisfied, grant such extension(s) of time. Liquidated and ascertained Damages shall then not be imposed for such delays. The successful Sub-Contractor shall, however be expected to place appropriate orders for all imported and locally manufactured materials immediately after the signing of the Sub-Contract Agreement in order to minimise the risk of delays caused through shortages of materials. The Tenderer should state below in the space provided any materials which in his opinion it is anticipated may be in short supply and likely to cause such delays.

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Carried to Collection USD.

A PURCHASE OF BUILDING MATERIALS IN ADVANCE

The Sub-Contractor will be required, immediately after the signing of the Sub-Contract to purchase in advance as much as possible of the building material requirements of the Sub-Contract in order to avoid possible future price increase and shortages. To qualify for inclusion in interim payment certificates all such materials shall be suitably stored on site or in an approved bonded warehouse adequately insured against theft and damage for the period of the storage, all to the approval of the Architect. Where any material is not immediately available the appropriate orders must be placed as soon as possible after the signing of the Sub-Contract and all appropriate measures must be taken to secure early delivery of such materials.

B SITE MEETINGS

The Nominated Sub-Contractor or his authorised representative shall attend site meetings whenever the Architect requires and the Tender Price will be deemed to include for all expenses in connection with such visits.

C DAMAGE TO SUB-CONTRACT WORKS, ETC.

The Nominated Sub-Contractor shall take every precaution to prevent damage to all existing property on site including the Main Contract Works and will be responsible for and shall pay for the making good of any such damage to the satisfaction of the Architect.

D SECURITY

Maximum precautions must be exercised to uphold existing security in the vicinity of the Works. The Sub-Contractor shall comply with all instructions issued by the Employer, Architect or the Main Contractor with regard to the upholding of security arrangements and will be held responsible for any breach of security by his own, his suppliers' or others' employees engaged directly or indirectly on the Sub-Contract Works.

Carried to Collection USD.

A "OUT OF BOUNDS" AREAS

The movement of the Sub-Contractor's men must be confined strictly to the works and the Sub-Contractor's working and Storage Areas. Certain areas within and adjacent to the site and to be identified later, will be designated "Out of Bounds" areas for the Sub-Contractor's employees and the Sub-Contractor will be required to comply strictly with this rule.

B WORKING AND STORAGE SPACE

The Sub-Contractor shall provide at his own risk and cost safe storage and custody of materials for the Works. Working and storage space for the Sub-Contractor's materials plant and workmen will be allotted by the Main Contractor within the limits of the area made available to him for this purpose. All activities pertaining to the works will be confined as far as is possible to the specified area or areas. No such activities will be carried out outside the area(s) without the specific authority of the Architect. The allotted area is located within an existing building and the Sub-Contractor will be required to erect temporary barricades to the approval of the Architect and clear them away when no longer required. No materials shall be stored or stacked on suspended slabs without prior approval of the Architect.

Carried to Collection USD.

A GOVERNMENT ACTS REGARDING WORK PEOPLE, ETC.

Allow for complying with all Government Acts, Orders and Regulations in connection with the employment of labour and other matters related to the execution of the works. In particular, the Sub-Contractor's attention is drawn to the provisions of the Factories Act Revised Edition 1972, and his tender must include for all costs arising or resulting from compliance with any Act, Order or Regulation relating to Insurance's, Pensions and Holidays for work people or to the safety, health or welfare of work people. The Sub-Contractor must make himself fully acquainted with current Acts and Regulations, including Police Regulations regarding the movement, housing, security and control of labour camps, passes for transport, etc. It is most essential that the Sub-Contractor, before tendering, shall obtain from the relevant Authority the fullest information regarding all such regulations and/or restrictions which may affect the organisation of the works, supply and control of labour, etc. and allow accordingly in his tender. No claim in respect of want of knowledge in this connection will be entertained.

Particular attention is drawn to the Rules published in Legal Notice 179, dated 2nd June 1979. (Building Operations and Works of Architecting Construction).

B SAMPLES

The Sub-Contractor shall furnish at his own cost any sample of materials or workmanship required by the Architect / the Engineer for his approval or rejection and any further samples in the case of rejection until such samples are approved by the Architect / Engineer. The Architect / Engineer may reject any materials or workmanship not in his opinion up to approved samples. The Architect / Engineer shall arrange for the testing of such materials as he may at his discretion deem desirable. The testing shall be made at the expense of the Sub-Contractor. The procedure for submitting samples of materials for testing and the method of marking for identification shall be as laid down by the Architect. The Sub-Contractor shall allow in his tender for all such samples and tests.

Carried to Collection USD.

A INSURANCE

The Sub-Contractor shall during the execution of the works insure himself and keep himself insured against all liability arising under the Workmen's Compensation Act or any amendment thereto for accidents to workmen employed by him on the said Works and shall indemnify the Employer in respect of any such accident to any such workmen. The Sub-Contractor shall further insure himself and keep himself insured against all liability arising from all Third Party Claims arising from accidents and he shall indemnify the Employer in respect of all claims, which may be made against him in respect of any such accidents. No payment on account of the work executed will be made to the Sub-Contractor until he has satisfied the Architect either by the production of an Insurance Policy or an Insurance Certificate that the foregoing provisions have been complied with in all respects. Thereafter the Architect shall from time to time ascertain that premiums are duly paid up by the Sub-Contractor who shall if called upon to do so, produce receipted premium renewals for the Architect's inspection.

B METHOD OF MEASUREMENT

These Bills of Quantities have been prepared in accordance with the principles of the "Standard Method of Measurement of Building Works for East Africa", unless otherwise expressly stated.

A MANUFACTURERS' OR PROPRIETARY NAMES

Where Manufacturer's or Proprietary names or catalogues number are mentioned in these Bills of Quantities the reference is intended as a guide to the type of article or quality of material required. The Sub-Contractor may use any article or material equal in type or quality to those herein described subject to the prior approval of the Engineer and at his absolute discretion. The onus of proof as to equivalent quality will rest with the Sub-Contractor, whose tender will be deemed to include for the makes described in the Bills of Quantities.

Carried to Collection USD.

A CLAIMS FOR EXTRAS

The Sub-Contractor shall submit to the Architect and Contractor claims for any work or circumstances on account of which he may consider that he is entitled to extra payment within seven days from the time of the commencement of such work or occurrence of such circumstances. Any such claim must be in writing and accompanied by full particulars and must state under which provision of the Sub-Contract it is claimed so that payment shall be made.

B PRIME COST AND PROVISIONAL SUMS

The terms "Provisional Sum" and "Prime Cost Sum" or "P.C. Sum" wherever used in these Bills of Quantities shall be deemed to have the same meaning as defined in the General Preliminaries to the Main Contract Bills. The adjustment of these Sums shall similarly be dealt as described in the above General Preliminaries.

C LABOUR CAMPS

The Sub-Contractor will be permitted to house labour on the site and must make his own arrangements to construct the houses. Cooking and eating facilities for workers will be permitted on the site.

D WORKING AND RECORD DRAWINGS

The Sub-Contractor shall prepare all necessary sets of schematic diagrams, working drawings, etc required by the Engineer and shall also prepare and provide sets of Records Drawings together with instruction charts, maintenance manuals, etc all as specified in the attached General Specification.

Carried to Collection USD.

A FIRM PRICE SUB-CONTRACT

Unless otherwise specifically stated in the Preliminaries, this is a Firm Price Sub-Contract and the Sub-Contractor must allow in his tender for any increase in cost of labour and/or materials during the currency of the Sub-Contract. No claim for increased costs will be entertained except for increased costs, which may arise from fluctuations in Duties, and Exchange Rates defined in Clause 32 of the Sub-Contract Agreement.

B WATER AND ELECTRICITY FOR THE WORKS

These will be made available by the Main Contractor but the Sub-Contractor will be liable for the cost of any water or electric current used and any installations provided especially for his use.

C PROVISIONAL WORK

Quantities given as "Provisional" in these Bills of Quantities shall not be held to gauge or limit the amount or description of the work to be executed by the Sub-Contractor. However, the value thereof shall be deducted from the Sub-Contract Sum and the value of the work ordered by the Architect and executed thereunder shall be ascertained as provided by the relevant Clause of the Conditions of Sub-Contract. All "Provisional" and other work liable to adjustment under this Sub-Contract shall be left uncovered for a reasonable time to allow measurements needed for such adjustment to be taken by the Engineer and Quantity Surveyor. Immediately the work is ready for measuring, the Sub-Contractor shall give notice to the Architect. If the Sub-Contractor makes default in these respects, he shall, if the Architect so directs, uncover the work to enable measurements to be taken and afterwards reinstate all at his own expense.

D CASING UP, PROTECTING AND HOARDING

The Sub-Contractor shall be responsible for casing up, protecting or otherwise to the satisfaction of the Architect all parts of the Sub-Contract Works liable to damage or to cause injury and for removing such protection and making good at completion of the Works. The Sub-Contractor shall take into account that the works shall be carried out concurrently with other trade works and the safety of staff shall remain the responsibility of the Sub-Contractor during the course of the Sub-Contract.

E WORKS TO BE DELIVERED UP CLEAN

On completion of the Works, the Site and the Works shall be cleared of all plant, scaffolding, rubbish and unused materials and shall be delivered up in a clean and perfect condition in every respect to the satisfaction of the Architect.

Carried to Collection USD.

B ADDITIONAL ITEMS

Any additional item(s) which the Tenderer may wish to price separately and which he considers has not been included in the foregoing Conditions, Specification and/or Bills of Quantities.

Description_____

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C EXISTING INSTALLATIONS

All items, which have been disconnected and removed from the existing installations in accordance with the Technical Specifications, shall remain the property of the Employer. These items shall be packaged in waterproof boxes and kept in storage as directed by the Employer. The Employer may however opt to surrender the same to the Sub-Contractor at a salvage value, which shall mutually be agreed between the Employer and The Sub-Contractor.

Carried to Collection USD.

SECTION 2

PRELIMINARIES COLLECTION

ITEM	AMOUNT (USD)
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PART 3:
GENERAL REQUIREMENTS
KISII CANCER CENTRE

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EQUIPMENT AND MATERIALS INCLUDED IN THE TENDERED SUM

3 GENERAL REQUIREMENTS

3.1 DESCRIPTION OF THE MAIN CONTRACT WORKS

The Proposed Kisii Cancer Centre is located in Kisii, Kisii County Kenya.

The project also shall include infrastructure and civil works.

This section of the contract relates to the Internal Plumbing, Drainage, External Water Reticulation and Fire Protection installations which shall comprise of the following:

- Cold and hot water Plumbing works;
- Internal Drainage;
- Rainwater drainage;
- Sanitary ware;
- Fire Protection Installations;
- External water reticulation;
- Boiler and hot water generation systems;

Drawings of the development may be inspected at the offices of the Architect and the Engineer provided this is done by appointment.

The services drawings are provided with the Specification - as per the Schedule of Drawings.

The above sub-contract works shall be carried out by a nominated sub-contractor and as such will be required to work in close liaison with the main contractor and all other sub-contractors. It is essential that complete co-ordination is maintained at all times to enable the timely completion, within the specified contract periods, of the Works. The sub-contractors will be required to agree with the main contractor the full working programme for all elements of the contract. Certain areas are more critical to the completion than others as certain items of plant and equipment, which will be required to be installed and commissioned, may experience long delivery dates. The specialised sub-contractors must identify these areas and agree on dates for completion with the main contractor and the Engineer so that no delays to the main contractor and other specialists are caused.

3.2 SCOPE OF THE WORKS

The works to be carried out under this section of the contract shall include Air Conditioning and Mechanical Ventilation including all the necessary pipework and ductwork. These items, together with other contract requirements, have been further expanded under later sections of the Specification.

(i) Design;
(ii) Manufacture;
(iii) Supply;
(iv) Delivery to site;
(v) Installation;
(vi) Works testing;
(vii) Commissioning;
(viii) Performance testing;
(ix) Making good any defects that occur during the defect liability period;
(x) Provision of 'As Installed' drawings and Maintenance and Operation documents;
(xi) The whole of the labour and all materials necessary to form a complete installation (whether or not all the necessary components are indicated).

The sub-contractor shall supply all labour, materials, plant, equipment and components necessary and execute the services installations described above and set out in this section of the Specifications, Bills of Quantities and the accompanying Drawings and in accordance with the general specifications herewith.

Unless otherwise indicated within this Specification, all equipment and materials to be installed shall be new and the Contractor shall ensure that all equipment can be installed in the allotted spaces and maintain adequate access for maintenance and repair. All equipment shall be installed in accordance with the manufacturers written instructions.

3.3 EXTENT OF SUB-CONTRACT

The sub-contract shall include, in addition to all items scheduled above, for the design, manufacture, inspection and testing, packing for shipment, insurance, shipping, delivery to site, unloading and all other charges, complete erection, tests on completion, setting to work, finishing, painting and maintenance for a period of twelve calendar months, all to the satisfaction of the Architect and Engineer, of the items of Plant and Equipment described or implied within this Specification and shown on the relevant Drawings**. This tender shall be exempt from all taxes and duties as imposed by Kenya Revenue Authority.**

The proposed installations within the new facilities are required to be complete in all respects as specified herein, and shall include all items of equipment, materials, accessories, fittings, supports, etc. necessary whether such items are specifically referred to in the contract or not. The sub-contractor shall be deemed to have included in his tender price for all items necessary such that the installations are complete in all respects and left in a satisfactory working order.

The sub-contractor shall provide fully detailed drawings of the entire installation together with layouts of all civil and building works etc. required to accommodate/house the plant and equipment, these layout drawings and details being related to the existing layouts as may be necessary. The drawings shall be submitted for approval within three weeks of the award of the sub-contract such that the Architect and Engineer can be made aware of all requirements. It shall be fully the responsibility of the sub-contractor to liaise with the main Contractor to ensure all civil and builder's works required for this sub-contract are prepared and/or provided to suit the programme of this contract. No claims will be entertained.

All modifications to existing layouts and all proposed new layouts and structures shall be subject to the full approval of the Architect, Engineer and the Employer.

3.4 SUB-CONTRACT PERIOD AND PROGRAMME

The sub-contractor shall provide within the stipulated period after the acceptance of his Tender, a complete programme for the execution of this contract. This programme shall indicate the expected dates of the commencement and completion of the following specialist contract works: -

(i) Submission of Working Drawings for approval;
(ii) Placing of orders with other specialists or sub-contractors for Plant and Equipment to be incorporated in the Works;
(iii) Receipt by the sub-contractor from other specialist or sub-contractor's of Plant to be incorporated in the Works;
(iv) Manufacture by the sub-contractor of Plant to be incorporated in the Works;
(v) Inspection and testing by the Engineer;
(vi) Shipment from country of supply;
(vii) Delivery to Site;
(viii) Erection on Site, details for all activities;
(ix) Tests on Completion. Operations shall be commenced when instructed and shall be carried forward to completion with the greatest possible expediency, to the satisfaction of the Architect, and Engineer, in accordance with the Programme. The sub-contractors programme shall be agreed with the main contractor, as the sub-contractor shall adhere fully to the requirements and timing of the agreed main contractors programme.

3.5 DRAWINGS ACCOMPANYING THE TENDER DOCUMENTS

Drawings accompanying this Specification indicate generally the arrangement of the installations and are

for assistance in tendering. The position of equipment and apparatus shown thereon are approximate only, the exact positions, together with the actual runs of ductwork, trunking and conduit etc., will be agreed with the Architect, the Engineer and the Employer before commencement of work. It shall be deemed that the prices entered by the sub-contractor include for the repositioning, of the various services, to meet the above requirements. No claims will be entertained.

The sub-contractor shall satisfy himself as to correctness of all Drawings and measurements particularly the dimensions of the works already constructed on site. If the sub-contractor finds any discrepancy in the Drawings or between the Drawings and the Specification or between the constructed works and the Drawings he shall immediately refer the same to the Architect and Engineer who will decide which shall be followed. Figured dimensions shall be taken in preference to the scale mentioned on or attached to any Drawings. Details shown on Drawings shall be read in conjunction with items in the Specification.

Copies of all Drawings and of the Specification will be furnished free of cost to the sub-contractor for his own use.

The Architect will furnish to the sub-contractor within a reasonable time after the receipt by the Architect of a written request for the same, any details which, in the opinion of the Architect are necessary for the execution of any part of the work such request to be made only within a reasonable time before it is necessary to execute such work in order to fulfil the contract. One copy of the Drawings, details and Specification shall be kept on the site until the completion of the sub-contract and the Architect shall at all reasonable times have access to the same. All copies of Drawings and details shall be returned by the sub-contractor to the Architect on the completion of the Contract.

Additional Drawings will be issued by the Engineer to suit the design requirements of the works these Drawings being issued either during or after the tender period as may be required or necessary. These drawings will supplement the details contained within the Specification and Bills of Quantities and the tenderer shall be deemed to have taken these into account in his pricing. Where the sub-contractor can demonstrate that the Drawings relate to new or additional items these new or additional items shall be priced to approval and shall be in accordance with the sub-contract rates and prices.

3.6 SUB-CONTRACT WORKING DRAWINGS

The sub-contractor shall prepare fully detailed Working Drawings for all items of plant, equipment and accessories required for installation under this section of the contract. Two copies of each Drawing shall be forwarded to the Engineer for approval and or comments. One copy will be returned stamped "approved" or "not-approved". Where Drawings require further information and/or modifications to meet the comments made by the Engineer they shall be re-submitted, again in duplicate, for approval.

When Drawings have been approved two further copies shall be forwarded to the Engineer, together with copies to the Architect, site and the Employer.
Drawings, and, where relevant, calculations in respect of the following shall be prepared by the sub-contractor and submitted to the Engineer for his approval commencing within ten (10) days from acceptance of the tender.
All drawings shall be to scale and fully detailed and all-important dimensions shall be given and the material of which each part is to be constructed shall be indicated.
During progress of the building works, the sub-contractor shall make all necessary checks on site to make certain the various Services can be installed as specified and shown on the approved Drawings.

Where such works cannot be so installed, this must be immediately brought to the notice of the Architect and Engineer prior to the progress of such works.

The Engineer, in conjunction with the Architect and the Employer, will check and return the Drawings submitted for approval within a reasonable period, not exceeding fourteen (14) days from receipt.
The layouts of plant and equipment are for general guidance only. The sub-contractor shall assess the requirements immediately and prepare a plant layout for approval, the required liaison being maintained with other specialists, sub-contractors and main contractor such that an agreed layout is submitted for

approval.

3.7 RECORD DRAWINGS

As soon as the works are complete and all tests have been satisfactorily carried out, the sub-contractor shall hand to Architect/Engineer two sets of Record Drawings, together with one set of negatives of these record drawings, showing the works as finally installed. These drawings shall be prepared on approved transparent plastic material in black ink or as approved by the Architect/Engineer. The certificate, of making good defects, will not be issued until this condition has been complied with. Record Drawings are in addition to detailed Working Drawings and shall show all cable routes, circuits, trunking, conduits, plant, trenches, ductwork and ducts etc., together with the entire Air Conditioning and Mechanical Ventilation as finally installed.

The Architect will provide the sub-contractor with a set of Contract Drawings (in addition to the two sets provided for the sub-contractor's site and office use), which shall be maintained by the sub-contractor's representative on site and which shall be used for recording contract variations as they occur. This set of Drawings shall be available for the Architect's inspection on site, and shall be kept up to date.

The cost of the preparation and submission of the above Contract and Record Drawings shall be deemed to be included within the sub-contractor's prices.

3.8 MAINTENANCE MANUALS

Upon Practical Completion of the Contract Works, the Contractor shall furnish the Engineer four copies of a Maintenance Manual relating to the installation forming part of all of the Contract Works.

The manual shall be loose-leaf type, International A4 size with stiff covers and cloth bound. It may be in several volumes and shall be sub-divided into sections, each section covering one Engineering service system. It shall have a ready means of reference and a detailed index.

There shall be a separate volume dealing with Air Conditioning and Mechanical Ventilation installation where such installations are included in the Contract Works.

The manual shall contain full operating and maintenance instructions for each item of equipment, plant and apparatus set out in a form dealing systematically with each system. It shall include as may be applicable to the Contract Works the following and any other items listed in the text of the Specifications:

System Description shall include but not limited to:

1) Plant;
2) Valve Operation;
3) Switch Operation;
4) Procedure of Fault Finding;
5) Emergency Procedures;
6) Lubrication Requirements;
7) Maintenance and Servicing Periods and Procedures;
8) Colour Coding Legend for all Services;
9) Schematic and Writing Diagrams of Plant and Apparatus;
10) Record Drawings, true to scale, folded to International A4 size;
11) Lists of Primary and Secondary Spares.

The manual is to be specially prepared for the Contract Works and manufacturer’s standard descriptive literature and plant operating instruction cards will not be accepted for inclusion unless exceptionally approved by the Engineer. The Contractor shall, however, affix such cards, if suitable, adjacent to plant and apparatus. One spare set of all such cards shall be furnished to the Engineer.

3.9 BUILDER'S WORK AND CIVIL WORKS

All Builder's Work and Civil Works incidental to this section of the contract such as the cutting of holes in walls and floors, the provision of foundations for plant and machinery, the building in of lifting beams, breaking into the existing plant rooms and duct systems, changes in levels the protection of existing structures, painting and the re-instatement of the plant rooms and associated areas to their original standard etc shall be the responsibility of the main contractor. The sub-contractor shall however be fully responsible for the preparation of all such details that relate to this sub-contract works, the details being subject to approval by the Architect and Engineer prior to submission to the main Contractor for action. Other items such as the fixing of brackets, cable and ductwork ducts and trenching, making good, etc shall be carried out by the sub-contractor to suit the installation of all the services.

It is the sub-contractor's sole responsibility to ensure that all holes and chases etc are in the required position and that any additional ducts, holes and chases necessary for the erection of the installations in situ concrete walls, floor slabs etc., are included in the early stages of construction as appropriate.
The sub-contractor shall furnish the Architect, Engineer and main Contractor with all information as to where foundations, brackets and fixings are required and shall ensure that such work is done in accordance with such information.

The sub-contractor shall include in his tender for all supports, fixings, the plugging of all walls, ceilings and floors to facilitate the fixing of the pipework, accessories, and all other portions of the Air Conditioning and Mechanical Ventilation installations. Any purpose made fixing brackets shall also be provided and installed by the sub-contractor, including escutcheon plates and the like.

The sub-contractor is to set out at the earliest opportunity the position of all holes necessary for the passage of ducts, pipe-work and conduits or otherwise required in connection with his work, and should additional holes or openings be required due to failure of the sub-contractor to fulfil the conditions of this clause, then he must arrange for the main Contractor to make such openings, etc at his own expense. The sub-contractor is not to arrange for the cutting of any holes or openings unless specifically authorised to do so and should he do so without approval, he will become liable for any damage to the building or fittings.

The sub-contractor shall supply and install approved pipework support brackets and hangers. It shall be deemed that the prices entered include for any special requirements and that the sub-contractor has visited the site during the tender period to ascertain all details.

The sub-contractor shall pay particular attention to the fixing and alignment of items. All items shall be installed square, true and perpendicular to floors i.e. as shown on Drawings and as may be required at site to the Engineers approval and to suit the existing and new services.

3.10 GUARANTEE

The sub-contractor shall guarantee all work for a period of twelve months after acceptance by the Architect. In the event of a defect arising within the contract defects liability period which, in the opinion of the Architect, is due to faulty workmanship or materials, the sub-contractor shall, at his own expense, make good such defects where instructed to do so, to the satisfaction of the Architect.

3.11 SETTING TO WORK

The sub-contractor shall instruct the Employer's Maintenance Engineer or his representative on the operation and maintenance of the various components forming the Air Conditioning and Mechanical Ventilation installations and shall provide such drawings, diagrams and manuals to ensure the Maintenance Engineer or his representative is completely conversant with such installations.

The sub-contractor shall ensure that the Services Installations are left in complete safe working order and

operating to the satisfaction of the Architect and the Engineer.

3.12 REGULATIONS AND STANDARDS

The Installations must be carried out strictly in accordance with the following documents: -

Electrical Services

(i) The current edition of the 'Regulations for the Electrical Equipment of Buildings' issued by the Institute of Electrical Engineers of Great Britain;
(ii) Electrical Supply Authority;
(iii) Relevant British Standard Specifications and Codes of Practice published by the British Institution (hereinafter referred to as B.S. and C.P. respectively);
(iv) Regulations of the Government of Kenya;
(v) Water Supply and Sewerage Authorities Regulations;
(vi) Any other duly constituted authorities regulations having jurisdiction over the works;
(vii) The Specification and accompanying documentation and Drawings;
(viii) The Working Drawings, produced by the sub-contractor and approved by the Architect/Engineer.

Mechanical Installations

(i) The Kenya Bureau of Standards;
(ii) Relevant British Standard Specifications and Codes of Practice published by the British Standard Institution (hereinafter referred to as B.S. and C.P. respectively);
(iii) Regulations of the Government of Kenya;
(iv) Water Supply and Sewerage Authorities Regulations;
(v) Any other duly constituted authorities regulations having jurisdiction over the works;
(vi) The Specification and accompanying documentation and Drawings;
(vii) The Working Drawings, produced by the sub-contractor and approved by the Architect/Engineer;
(viii) The Loss Prevention Council Regulations.

The sub-contractor shall undertake all modifications demanded by the authorities in order to comply with the regulations, and produce all certificates, if any, for the authorities without extra charge.

3.13 QUALITY OF MATERIALS

All materials, fittings and accessories are to be new and in accordance with the requirements of the current rules and regulations where such exist, and with the relevant British Standard Specification.

Uniformity of type and manufacture of fittings or accessories is to be preserved as far as practicable throughout the whole work.
Wherever in this specification the practice is adopted of specifying a particular item as 'similar' to that listed in a particular firm's catalogue, it is to be clearly understood that this is to indicate the type and quality of the equipment required. No attempt is being made to give preference to the equipment supplied by the firm whose catalogue is quoted.

Where particular manufacturers only are specified herein no alternative makes will be considered without good reasons.

All materials shall be good quality, suitable for the purpose specified, and to the approval of the Architect and Engineer.

3.14 WORKMANSHIP

The sub-contractor shall take into consideration, when pricing his tender, that there will be other sub-contractors working. Any disruptions to the existing services must therefore be kept to an absolute minimum, and in this respect the sub-contractor shall include in his prices for carrying out works outside

normal operating hours as may be directed by the Architect or Engineer. No claim will be entertained where abnormal working hours are required to meet this requirement and completion of the works within the specified contract period.

The sub-contractor shall be fully responsible for the co-ordination of all services, both new and existing, and in this respect he shall ascertain that the installation of the services will not foul other new or existing services. In all cases services through ducts etc. must be readily accessible for maintenance.

The sub-contractor shall be deemed to have included in his tender prices for locating switches, terminal points, ductwork, outlets and fixtures in positions and/or locations at least one metre, both horizontally and vertically from those positions indicated on the contract drawings. Within these limits no variations in the sub-contract sum will be made unless the work has already been executed in accordance with previously approved Working Drawings.

All trade work shall be carried out by tradesmen fully competent and qualified in their respective trades, and the entire installation shall be performed in a neat and workmanlike manner.

The sub-contractor shall take every precaution to avoid damage to all existing property including roads, paved walkways, grassed areas, landscaping, cables, drains and other services, and he will be held responsible for and shall make good all such damage arising at his own expense to the satisfaction of the Architect.

The sub-contractor will be responsible for the exact runs and placing of pipework, conduit, boxes, ductwork and accessories that are to be cast in concrete ceilings, floors, walls, columns and beams, and for the proper fixing of the pipework and accessories to the shuttering and the steel reinforcement work.

Where ductwork is to concealed, the pipes etc shall be in an exact position relative to the finished plaster or such other finishes as may be applied to enable adequate cover to be applied.

Where services are run above the false ceilings the sub-contractor shall ensure that access to all services is readily available such that future maintenance can be carried out without difficulty. Full details shall be included on the Working Drawings such that the Architect and Engineer can give consideration to the sub-contractor's proposals.

3.15 LAYING OUT OF WORK

The sub-contractor will be responsible for laying out his work and shall obtain all necessary information as may be required to carry out the work, and such information shall be obtained sufficiently in advance to avoid any possibility of delay to the works as a whole.

The sub-contractor shall be fully responsible, and shall inform himself of, the details of all work being carried out by the various trades on Site, particularly where such trades may interfere one with the other, or where co-ordination is necessary. No claims for extra costs will be met arising from omissions, oversights, or neglect in this regard.

The sub-contractor shall arrange for the supply, in advance of the delivery of the equipment, of all necessary foundation bolts, templates, nuts, plates, sleeves, anchorage, etc., as required and as may be directed by the Engineer or Architect.

3.16 ERECTION AND CHECKING OF WORK

The sub-contractor shall provide, and be solely responsible for, all skilled and unskilled labour, tools, lifting tackle and other equipment required for transport to the site, the handling and transport about the site and the erection of the plant and equipment.

As each part of the Works is erected, it shall be subject to approval by the Engineer.

All parts shall pass such tests on the site as required by the Architect and Engineer to prove compliance with the contract irrespective of any tests which may already have been carried out at the Manufacturer's Works. In particular all electrical pressure tests made at the Manufacturer's Works shall be repeated at voltages approved by the Engineer.

The sub-contractor shall supply and install all supports, fixings, brackets and similar items as may be necessary for the completion of the installation of the services as specified and as shown on the Drawings.

3.17 PERFORMANCE AND ACCEPTANCE TESTS ON SITE

The sub-contractor shall give to the Engineer in writing at least five days notice of the date after which he will be ready to make the specified tests on completion of installation. Unless otherwise agreed the tests shall take place within seven days after the said date on such day or days as the Engineer shall in writing notify the sub-contractor. The tests shall be carried out under normal working conditions to the satisfaction of the Engineer and shall extend over such continuous periods as he may direct.
All skilled labour, supervision, apparatus, fuel for tests and instruments required for carrying out the tests efficiently will be the responsibility and at the expense of the sub-contractor. The accuracy of the instruments shall be demonstrated if required.

If any part of the plant or equipment fails to pass the specified tests, further tests of the said part shall, if required by the Engineer, be repeated. The sub-contractor shall, without delay, put in hand such modifications as are necessary to meet the requirements as described in the Contract and any expense which the Employer may have incurred by reason of such further tests shall be deducted from the sub-contract price.

Each completed system within the installation shall be tested as a whole under operating conditions to ensure that each component functions correctly in conjunction with the rest of the system.

3.18 TEST RECORDS

The sub-contractor shall make all necessary records of the tests carried out, and when the tests have been successfully completed he shall provide the Architect and Engineer with test records and reports in a form to be agreed.

The Air Conditioning and Mechanical Ventilation be deemed to be complete when the following obligations have been fulfilled by the sub-contractor: -

(a) The satisfactory completion of the Performance and Acceptance Tests on Site;

(b) Test records and reports have been received;

(c) The handing over of two preliminary sets of Record Drawings. The supply of these preliminary Record Drawings shall not relieve the sub-contractor of his obligations to supply Record Drawings in accordance with the requirements of the Specification;

(d) The issue of an acceptance certificate by the City Council for all works associated with the Air Conditioning and Mechanical Ventilation systems as may be necessary and required;

3.19 DUST, INSECT AND VERMIN PROOFING

All equipment, which is affected by ingress of dust, shall be effectively dust proofed and also vermin proofed where no protection is afforded in its normal manufactured form. All materials used shall be in general resistant to attack by insects, microbiological life or other local fauna and such materials shall be to the approval of the Architect and Engineer.

3.20 PAINTING AND FINISHING

All mechanical and electrical equipment installed under this sub-contract shall be painted or otherwise finished to approval in accordance with B.S. Code for Standard Colours including all pipework and ductwork, etc. Such finish shall be entirely compatible with the conditions of heat, humidity, exposure to the weather, and other relevant factors arising from the materials, location and condition of operation of the equipment.

The Architect may request examples of paint finishes, the cost of which shall be deemed to have been included within the tendered prices for all works.

All final painting of equipment, fixtures, and accessories shall be carried out by the sub-contractor, except where it is the usual practice of the manufacturer of items of plant, equipment, and switchgear etc to apply a high standard of protective finishing paintwork in the shop before despatch. This will be acceptable provided any damage to paintwork that occurs before the plant is taken over is made good by the sub-contractor at his own costs.

The interiors of electrical switchboards, control panels, and similar items, where supplied by the sub-contractor shall be finished in approved enamel and shall comply with the appropriate B.S. for enamel finish. The exteriors of such panels and enclosures shall be of British Standard Specification colour as specified by the Architect.

3.21 LABELS

All items of plant, valves, tee's etc shall be neatly and clearly labelled externally with identification marks corresponding with those on Drawings or in Specifications. Final details shall be agreed.

Identification labels shall be of laminated plastic material engraved, black on white, with no less than 6mm "Lino" style letters and shall be fixed on or adjacent to all items by means of at least two brass screws or to approval.
All main switches, circuit breakers, isolators, valves, motors, switch-fuse, consumer's service units, and distribution boards etc shall be neatly and clearly labelled externally with identification marks corresponding with those on Drawings or in Specifications. Final details shall be agreed with the Engineer, but all labels/plates shall be in English.

3.22 SPARE PARTS AND SPECIAL TOOLS

The sub-contractor shall submit his recommended list of spares covering a period of two years for all plant and auxiliary equipment supplied under this sub-contract. This list shall be priced individually, but not carried forward to the Bills of Quantities where provisional sums have been included for the purchase of spare parts. Before a Taking-Over Certificate is issued a full set of spares as agreed shall be handed over to the Engineer.

Complete sets of any special tools, necessary for the operation, maintenance and dismantling of various sections of the plant and equipment shall be provided in a strong box or boxes each fitted with a suitable padlock and two keys. Such tools shall not be used by the sub-contractor during the erection of the plant or equipment. The cost of these tools shall not be carried forward to the Bills of Quantities where a provisional sum has been included for the purchase of these special tools.

3.23 SPECIALIST MANUFACTURERS AND SUB-CONTRACTORS

Where specialists are not nominated by the Employer, the sub-contractor shall appoint specialist manufacturers and contractors for any sections of the Works described herein in which he is not himself an experienced, recognised and approved operator.

The Tenderer shall, on submission of his Tender, indicate the names of all proposed specialist

manufacturers and contractors, together with the precise sections of the Works for which each will be responsible. The sub-contractor may be required to seek alternative manufacturers or contractors or to accept specialists nominated by the Employer. It shall be deemed that the prices entered include for this requirement.

The sub-contractor shall allow in his prices for phasing his work to meet the requirements of the other sub-contractors and any specialists, and for varying his programme or otherwise, to comply with the erection programme of such specialist or sub-contractors. No additional costs will be allowed to the sub-contractor for any disruptions to his programme, or otherwise, in his compliance with the above requirements.

3.24 USE OF SITE

The lands and other places outside the Site that are the property of or under the control of the Employer shall not be used except with the approval of the Architect or Engineer.

The sub-contractor shall at any time remove any vehicle, wagon, or any other obstruction within his control that may be required to be moved by the Architect/Engineer for any purpose and the sub-contractor shall move such obstruction promptly on instruction being given and at his own cost, unless the Architect/Engineer shall decide otherwise.

The sub-contractor shall maintain access for the inspection, operation and maintenance of any of the Employer's plant or work that lies within the Site or elsewhere. The sub-contractor shall not use any portion of the Site for any purpose not connected with the Works unless the prior written permission of the Engineer has been obtained.

Except with a written permission of the Architect / Engineer, which shall be given when necessary for the execution of the works, the sub-contractor's employees will not be permitted to enter any of the Employer's buildings or lands or sites under the control of the Employer, other sub-contractors or the Engineer. The sub-contractor shall warn his employees that any man found within such buildings or sites without authority is liable to be removed from the Works.

3.25 POSSESSION OF SITE

It shall be deemed that the prices entered by the sub-contractor for the completion of the works are inclusive of all required temporary supplies associated with retaining of essential services as may be directed by the Architect / Engineer or the Employer. All details shall be fully agreed as the works proceed to suit the operational situations as and when they arise.

3.26 INTERFERENCE WITH THE WORKS

The sub-contractor shall not interfere in any way with any existing Works whether the property of the Employer or of a third party and whether the position of such works is indicated to the sub-contractor by the Architect or Engineer or not except where such interference is specifically described as part of the Works either in the contract or in any instruction from the Architect/Engineer.

3.27 WATER AND POWER FOR USE ON THE WORKS

Water for construction purposes and for use by the sub-contractor's staff during the contract period will be the responsibility of the contractor. The contractor shall make his own arrangements for connection to the nearest suitable water supply/main and for metering the water used. In this respect the sub-contractor shall liaise with main Contractor and the Employer who may be able to assist.

The sub-contractor shall be responsible for the supply of all electrical power for construction purposes prior to the issue of the Taking-Over Certificate.

3.28 TELEPHONE AND COMMUNICATIONS

The sub-contractor shall make his own arrangements for the provision of a telephone at the site, the sub-contractor being fully responsible for all charges and costs incurred in providing this facility. In this respect the sub-contractor shall liaise with the main contractor and the Employer who may be able to assist.

3.29 SITE OFFICES, WORKSHOP AND STORAGE

A space will be provided by the Main Contractor for the sub-contractor's site offices, workshops and storage. The sub-contractor shall be responsible for providing all buildings, fencing, etc that he may require and on completion of the Works shall be required to remove all such buildings, fencing, etc and to restore the land to its original condition.

The sub-contractor shall state, with his Tender, the areas that he requires for his site offices, workshops and storage. The areas of land available are limited and the Employer reserves the right to allocate areas of land smaller than the sub-contractor may require, in which case, the sub-contractor shall make such additional or alternative arrangements as may be necessary for his full requirements, all at his own cost.

3.30 SANITATION OF THE WORKS

The sanitation of the works shall be the responsibility of the contractor who shall arrange and maintain all required sanitation facilities to the satisfaction of the Local Authorities, Labour Department and Architect.

The Sub-contractor shall warn his employees and other specialists and sub-contractors that any employee found fouling the site shall be removed from the Site immediately.

In this respect, the sub-contractor shall arrange for erecting temporary toilet and ablution facilities, these facilities being connected, on a temporary basis, but to approval, into the existing foul sewage system. Full details shall be agreed. These temporary ablutions are a specific requirement of the Employer and shall therefore be provided for this duration of the contract, all items being removed at the completion of the Works and the existing system fully reinstated to its original condition.

3.31 PROTECTION OF WORKS

The sub-contractor shall carefully protect from injury by weather all work and materials which may be affected thereby and allow in his prices for all dams, pumping, shoring, temporary drains, sumps etc, necessary for the purpose, and shall clear away and make good at his own cost to the satisfaction of the Engineer all damage caused thereby.

3.32 SUNDRIES

The necessary holding down bolts, supporting brackets and templates, guards and screens, locks, piping, conduits, lamps and other requisite sundries whether specified in detail or not shall be provided, under the contract and it shall be deemed that the sub-contractor's prices, rates and the like include for all such items.

3.33 MAINTENANCE CONTRACT

The Employer will consider the introduction of long term maintenance contracts with specialist manufacturers and sub-contractors. In this respect the sub-contractor shall submit, with his tender, details of a planned maintenance contract that will take effect after the completion of the six-month maintenance period previously specified.

3.34 DELETION OF ITEMS FROM CONTRACT

Where Provisional Sum items have been identified within the Bills of Quantities these may be expended in whole, in part or may be totally deleted from the sub-contract works. In addition, certain items that have been designed, specified and included within the Bills of Quantities may finally be deleted from the sub-contract, as the Employer has not finally decided whether they are to be provided. It shall be deemed that the tender price entered by the sub-contractor has taken into account the possible deletion of these items, and Provisional Sum items, as no claims for loss of profit or any other such claim will be entertained.

3.35 AMBIENT CONDITIONS

The following climatic conditions apply at the site of the contract works and plant, equipment, apparatus and installation shall be suitable for these conditions:

CLIMATIC CONDITIONS	KISII TOWN
Maximum out door dry bulb Temperature, t_o	29˚C
Minimum Temperature	8˚C
Relative Humidity	41% - 97%
Altitude	1962 M ASL
Longitude	35˚ 21’ 32” E
Latitude	0˚ 44’ 37” S
Max. solar radiation occurs during the month of February	

Extremely heavy rains fall during certain periods of the year and the contractor shall be deemed to have taken account of this fact both in his prices and his planning for the execution of the works.

3.36 SCHEDULES OF TECHNICAL DATA

Where included in the Tender Documents, Schedules of technical data shall be completed by all tenderers, otherwise the Tender may not receive full consideration, and will be liable to rejection.

3.37 COPIES OF ORDERS

Copies of all orders for major items of plant, equipment and materials placed with suppliers shall be provided in triplicate to the Engineer.

3.38 INSPECTION AND TESTS AT MANUFACTURER'S WORKS

The Engineer, and his duly authorised representative, shall have at all reasonable times access to the Contractor's premises to inspect and examine the materials and workmanship of the mechanical and electrical plant and equipment during its manufacture there; and if part of the plant and equipment is being manufactured on other premises, the Contractor shall obtain for the Engineer and for his duly authorised representative permission to inspect as if the plant and equipment was manufactured on the Contractor's own premises. Such inspection, examination or testing, if made, shall not relieve the Contractor from any obligation under the Contract.

Where the plant and equipment is a composite unit of several individual pieces manufactured in different places, it shall be assembled and tested as one complete working unit, at the Maker's works, to the relevant British Standard where applicable.

4 PARTICULAR SPECIFICATION FOR PLUMBING AND DRAINAGE INSTALLATIONS

4.1 Introduction

These specifications cover the execution of the Plumbing and Drainage installations and should be read in conjunction with other relevant specifications, drawings and contract documents issued to the Contractor in conjunction with the job.

The specifications apply to works at the previously-mentioned site, description and design by and executed under the supervision of Schon and Associates or any agent or representative duly appointed to do so.

4.2 Included in the Sub-Contract (Unless otherwise specified)

(a) The works include, unless otherwise specified, supply, delivery, installation, testing, commissioning, cleaning-up and setting to work all the installations described in the specifications and shown on the Contract Drawings.

(b) The provision of all labour, materials, tools, instruments, testing apparatus and scaffolding necessary to execute the work in a first class manner, even such labour, materials, instruments or apparatus that are not specifically mentioned in the project but are necessary for the satisfactory completion of the works, including such elements as:

- Cold water supply pipework and fittings to the water storage tanks from the residential apartments site;
- Pressed steel water storage tanks complete with all necessary covers, fittings, washouts, overflow pipes and supports. Also included are pipe connections, fittings, washouts and overflow piping to the underground tank. The Sub-Contractor is expected to take the overflow and washout pipes to reasonable discharge points;
- Main water booster pumps to pressurize the hospital water supply system;
- The water supply pipework to the functional points and sanitary fittings as shown on the contract drawings plus the necessary fixing, supporting and jointing materials from the pressurized mains;
- The sanitary and operational fittings together with the fixing, supports and jointing to the supply and discharge pipes;
- The waste and soil pipework from the sanitary and operational fittings to the first manholes, including all fixing, supports and jointing materials;
- Hot water generation system including hot water boilers and solar water panels;
- Fire protection systems including automatic sprinkler system, hydrants, hose reel and portable fire extinguishers.

(c) All cutting away and all making good will, if nothing else is specified, be carried out by the Main Contractor, but it will be the responsibility of the Sub-Contractor to ensure that this work is kept to a minimum. The Sub-Contractor shall also be responsible for the correct marking of all chases and holes, including the provision of all necessary details to the Main Contractor.

(d) The Sub-Contractor shall also be responsible for ensuring that runs for floor or wall chases, holes to be cut or left, will be marked out at appropriate stage of the structural work.

(e) The Sub-Contractor shall undertake all notifications demanded by the Authorities in order to comply with current regulations and produce all certificates, if any, from the Authorities without extra charge.

(f) The Sub-Contractor shall, as part of his Tender, supply all necessary information such as manufacturer's catalogue or type numbers, brochures or copies of catalogue pages, weight, and all other relevant information that are necessary to classify the equipment tendered for.

(g) Electrical wiring in plant rooms from isolator and all control wiring.

(h) All other materials, labour, tools, instruments, scaffolding, etc., which are necessary for final completion in a first class manner of the plants to the Engineer's satisfaction. Excluded are only materials and workmanship especially mentioned herein as "Excluded from this Sub-Contract".

(i) The sub-contractor shall include for cables, pipes, etc., from central facilities to working area.

(j) Provide the consulting engineer for his approval complete working and manufacturing drawings as specified.

(k) Commissioning and testing of the plants as specified.

(l) Supply of complete operation and maintenance manuals as specified, as well as instructions to the Client's maintenance personnel as specified.

(m) The Sub-Contractor shall include for full maintenance during initial maintenance period as specified.

4.3 Excluded from the Sub-Contract

(a) All concrete works, inclusive of necessary holes, plinths, etc.

(b) All blockwork inclusive necessary holes, etc. (to be marked by the Sub- Contractor).

(c) All electrical wiring up to and inclusive isolators and switchboards.

(d) The Main Contractor will provide central located facilities for supply of water and power during the construction period.

4.4 Extent or the Sub-Contractor's Duties

At the commencement of the work, the Sub-Contractor shall investigate and report to the Engineer if all materials and equipment to be used in the work, and not specified as supplied by others, are available locally. If not available, the Sub-Contractor shall at this stage place orders for the materials in question and copy the orders to Architect and the Engineer. Failure to do so shall in no way relieve the Sub-Contractor from supplying the specified materials and equipment in time.

Materials supplied by others for installation and / or connection by the Sub-Contractors shall be carefully examined before installation and connection. Any defects noted shall immediately be reported to the Engineers.
Any item or material found to be defective shall be replaced by the Sub-Contractor within seven days of his being notified and any result of defective workmanship shall be repaired including supply of new parts if necessary, immediately upon being notified.

The Sub-Contractor shall furnish at his own cost any samples of materials or workmanship required for the Sub-Contractor works, that may be called for by the Engineer for his approval The Engineer may reject materials or workmanship not in his opinion up to the approved standard. The Sub-Contractor shall allow in his prices for such samples.

The Sub-Contractor shall, when authorised in writing by the Architect or the Engineer, make variations from the specifications and drawings.

The Sub-Contractor shall submit to the Architect or to the Engineer, claims for any work for which he considers demanding extra payment before the beginning of such work.

The Sub-Contractor shall be responsible for verifying all dimensions relative to his work by actual measurements taken on the site.

The Sub-contractor shall request any alteration to the building structures within 30 days of the awarding of the Sub-Contract. Only such alterations as deemed unavoidable by the Engineer will be considered.

The Sub-Contractor shall collaborate with the Engineer and the Contractor in planning the installation before work is commenced. Particular care shall be taken to ensure that there is close collaboration with the other Sub-Contractors when installing services.

The Engineer and the Architect shall have full rights to inspect the work in progress and all materials and equipment for use in the installation prior to its erection whether these are on site or the Sub-Contractor's workshop. The Sub-Contractor shall allow for reasonable access to the work for this purpose.

Where large items of equipment are to be installed, the Sub-Contractor shall advise the Contractor in good time, so that access is provided for installation before work is commenced on site.

The Sub-Contractor or his responsible representative shall participate in all site meetings as and when required, in order to discuss the works, make necessary decisions, receive relevant instructions, confirm fulfillment of time schedules, etc.

4.5 Finish Painting

When all the installations have been set work, tested and commissioned, the Sub-Contractor shall prime the pipework with an undercoat and paint 2 No. coats of paint in accordance with BS 1710 standard for color coding, to the satisfaction of the Engineers and the Interior Designers.

5.1 GENERAL SPECIFICATION FOR PLUMBING AND DRAINAGE

5.1.1 General

The materials shall be new and the best of their respective kinds.

Where proprietary materials are specified, the sub-contractor may propose alternatives for the consideration of the Engineer, but the written approval of the Engineer must be obtained prior to the use of such an alternative.

The sub-contractor shall be responsible for, and shall replace or make good at his own expense, any materials lost or damaged during the whole construction period until the official handing over of the works (and keys) to the Employer or the Employers representative.

5.1.2 Galvanised Pipes and Black steel pipes

Galvanised mild steel tubing shall be in accordance with BS EN 10255:2004 as specified in the Bills of Quantities, with screwed and socketed joints.

Fittings for the same shall be galvanised malleable iron to BS EN 10241:2000 joints shall be made with P.T.F.E. tape.

5.1.3 Copper Pipework

Capillary type connectors may be used for copper pipework where installed in continuous runs, and elsewhere approved compression fittings to BS EN 1057:1996 shall be used.

Short right angle bends are to be avoided and normal elbows and bends are to be used where practicable. Sets and bends in copper pipe shall be made by heating and sand filling where necessary. Kinked or flattened bends will be rejected.

5.1.4 PPR Pipework

The pipes and fittings shall comply in all respect with the current Europeans standards for PPR installation or equivalent DIN standards and to the Engineer’s approval. All PPR pipe-work shall be PPR PN 20 Oxy stable.

Pipe jointing shall be by poly-fusion or use of electric coupling.

5.1.5 Unplasticized PVC Pipework Above Ground

Unplasticized PVC drainpipes shall comply with BS 4514:1983 (1998) and bear the BS and KS Kitemark. Jointing of pipes shall be carried out by means of solvent welding or with ring seal expansion joints. The manufacturer's recommended method of joint preparation and fixing shall be followed.

5.1.6 Unplasticized Pvc Pipework Below Ground

The pipes and fittings shall comply in all respects with BS 4660:2000 and bear the BS Kitemark. The base of soil and vent stack connection to each of these drains shall be made using a bend with a minimum centre line radius of 150mm.

5.1.7 Black Vulcathene Pipe Work

The pipes and fittings shall comply in all respects with British Standards and jointing of pipes and fittings shall be carried out in accordance with the manufacturer's instructions and to the approval of the Engineer.

5.1.8 Valves Generally

(a) All valves required to be stamped by the appropriate authority.

(b) Easy clean patterns are to be supplied. Where visible, and where easily accessible, a locking shield type is to be provided.

(c) Valves should be installed to control each section of the work and as indicated on the Drawings.

(d) The pattern of all valves to be used must be approved by the Engineer before any orders are placed.

(e) Stopcocks shall be fitted on all water supplies up to and including 50mm diameter unless otherwise specified. For pipe sizes over 50mm in diameter gate valves shall be installed.

(f) Drain cocks shall be fitted to all water mains entering the building after the isolating valve, where indicated on the drawings and where necessary for draining of services.

(g) All must fully conform to the relevant British Standard. Valves of Chinese or Taiwanese origin will not be considered as acceptable for this Contract.

5.1.9 Stop Cocks

Stopcocks shall comply with BS 1010 and shall be manufactured from bronze or gunmetal.

5.1.10 Gate Valves

Bronze-bodied valves shall be cast to BS EN 1982:1999. The bodies shall be of the even thickness throughout, clean and free from scale and flaws.

The gate valves up to and including 80mm shall be as Crane No. D 151 non-rising stem and wedge disc to BS 5154: 1991 with screwed threads to BS 21 taper thread.

Gate valves exceeding 80mm up to 300mm shall be as *Glenfield* R.S. Gate Valve 3500 series to BS 5163:1986(1991) with flanges to BS 4504:1989 PN 16. The valve is a double flanged cast iron wedge gate valve for water works purposes with *Meehanite* cast iron body to BS 1561:1997 GR. 14 with rubber covered *Meehanite* cast iron gate. The stem is to be of forged stainless steel to BS 970 with *Meehanite* cast iron hand wheel.

5.1.11 Drain Cocks

Drain cocks shall be of the packed gland type. Bodies shall be of cast bronze. Plugs shall be tapered and ground into the body to form a tight seal under pressure. Gland flanges shall be bolted to the valve body with steel stud bolts.

Screwed connections shall be BS 21:1985 taper threads; flanged connections shall be BS 10:1962. Cocks shall be suitable for operation by hand switch.

5.1.12 Ball Valves

Ball valves supplied for WC Cisterns shall be the plastic diaphragm type with seating to suit the working pressure with plastic float to BS 2456:1990 and suitable for internal overflow unless otherwise specified.

5.1.13 Foot Valves

The foot valves shall be as *Glenfield* check valve no. 5803 to BS 5153: 1974 (1991) incorporating strainer, with flanges to BS 4504:1989 PS 16. The strainer shall be of *Meehanite* cast iron and the strainer area shall be not less than twice the suction pipe area.

5.1.14 Non-Return Valves (Check Valves)

The non-return valves up to and including 80mm diameter shall be as *Glenfield* no. 5703 conforming to BS 5153: 1974 with flanges to BS 4504:1989 PN 16.

Non -return valves exceeding 80mm diameter and up to 300m diameter shall be as *Glenfield* no. 5103 conforming to BS 5153: 1974 (1991) with flanges to BS 4504:1989 PN 16.

5.1.15 Hot water mixing valves (Tempering valve)

The tempering valve is used to regulate the set temperature of mixed hot and cold water even when variations occurr in the water supply conditions

The tempering valve are supplied with in-line strainers and check valves plus union at the inlets. The end connections are male compression.

Operating temperature range is 30-55°C and dynamic working pressure of 0.2-5.0bar with static working pressure of 14bar. These parameters should be clearly labelled on the valve body. The minimum flow rate should be 4L/minute.

The valve should be constructed as DZR alloy EN 12165 CW602N.

5.1.16 Pressure reducing valve

5.1.16.1 Fixed Ratio Type Pressure Reducing Valves

Fixed ratio type pressure reducing valve shall be able to maintain the outlet pressure as a fixed ratio of the inlet pressure, independent of the magnitude of the inlet pressure and the water flow across the valve.
It shall be of a size and pressure ratio as specified on the Drawings. The operating pressure range of the valve shall be suitable for the particular application and it shall have a rated working pressure of not less than 16 bar.

Each valve shall be hydraulic tested at 1.5 times the nominal pressure of the valve for a period of not less than 1 minute at the factory.

Details of the pressure reduction against flow rate and inlet pressure performance curve and test certificates /reports issued by accredited laboratories confirming that the valve has been tested in accordance with the requirements of this Specification shall be submitted to the Engineer for examination and approval of use.

The valve body shall be of gunmetal to BS EN 1982: 2008 CuSn5Zn5Pb5 or stainless steel to BS EN 10088-1: 2005 number 1.4401.

The valve shall have a piston of straight through design, constructed of stainless steel at least to BS EN 10088-3: 2005 number 1.4301 for fresh water and BS EN 10088-3: 2005 number 1.4401 for flush water application unless otherwise approved by the Engineer.
The valve shall with seats and O-ring seals of high grade synthetic rubber.

The valve shall be provided with an arrow on the exterior to indicate the direction of flow.

The valve shall with end connections of thread-in screw type to BS

21: 1985 or flanged type to BS EN 1092-1: 2007.

5.1.16.2 Pilot Type Pressure Reducing Valves

Pilot type pressure reducing valve shall be hydraulically operated, pilot-controlled and of diaphragm or piston-actuated type. The whole valve shall be assembled and tested by the manufacturer.

The valve shall be provided with a strainer in the pilot control system.
It shall be of flanged-end connection with flange to BS EN
1092-2: 1997 PN16. The main valve and its pilot control system shall contain no packing glands or stuffing boxes.

The valve shall be capable to reduce a higher inlet pressure to a steady downstream pressure regardless of fluctuations in flow rate and/or varying inlet pressure. The downstream pressure shall be adjustable and could be reduced down to a pressure suitable for the application. The valve shall be selected by the plumbing Contractor in such way that no cavitation shall occur within the anticipated flow and pressure ranges.

Means shall be provided for adjusting the response of the valve to changes in inlet pressure without the use of special tools.

The valve, when in operation, shall not cause any noise nuisance. Otherwise, a suitable acoustic enclosure to cover the valve shall be provided.

The operating pressure range of the valve shall be suitable for the particular application. Unless otherwise specified, the minimum rated working pressure of the valve shall not less than 16 bar.

Each valve shall be hydraulic tested at 1.5 times the nominal pressure of the valve for a period of not less than 1 minute at the factory.

The valve shall be of the type approved by the Water Authority as in accordance with its application. Details of the pressure reduction against flow rate and inlet pressure performance curve within the specified pressure range and test certificates /reports issued by accredited laboratories confirming that the valve has been tested in accordance with the requirements of this Specification shall be submitted to the Architect for examination and approval of use.

The valve shall have the minimum standard as specified below for its intended purposes: -

(a) Body and bonnet: cast iron to BS-EN 1561: 2011 EN-GJL-250 or ductile iron to BS EN 1563: 2011. The body shall be epoxy or polyester coated both inside and outside.

(b) Disc: - Solid or trimmed with bronze to BS EN 1982: 2008 CuSn5Zn5Pb5, or with stainless steel to BS EN 10088-2: 2005 number 1.4301, or with ductile iron to BS EN 1563: 2011; or trimmed with rubber compound for use in fresh water.

Solid or trimmed with zinc free bronze to BS EN 1982: 2008 CuSn10 or stainless steel to BS EN 10088-2: 2005 number 1.4301 or ductile iron to BS EN 1563: 2011 with epoxy /polyester coated; or trimmed with rubber compound for use in flush water.

(c) Seat: - Bronze trimmed as disc for use in fresh water. Zinc free bronze or stainless steel trimmed as disc for use in flush water.

(d) Stem: High tensile brass or leaded brass to BS EN 12163: 2011 or stainless steel to BS EN 10088-3: 2005 number 1.4006, 1.4005 or 1.4021 for use in fresh water. Stainless steel to BS EN 10088-3: 2005 number 1.4301 or 1.4401 for use in flush water.

5.1.17 Gas Supplies

i. General

The gas installation shall be made in accordance with CP 339 and relevant Kenyan Code of Practice and regulations.

ii. Pipework and fitting

The gas supply shall be installed in black mild steel pipework to BS 1387. Fittings shall be constructed of a similar material and shall conform to BS 1740.
All liquid pipelines shall be Schedule 80 seamless steel pipes conforming to BS EN 10216-1:2002, BS EN 10217-1:2002 or API 5L:2004, and of a design working pressure of 2.75 MPa.

All vapour pipelines at high pressure stage shall be Schedule 80 seamless steel pipe conforming to BS EN 10216-1:2002, BS EN 10217-1:2002 or API 5L:2004 or ASTM A53:2006 or equivalent.

All vapour pipelines at medium pressure stage and below shall be of heavy grade steel construction and conform to BS EN 10255:2004 or ISO 65:1981 heavy grade or equivalent.

iii. Fittings

Control valves shall be provided where indicated on the Drawings and where required to isolate the gas supplies and shall be manufactured in accordance with BS 1552. Gas governors shall comply with BS EN 88: 1991 and shall be sized to suit the particular items of equipment they are supplying.

iv. Tank

Vessels shall be designed and constructed of steel in accordance with a recognised Pressure Vessel Code such as PD 5500:2000, AS1210, or ANSI/ASME Boiler and Pressure Vessel Code Section VIII or equivalent. The Contractor shall be responsible to obtain the approval from the Gas Authority and submit the manufacturer's test certificates to prove that these standards have been fully complied with. Use of partial standards shall not be allowed.

Vessels shall be post-weld heat treated in accordance with the respective design codes and shall be subject to 100% radiography examination and a satisfactory "charpy" test at minimum design temperature.

Bulk tanks shall be designed to minimum pressure of 1.725 MPa and a minimum design temperature of -10 °C.

Each vessel shall be provided with a permanently fixed and clearly visible data plate that shall include as a minimum the following information:

(a) The Pressure Vessel code;

(b) The manufacturer's name and serial number; (c)

The gas capacity in kilolitres;
(d) The maximum working pressure in Pa; (e)
The date of manufacture;
(f) Design temperature range in °C – minimum and maximum;

(g) Date of test, pressure applied, inspection authority, and its symbol; and

(h) Provision of sufficient space for subsequent re-test marking.

The vessel supports shall be of adequate design with due consideration of the vessel shell stressing and transmission of loading to the ground.

Saddles, bearing or corrosion plates shall be designed in accordance with the Pressure Vessel Code to which the vessel is designed and shall be of steel. Where saddles are not welded to the vessel, bearing and/or corrosion plates shall be used. The latter shall also be used whenever there is likely to be severe corrosion between the vessel and the supporting structure.

Saddles shall project downward more than any other projection on the lowest part of the vessel. Where saddles are not used, the vessel supports shall be shaped to conform to the vessel shell.

For above ground vessels above 5000 litres water capacity or where piers are used as part of the vessel support, provision shall be made for securing the vessel at one end, the other being free to move as required. The end so secured shall be that to which the principal liquid and vapour lines are attached.

Underground vessels shall be secured at both ends against flotation and they shall also be secured against movement at the end to which the connections are made.

Skirts for vertical vessels shall be provided with at least two vents to prevent the accumulation of liquid or vapour.

Horizontal vessels shall be sloped slightly towards the drain connection; alternatively the liquid withdrawal connection shall be at a slightly higher level than the drain connection.

Vessels exceeding 5000 litres water capacity shall have a manhole of minimum diameter of 450 mm. The manhole in the form of extruded nozzles shall be of not less than 550 mm internal diameter. Above ground vessels of less than 5000 litres water capacity and not fitted with a manhole shall be fitted with inspection openings accessible from the top.

In addition to inlet and outlet connections, each bulk storage LPG vessel shall be provided with at least one of each of the following fittings:

(a) pressure relief valve connected directly to the vapour space; (b)
plugged shut-off valve for connection;
(c) a fixed maximum liquid level device and a contents gauge; (d) a
pressure gauge connected to the vapour space; and
(e) a suitable earthing connection.

All fittings on an underground vessel shall be accessible above ground level and shall be either on the manholes or on welded extensions.

v. Testing

The gas pipework and fittings shall be subjected to an air pressure test of twice the working pressure for a period of two hours or for whatever longer time is necessary to complete the

section under test. During this time there shall be no fall in pressure.

5.1.18 External Pipe Works, Pipe Laying, Backfilling and Associated Items

(i) Where pipes are laid below ground, the main contractor shall carry out all excavation, back-filling, removal of spoil, and making good as specified and as necessary to complete the installation to the satisfaction of the Engineer and Architect.

The sub-contractor shall include for providing all information and marking out as necessary in good time, so that the main contractor can provide the necessary attendance.

All pipework shall be installed in a neat and workmanlike manner and be properly aligned throughout.

Depth of crown of pipe shall not be less than 0.7m and pipes shall be installed with due regard to clearances from other services installed in the area.

Pipes shall be so arranged as to avoid air pockets, and shall be graded such that the system will vent normally through the installation, or by other approved means.

Trenches shall be of ample dimensions to permit laying and jointing, and pipes shall be bedded in not less than 75mm of sand or other approved material. Filling of the same material shall be hand packed around the pipe a further 75mm above the crown of the pipe, and the whole shall be wall rammed before completion of back-filling, consolidating and making good.

(ii) All drainage pipes shall be laid to continuous and even falls and in accordance with the manufacturer's recommendations. The pipe trenches shall not be back-filled before the pipes have been tested and approved by the Architect and the Engineer.

Following the final back-filling of all trenches, headings and manhole surrounds, the surface of the excavated areas shall be fully reinstated to the approval of the Engineer and Architect.

All drains below buildings and small roads shall be encased in 150mm thick concrete (1:3:6). On completion, all drains, manholes, etc shall be flushed from end to end with water and left clean and free from obstructions.

5.1.19 Construction of Manholes

(i) Manholes shall be watertight and constructed of blockwork 200mm thick on a concrete foundation as shown on the Drawings. Where manholes are likely to receive heavy loads such as roads and access areas, or where they are classed as deep manholes then the blockwork walls shall be reinforced and filled in accordance to the structural engineers Specification. The top of the chamber shall be covered by a reinforced concrete slab with an opening to suit the cover and frame.

(ii) Branch connections to the main drain line shall be made with three-quarter section bends, which will be mounted on top of the half section channel of the main drain line and shall be swept in the direction of the flow.

(iii) The manhole shall be benched up, sloping at 1 in 10 and rendered and trowelled smooth.

(iv) Manhole covers to BS EN 124: 1994 shall be of suitable size to allow complete access, or as indicated on the Drawings.

(v) Manhole covers should be capable of supporting the traffic indicated by the area in which they are situated, or as shown on Drawings.

(vi) The underside of all foul drainage manhole covers and frames exposed to crude sewage vapours shall be suitably protected at the place of manufacture.

(vii) Keys for the purpose of lifting and locking these covers shall be provided, three sets under this contract.

(viii) Before manhole covers are supplied to site, details of all covers are to be submitted to the Engineer for approval.

(ix) Step irons to BS 1247 shall be provided wherever the depth of the access pit requires, and as shown on Drawings.

(x) In manholes that may in the future carry liquid containing acid, the trenches/channels shall be formed by uPVC pipe cut in half horizontally and embedded in the manhole benches.

(xi) The neutralising chamber shall be constructed as specified above and as shown on the Drawings full details being agreed.

5.1.20 Gullies

Gullies shall be 100mm PVC trapped type with a 150mm Belfast framed in concrete (1:3:6) of a 100mm minimum thickness, forming a box approximately 300 x 300mm x 100mm above ground. The gullies shall be provided with a light duty cover, to fit in the recess made for this purpose.

5.1.21 Installation of Internal Pipework

All pipework shall be installed in a neat and workmanlike manner, properly supported and aligned throughout.

Prior to erection, all piping, plant and equipment shall be cleaned throughout or blown through with compressed air. Where falls are not shown on the Drawings or stated otherwise in the Specification, pipework shall be installed parallel to the lines of the buildings and as close to the walls, ceilings, columns etc as is practicable. All details shall be approved and shall be clearly indicated on the contractor's detailed Working Drawings.

Before any joint is made, the pipes shall be hung in their supports and adjusted to ensure that the joining faces are parallel and any falls that shall be required achieved without springing the pipe.

All pipes shall be installed with due regard to other services within the ducts, ceiling spaces, or other spaces provided. Branches shall be fitted so as to avoid stresses at the take off point, and to minimise as far as practicable sharp changes in the direction of flow. Pipe ends are to be cut square, be free from burrs and well reamed or filed inside to ensure full bore. The contractor shall ensure that access to all pipework, rodding eyes, etc is readily maintained particularly where such items are installed above false ceilings and similar areas. Full details shall be included in the sub-contractor's detailed Working Drawings.

Screwed piping shall be installed with a sufficient number of unions to facilitate easy removal of valves and fittings and to enable alterations of pipework to be carried out without the need to cut the pipe. It is the sub-contractor duty to suggest the positions and amount of unions to be fitted, but the final decision rests with the Engineer.

Full allowance shall be made for the expansion and contraction of pipework, precautions being

taken to ensure that any forces produced by pipe movements are not transmitted to valves, equipment or plant.

The sub-contractor shall pay particular care when supporting all pipework, particularly cast iron pipes, in order to ensure that settlement and building movement do not break the pipe joints.

If nothing else is specified, all pipe supports shall be of robust metal construction galvanised or painted. They shall be so arranged as to permit longitudinal expansion and contraction of the pipework as necessary. Hangers, where used, shall be of the adjustable type, and anchor points shall be installed where necessary. All to be in accordance with manufacturer's recommendations or where this is not specified then the following maximum spacing will be permitted.

Pipe Nominal Bore (mm)	Horizontal Rums (m)			
	Iron	Copper	uPVC	PPR
15	1.80	1.20	0.30	0.70
20	2.40	1.80	0.35	0.75
32	2.40	1.80	0.38	0.85
40	2.75	2.40	0.43	1.10
50	3.00	2.40	0.45	1.25
65	3.65	3.00	0.65	1.35
80	4.00	3.00	0.67	1.55
100	4.00	3.00	0.75	1.70
150	4.00	3.00	1.00	2.00

The support spacing for vertical runs shall not exceed one and a half times the distances given for the horizontal runs.

Where more than one size of pipe is carried on the same supports, spacing of supports shall be that required for the smallest pipe.

Attachment of supports to masonry shall be by means of approved metal expansion devices. Use of explosive tools will be subject to Site approval by the Architect and Engineer in each case.

Unless otherwise directed, the pipework shall be generally concealed throughout, and no pipework may be exposed without prior approval unless so indicated on the Drawings.
The sub-contractor shall provide all necessary rodding and inspection facilities within the draining system. In positions where stacks pass through the roof, a weather apron shall be provided. The sub-contractor is to fix stacks before roofing is completed, to ensure that stacks do not allow ingress of water to building or duct. Full details shall be agreed with the Architect prior to the commencement of the installation as the Architect must agree details at roof level.

The open end of each stack shall be fitted with a plastic-coated or galvanised steel wire guard.

Where pipes pass through walls and floors, sleeves shall be fitted to allow free axial movement of the pipes. Sleeves shall be of a material compatible with the pipe they protect. Where fitted in visual position the sleeve should be fitted with an end plate, the details to be agreed upon by the Architect and Engineer. In all other cases they shall finish flush with the wall and the open space filled up with approved fire and sound proofed material. Sleeves passing through wetted floors, or walls, and floors below ground shall be of stainless steel and extend 6mm above floor and fitted with approved puddle flanges, or similar type arrangements, to prevent the ingress of moisture. Details shall be agreed.

Note that testing and sterilising of pipework is required as referred to later herein.

5.1.22 Pipe Entry into Buildings

Service pipes shall enter the buildings in the positions shown on the Drawings. Entry shall be by means of sleeves built into the building structure, of ample dimension to permit the installation of the service pipes to move freely. On installation of the pipes, the sleeves shall be sealed both within the building and at the point of entry below ground level for distances of not less than 150mm, to prevent ingress of moisture or vermin. Sealing material shall be by use of bitumen, and the protruding sleeve, must be fitted as specified herein.

5.1.23 Sleeves

Where pipework passes through walls, floors or ceilings a sleeve shall be provided one diameter larger than the diameter of the pipe. The space between is to be packed with mineral wool, to the Engineer's approval.

Where sleeves pass through structural elements (beams, columns structural slabs etc) permission from the structural engineer must be obtained.

All sleeves associated with the same lengths of pipework must align and run true. Particular attention is required on this matter, and failure by the contractor to achieve this will render himself liable to the total costs involved in correcting the position of the sleeves.

5.1.24 Floor and Ceiling Plates

Where pipework passes through walls, floors or ceilings, plates shall be secured around the pipe. The plates shall be of stainless steel construction and will serve no other purpose other than to present a neat finish to the exposed installation.

5.1.25 Connections

The sub-contractor shall connect the water supply to all outlets and equipment as scheduled in the Bill of Quantities or shown on the Drawings. Tee's and short radius bends will be permitted in 20mm and 15mm copper where associated with such final connections to equipment and outlets.

Unless otherwise directed, final connections to outlets and sanitary fixtures shall be carried out using copper pipework. Connections to W.C. pans shall be effected by the use of a W.C. connector, gasket and cover, sized to suit pan outlet.

5.1.26 Pipework Lagging

All hot water pipework, except exposed final connections, shall be lagged with an approved Aerofoam polyolefin insulation. The final lagging thickness shall be commensurate with the pipework and existing installation details.

The required minimum thickness of insulation should be as follows:

Pipe I.D.	Min. Insulation Thickness
15 mm	12.50 mm
20 mm	19.00 mm
25 mm	25.00 mm
32 mm	38.00 mm
40 mm	38.00 mm
50 mm to 150 mm	50.00 mm

All insulation to be covered with aluminium foil, American Cloth and painted with three coats of waterproof paint. Pipework and equipment within boiler house, calorifier room or external to

buildings to be clad with galvanised mild steel or aluminium sheets of minimum 22 gauge thickness.

The insulation shall be fixed to the pipes by means of metal clips at intervals not exceeding 400mm and at bends by continuous binding with copper wire to the extent necessary to provide a neatly formed finish.

5.1.27 Painting

The sub-contractor shall allow for priming, undercoating, and finishing of all exposed ferrous pipework and equipment to architectural requirements.

Exposed brasswork shall be left polished and all supporting brackets, handles and similar items chromium plated or provided with a permanent bright finish to approval.

5.1.28 Pressure Tests

5.1.1 General

As the installation of pipework proceeds, the various sections shall be tested before they are built in, concealed, or finally connected. The sub-contractor shall advise the Architect and Engineer in writing at least three days in advance of the carrying out of such tests, and such tests shall, if considered necessary by the Engineer, be carried out in his presence.
All tests shall be at the expense of the sub-contractor and it shall be the responsibility of the sub-contractor to make all necessary records of the tests and results and submit these to the Architect and Engineer in the final form agreed.

5.1.2 Pressure Pipes

All pipe systems shall be tested hydraulically for a period of one hour to not less than one and a half times the design working pressure.

If preferred, the sub-contractor may test the pipelines in sections. Any such section found to be satisfactory need not be the subject of a further test when the system has been completed, unless specifically requested by the Engineer.

During the test, each branch and joint shall be examined carefully for leaks and any defects revealed shall be made good by the sub-contractor and the section re-tested.

5.1.3 Drainage Pipes

A site test shall be carried out on all drainage pipes before concrete haunching or surround is applied. These tests shall be carried out preferably from manhole to manhole.

5.1.29 Sanitary Appliances

The sub-contractor is required supply, install, test and commission the appliances specified elsewhere in accordance with C.P. 305 (1974).

The appliances shall be fixed in the position shown on the drawings or as directed by the Architect or the Engineer.

For all sanitary appliances, the necessary number of supports, brackets, plugs, screws, washers, jointing material, etc shall be provided by the sub-contractor. Where supports, brackets, etc are screwed to wall or structure rawl-plugs or similar shall be used.

No trap for any appliances whatsoever shall be with less seal than 75 mm.

Fixing shall, if required by the Architect or the Engineer, include for temporarily erecting appliances in the required position of service and discharge pipes, taking down, storing and permanently fixing after completion of wall finishing and connecting to service and discharge pipes.
Care shall be taken at all times, and particularly after fixing, to protect appliances from damage.

Upon completion of the work, all appliances shall be cleaned for plaster, paint, etc and carefully examined for defects.

5.1.30 Cleaning

The inside of all pipes, valves, tanks and fittings shall be clean, smooth, and free from blisters, loose scale and dirt, when erected.

All lines shall be cleaned after installation and before placing in service.

When pipes are installed all ends shall be suitable plugged until final fixing of fixtures can be carried out. No pieces of cloth or stones will be permitted.

5.1.31 Sterilisation of Water Supply Systems

All underground water mains and above ground water distribution systems, cisterns, tanks, pumps, etc shall be thoroughly sterilised and flushed out after the completion of all tests and before being fully commissioned for handover.

The sterilisation procedure shall be carried out in accordance with the requirements of BS Code of Practice 310, Clause 409, to the approval of the Architect and Engineer.

5.1.32 Testing and Commissioning

Before handing over, the sub-contractor shall confirm that the installation has been examined, tested, accepted and approved by the relevant local authorities, is ready for use, that it will operate and can be maintained efficiently.

When handing over, the sub-contractor shall demonstrate to the Employer the methods of operation, limitations, the maintenance requirements and the safety precautions to be observed.

5.1.33 Instruction Period

The sub-contractor shall allow in his pricing for instructing of the use of the equipment to the Client's maintenance staff. The period of instruction may be within the contract period, but may also be required after the contract period has expired.

The period of time required shall be stipulated by the Client but will not exceed five days, in which time the Client's staff shall be instructed in the operation and maintenance of the equipment.

5.1.34 Electrical Services

Suitably rated control panels shall be supplied and installed as part of this sub-contract to meet the starting and operating characteristics of the pumping equipment.

The panels shall be either wall or floor mounted to suit the specific area and requirements. Power supplies to these panels shall be extended from adjacent isolating switches to be provided under the electrical services sub-contract. Complete co-ordination shall be maintained with the electrical services sub-contractor to ensure supply and termination details are satisfactorily carried out to suit the plant and installation requirements.

5.1.1 Motor Control Panels

All starters, control equipment and the like shall be enclosed in purpose made sheet panels. The panels shall be installed within the plant rooms to suit the dimensions of the actual panels. All details of the panels and layouts within the plant shall be to the approval of the Engineer and shall include:

- Triple pole isolating switch removable neutral link and HRC fuses;
- Control circuit fuses of the HR cartridge type;
- Under voltage release, adjustable and complete tower to allow for voltage associated with the KP&L supply and motor starting;
- Over voltage protection, details to be agreed;
- Ammeter of the moving iron mounted on panel with selector switch;
- Pilot lamp, green;
- Rotary switch for MANUAL/OFF/AUTO operation, where required. Removable neutral link of heavy section copper;
- Motor winding over-temperature release. The Contractor shall provide this feature in conjunction with the specified thermistor protection;
- Duty selection switches;
- Manual stop-start button units to operate in conjunction with rotary switch;
- Hours run meter/counter.

The sub-contractor shall allow at present for the contractors to re-close automatically on the restoration of the mains voltage. This requirement shall be subject to further discussions with the Employer to suit the standby Diesel plant and the mode of operation of essential and non-essential supplies.

All starter panels shall include sufficient miniature circuit breakers, with neutral bar, to supply auxiliary or associated equipment. One 30TP and one spare 155P MCBs shall be included as spares.

All starter panels, motor starters and controllers shall comply with BS 587. Enclosures shall be rigid, at least 1.6 mm thick, with rolled corners stiffened as necessary, dust-proof, vermin-proof, damp and corrosion protected with a grey colour stone enamel or other approved finish, fully tropicalised, with washable air filters. Instruments, gauges, ammeters, indicator lamps, etc shall be flush mounted. Panel doors shall include isolating switches to prevent them being opened unless the switches are in the off position. Each door shall be provided with a lock, and three sets of keys for all panel door locks shall be handed over to the Engineer.

Terminals for all outgoing main and control cables shall be marked and positioned so that the cables may be carried to the outlet from the panel without crossing or being carried round the panel. Terminal numbers and markings shall correspond to those used on connected equipment and wiring diagrams. All internal interconnecting wiring between individual units and the terminal chamber shall be carried out by the panel manufacturer.

Each panel shall be provided with a main isolator so that the whole panel may be completely isolated.

The sub-contractor shall determine all motor starter requirements and associated auxiliaries and controls prior to manufacture and shall submit the design and circuit diagrams to the Engineer for approval.

Contractors shall determine all motor starter requirements and associated auxiliaries and controls prior to manufacture and shall submit the design and circuit diagrams to the Engineer for approval.

Contractors shall be of air-break type BS EN 60947-4-1: 1992 and/or BS 587, and shall be provided as follows:

- Magnetic blow-outs and air chutes on each pole;
- Renewable hard drawn copper contacts;
- Auxiliary contacts for remote control;
- Continuously rated operating coils, (Max 240 V);
- Thermal overload protection device incorporating single phasing protection.

Starters shall be rated as follows:

Ordinary duty: - For motors which will run continuously for periods in excess of two hours;

Intermediate duty: - For motors under automatic control other than time controls. When the intervals of operation are greater than two hours.

Starters shall be of the following type:

- Up to and including 400W motor: Single phase on/off with overload protection;
- Over 3.75 kW and up to 15 kW: Star Delta starter;
- For starters incorporating reduced voltage starting the changeover of voltage shall be automatic.

Terminals shall be accessible and shall be provided with adequate clearance between phases and between phases and earth. Where starters are not enclosed in a composite panel, an integral isolating switch as specified for control panels shall be provided. Where electric motors are either not visible from the control panel or are located more than 10 m distance they shall be provided with a local lock-off stop control circuit switch, or a main circuit isolator where there is no control circuit. A weatherproof lock-off stop control circuit switch shall be provided for motors located externally or otherwise exposed to the weather.

5.1.2 Motors

Motors shall comply with BS 3456, BS 3679: 1963, BS 5733: 1979 BS 6220: 1983 and shall be arranged for conduit entry.

Motors shall be fitted with locating type bearings and/or heavy thrust bearings at the non-driven and collar type at the drive end. Motors shall be of the totally enclosed fan cooled type, tropicalised to BS 5000 Part 99 suitably finished to resist corrosion by fluids or fumes. The rating of all motors shall be chosen to provide continuously the maximum power requirements of the plant. The motors shall be of the standard induction type. They may be of the squirrel cage, horizontal or vertical spindle type of all to the approval of the Engineer.

Vertical spindle type motors shall be provided with substantial canopies of approved design.

The locked rotor current shall be stated on the name plate of each motor and shall be not more than six times the full load current.

Thermistors shall be fitted to all motors above 5 kW. They shall be fitted during manufacture and their ends shall be brought out to additional terminals on the connector block of the motor.

All motors shall be rated 3 phase, 415 volt or single phase, 240 volt with high power factor continuous maximum rating complying with BS 5000 Part 99 and Class F insulation complying with BS 2757 unless otherwise specified. All motors larger than 400 W shall be three phase.

All three phase motors shall be supplied with six stud terminals with each end of the stator phase windings connected, terminals shall be of suitable size to accept the cable lugs of the feeding cables. Terminal blocks shall be mounted on the side of the motor case in an approved box complete with lid, gasket and tapped ET entry hole.

Rubber installation shall not be used on coil connections. Each motor shall be fitted with cable terminals and glands to accept the specified types of cable.

Except in the case of sprinkler system fire pumps, no motor shall run at a speed higher than 1500 rpm unless otherwise specified. Motors driving through Vee-belts shall be fitted with slide rails. The power factor shall not be less than 0.9 lagging. All motors shall be from the same manufacturer as far as possible.

5.1.3 Cabling and Wiring

The Contractor shall carry out all power and control wiring including LV and ELV or any other voltage for the control equipment and alarm systems and interconnecting wiring between starter panels, remote control items, and motor units as required.

Cabling shall be carried out in PVC insulated, PVC sheathed, single wire armoured and PVC sheathed overall cable, using compression type glands provided with means of securing armoured wires within the body of the gland, under armour moisture seal and outer sheath seal.

Each core termination shall be fitted with a plastic ferrule engraved with identification corresponding to the wiring diagrams.

Multi-core control cables to the remote stop, start allow water cut-out/ alarms shall be 0.62 mm^2 PVCSWAPVC where external to the pump station and PVC/PVC or similar, where internal. All cables, whether internal or external being suitably protected.

All conductors shall be copper and the installations, both internal and external being carried out in accordance with the regulations and by-laws previously stated. Trenching and the fixing of cables shall be in accordance with locally specified standards details of which have been specified within the subcontract documents for the electrical services. These details can be made available upon request should the sub-contractor not be familiar with these requirements.

Details of the ratings, types and methods for all cables and wiring to be supplied under this sub-contract shall be submitted with the tenders, wiring, PVC single core shall be run in either galvanised conduit or galvanised trunking of suitable sizes where surface in plant rooms and heavy gauge PVC were cast into walls, slabs etc.

All electrical work shall be doe to the entire satisfaction of the Project Electrical Engineer.

5.2 PARTICULAR SPECIFICATION FOR SOLAR WATER HEATING INSTALLATIONS

5.2.1 General regulation

The solar water heating system shall be manufactured, tested and installed fully in accordance with at least one of the following standard specifications for solar water heaters, or other equivalent international standards, as recognised by the Kenya Bureau of Standards (KEBS) and the East African Bureau of Standards (EABS);

1) Australian Standard 2712;

2) ASHRAE Standard 95-1981;

3) BS 5918:1989, BS EN 12975:2006, BS 853-20(1996).

5.2.1 Prior to commencing installation

Prior to commencing installation, the contractor shall inspect the premises and roof structure to satisfy himself that the building is structurally capable of accepting the solar water heating system as proposed, and if this is so he shall confirm this to the Engineer.

5.2.1 During Installation

During the installation period, the contractor shall ensure that every care is taken to warn and protect occupants of the building and members of the public from personal injury which may occur from falling tools, roof components, internal lighting, and other fittings and any other hazard of a general nature. Any loose materials or fitting which may become a hazard shall be removed or secured before commencing installation.

5.2.1 Water quality

The contractor shall take all reasonable precaution to ensure the quality of water available to the solar water heating system does not normally exceed the recommended limits as specified by the manufacturer.

5.2.1 Dissimilar metals

The contractor shall ensure that contact, directly or indirectly through a common circuit, is not made between dissimilar metals, (e.g. Copper/Galvanised mild steel)

5.2.1 Hot water outlet

The contractor shall ensure that the hot water outlet is open to atmosphere during installation until the hot water system is charged with water.

5.2.1 Collector mounting and orientation

The contractor shall ensure that the collector is mounted with the correct orientation and angle of inclination as specified and in a position where optimum solar exposure is possible. It shall be the responsibility of the contractor to ensure that the correct mounting system for the areas with windy conditions is supplied and used. The contractor shall also ensure that the collector and storage tanks are located and securely fixed to the building structural members.

5.2.1 Precaution with empty collector panel

The contractor shall ensure that the collector panel is not left exposed to the sun for prolonged periods either while empty or with fluid or when charged but disconnected from the storage tank. The collector fluid connections shall be left open when the collector is exposed to the sun during the installation period. Suitable precaution should be taken to prevent ingress of dust and dirt during this period. On completion of the installation and before the building or system

hand-over, the contractor shall ensure that, where recommended by the manufacturer, a shade cover is provided over the collector aperture.

5.2.1 Hail damage

Only the collector panel with hail resistance glazing shall be accepted, and it shall be the responsibility of the contractor to submit manufacturer's certification to prove that the glazing is resistant to hail damage.

5.2.1 Removal of waste materials

On completion of the installation, all debris, metals, scrap, waste, drilling, and dust shall be removed from the roof. That is the premises and the installation should be cleaned.

5.2.1 Water connecting before connecting of supplementary heating

The contractor shall arrange for the solar water heating system to be charged with water before the electrical supply is connected to the heater. Alternatively, he shall make such arrangements as are necessary to ensure that the electrical supply is isolated until the solar water heating system is charged with water.

5.2.1 Commissioning

The commissioning of the installation and it's handing over to the Engineer shall be the responsibility of the contractor.

5.2.1 Disposal of Heat-Transfer fluids

Heat-Transfer fluid shall not be discharged or spilled onto roofs or into gutters, and care shall be taken such that it is disposed of in the manner provided for disposal of toxic wastes.

5.2.1 Type of Solar Water Heating System

The solar water heating system shall be of the indirect detached type, comprising an insulated and vented water storage tank, solar absorber panels, interconnecting pipework and associated valves and fittings. The system shall be fully charged with heat exchange fluid and be mounted directly onto the sloping roof as specified on the drawings. All necessary steelwork and fixings shall be as recommended by the manufacturer. The system shall operate on a recirculation action and shall comply with the following minimum specifications.

5.2.1 Solar Collector Panel

The solar collector shall be of the flat plate type assembled such that it is moisture proof and able to withstand a temperature range of -5^0C to 140^0C. The solar collector shall comprise the following components.

5.2.1 Absorber

The absorber shall be of the stamped envelop design, tubes welded into headers, or tube in strip with header type. The absorber shall be manufactured from steel, copper or aluminium. Envelope type collector shall have a continuous weld around the perimeter.

All absorber panels shall withstand a test pressure of 500 kPa. The absorber plate shall have a minimum absorption of 85% and maximum emmissivity of 15%.

5.2.2 Collector frame

The collector frame and base plate shall be manufactured from robust corrosion resistant materials.

5.2.3 Collector cover

The collector cover shall be tempered glass of at least 3.5 mm thickness, resistance to hail, ultra violet light attack and have a solar transmittance of at least 80% and absorptance of not exceeding 2%.

5.2.4 Insulation

Insulation between the absorber and the base plate shall be suitable for the purpose and shall be equivalent to at least 25mm thick fibreglass with a thermal transmittance of not more than 0.041W/m^2K.

5.2.5 Minimum performance

The collector panels shall have efficiency, in both winter and summer operation, of not less than 12MJ/m^2 per day given an available radiation of 20MJ/m^2 per day, and a heat loss coefficient of not more than 7.0 MJ/m^2 K.

5.2.6 Collector area

The solar heating system shall have a minimum collector area to meet the daily energy collection requirement as specified.

5.2.7 On site testing

On completion of flushing and cleaning the whole system shall be commissioned and tested to establish its thermal performance. The system shall be tested on site, over a reasonable length of time sufficient to adequately establish the performance. Tests of the collector panels on it own shall not be taken to satisfy this requirement.

Performance testing shall be the responsibility of the contractor, who shall provide all necessary temporary measuring and recording equipment, including solar-meter, thermometers, water flow meter, energy meter etc, as necessary for the tests. The equipment shall be of a type generally used for this type of testing and shall be to the approval of the Engineer. All instruments shall be accurately calibrated before the tests begin.

For each system, the performance tests shall include energy-rating tests, whose procedure and methodology shall be approved by the Engineer before commencement. The contractor shall give the Engineer sufficient notice for his testing schedule to enable the Engineer to witness all such tests.

On completion of the whole of the tests and when the contractor is satisfied that the entire solar heating installation is operating satisfactorily, and will fulfil the function for which it has been supplied, he then shall submit to the Engineer triplicate copies of all tests records and charts together with reports on all tests called for in this specification. The Engineer shall reserve the right to ask for any reasonable additional tests or for the repetition of previous tests in order to prove that the operation of the plant is satisfactory and is in accordance with the specification and drawings.

5.2.8 Hot water storage vessel

The capacity of the storage vessel shall be as specified.

The storage vessel shall be manufactured from steel, copper, aluminium or other suitable material, with an appropriate high temperature internal lining such as, resistant vitreous enamel aluminium spray for carbon steel tanks. The storage vessel shall have a minimum internal operating pressure 8 bar, and be tested to 1.5 times the rated internal operating pressure.

The hot water storage tank shall have a maximum operating temperature of not less than 90^0C.

Where the storage tank is double-jacketed type, it shall have a full jacket extending the full circumference of the inner cylinder. The heat transfer jacket shall be manufactured of steel, copper or aluminium and shall be corrosion protected. The jacket shall also be tested to a pressure not less than 1200Kpa, and shall be provided with a vent connection.

Polyurethane foam insulation or equal shall be provided between the heat transfer jacket and the outer casing. The storage vessel outer casing shall be manufactured of aluminium or other suitable material, and shall have provision for the following fittings.

(a) A relief valve piped to a safe place.
(b) Heat exchange coil connection port
(c) Electric heating element connection port
(d) Thermostatic control for electric heater
(e) Tempering valve
(f) A drain cock
(g) Hot and Cold water connection ports
(h) Inspection access

The storage vessel shall be fitted with replaceable magnesium or other suitable material for sacrificial anode.

5.2.9 Hydraulic Kit

The hydraulic kit shall consist of the inline pump, regulator, expansion vessel, venting and bleeding valve, thermometer, pressure gauge, isolation, safety and non-return valves, wall fixtures as necessary for completion and performance of the system.

The pump shall be capable of circulation the solar heating fluid from the callorifiers located in the boiler room to the solar collector panels located at the roof. The expansion vessel shall be sized to accommodate the solar heating expansion fluid up to a temperature of 130^oC or accommodate a 6.5 bar pressure. The pressure vessel initial charge shall be 2 bar.

5.2.10 Heat Exchange Fluid

The heat exchanger fluid to be used in the solar water heating system shall include a rust inhibitor, antifreeze properties and a dye with a warning colour for detection of leaks into the water circuit.

The heat exchange fluid shall be non toxic and shall not form toxic reaction with foodstuffs at baking temperatures. Evidence of the above should be made available to the Engineer.

Solar water heating systems charged with a heat transfer fluid shall be pressure tested in accordance with the manufacturer instructions.

5.2.11 Manufacturers Guarantee

The entire assembly and its ancillary installation should be guarantee for a period of not less than 5 years.

5.2.12 Electrical / Boiler Backup for the Solar Water Heating System

5.2.13 General

Supplementary heating equipment installed shall have sufficient thermal capacity to supply normal hot water requirements and to meet the user profile as detailed in the detailed specification.

5.2.14 Design

Supplementary heating equipment shall be of a design suitable for the maximum pressure, maximum and minimum temperature, and the analysis of the inlet water, and shall comply with the requirements of the local supply authority.

5.2.15 Thermostat setting

To obtain an acceptable solar contribution, the supplementary heating should be suitable for operation at 65^0C normal temperature setting. Where this can not be effected by the use of the thermostat, the thermostat should be replaced by one of a type and design authorised by the Engineer. Replacement of the thermostat shall be undertaken only by authorised personnel, and the thermostat shall subsequently be marked at the operating temperature.

5.2.16 Drain connection

Supplementary heating incorporating a heating coil or similar heat exchange facility shall be provided with a drain connection to allow replacement of the components with the minimum of water spillage.

5.2.17 Statutory requirements

The electrical installation shall comply with the requirements of IEE wiring regulation 16^{th} Edition, or any supplements thereto.

5.2.18 Circuit

The installation shall consist of the final wiring of the heating equipment, together with all necessary control equipment and all necessary alteration to any existing mains and switchboard. For industrial systems, electrical supply shall be armoured cable on tray. Final connection to the heating element and the control thermostat in all cases shall be in silicon wire.

5.2.19 Workmanship

The installation shall be carried out in a neat and workmanlike manner and wiring shall be concealed wherever practicable.

5.2.20 Alteration or Additions

The alteration or addition to an existing switchboard shall be made in a manner that will preserve its layout, neatness, and appearance.

5.2.21 Isolation switch label

The installer shall affix adjacent to the isolation switch in a viewable position, a label or plaque supplied by the supplier or manufacturer of the collectors or the solar heating system, covering the function of the isolating switch.

5.2.22 Installation of Solar Water Heaters

5.2.23 Positioning

(i) Shade

Collector shall not be installed in positions likely to be affected by shade. The contractor shall take all the necessary care to ensure that the shading from the near by objects does not fall on the collector panels.

(ii) Orientation

Collector shall face true north wherever practicable. Deviation from north will reduce the performance of the solar water heater, depending upon the amount of deviation and the latitude. The maximum allowable deviation from the true North direction for this installation shall be ±15^{o}.

Collector shall be inclined at a similar angle to the latitude angle, however, to facilitate drainage; the minimum and the maximum allowable inclination angles shall be 2^{o} and 5^{o} respectively.

5.2.24 Provision for removal of collector

Collector shall be installed with union assemblies or compression fittings to permit removal without disturbing adjacent pipe-work or collector.

5.2.25 Mounting

5.2.26 Manufacturers instruction

Collector shall be erected and mounted either directly to the roof structure or to a suitably designed frame fixed to the roof structure, and shall not rely on pipe connections for structural strength of the fixtures.

Provision shall be made in all installations to ensure adequate drainage either under or over the collector, and the collector shall be arranged so as not to trap rainwater.

5.2.27 Roof mounting and supports

Solar water heaters shall be supplied complete with correctly designed roof mounting brackets, fixings, expansion connectors etc., as required to correctly install the unit and to accommodate thermal movement. Due regards shall be paid to mounting heights above ground level as well as to direction and speed of prevailing winds. All straps used in the supports or fastening units shall be hot dip galvanised after fabrication, or shall be stainless steel.

Only mounting meeting the manufacturer’s specification shall be used. Any required alteration to these mounting shall be approved by the manufacturer.
Structural members which penetrate the roof shall be flashed or rendered water tight in such a manner as will allow for expansion, be appropriate to the situation, and comply with the requirements of the Architect.

5.2.28 Detailed Specification

5.2.29 General description of the works

This specification covers the supply, delivery, Installation, testing, commissioning and handing over of the complete solar water heating installation to the complete satisfaction of the client and consulting Engineer for the above project as indicated on the drawings which form part of this specification.

5.2.30 Drawings by Engineers and architects

This specification must be read in conjunction with all Engineer's and architect drawings. Any discrepancies must be brought to the notice of the Engineer before submittal of the tender.

5.2.31 Building construction period

The building construction period and programme will be provided by the builder. The sub-contractor will be required to conform to the building programme.

5.2.32 Insurance

The Mechanical contractor shall carry insurance as required

5.2.33 Drawings by Mechanical contractor

(a) Mechanical contractors drawings;
(b) Builders work drawings;
(c) Shop drawings;
(d) Electrical & Pneumatic diagrams;
(e) Record drawings.

5.2.34 Samples and technical data

The mechanical sub-contractor shall submit samples and technical data of all equipment and fittings for the approval of the Engineer before ordering or commencing manufacture of these items.

5.2.35 Inspection, testing and commissioning

The mechanical contractor shall be responsible for testing and commissioning of the complete plant and allow for inspection by the Engineer as required. This testing should be done with proper instruments to the satisfaction of the engineer or his representative.

5.2.36 Operating and maintenance manuals

The mechanical contractor shall provide three copies of operating and maintenance manuals to the Engineer.

5.2.37 Maintenance and defects liability period

The mechanical sub-contractor shall be responsible for maintenance and defects liability for the period of 6 months.

5.2.38 Builders work

All builder's work on this project including cutting of opening in the roof sheeting for supports and pipework and provision of the necessary flashing and water proofing etc shall form part of this solar water heating contract.

It shall be the responsibility of the solar water heating contractor to provide the builder's work drawings showing full details of all such openings, bases, etc and for checking the positions and sizes of all the openings, bases etc so provided.

5.2.39 Electrical work

The solar water-heating contractor shall be responsible for all electrical work including the control panels where specified and wiring to all mechanical equipment, which form part of this contract.

The electrical power supply for the solar water heaters will be provided by the electrical contractor up to the isolator location. However, it will be the responsibility of the Mechanical contractor to connect the back-up element, pumps and the necessary controllers to electrical power.

It shall be the responsibility of the solar water heating contractor to provide the power supply loading and submit control panel wiring drawings, wiring diagrams and schematics for approval by the Engineer before manufacture of the control panels is commenced.

5.2.40 Services Conditions

Tenderer shall ensure that all equipment offered is suitable for use under the conditions specified and are invited to call for any further information that may be required.
All solar water heating equipment shall be selected to suit ambient conditions as applicable to the project location.

CLIMATIC CONDITIONS	KISII TOWN
Maximum out door dry bulb Temperature, t_o	29˚C
Minimum Temperature	8˚C
Relative Humidity	41% - 97%
Altitude	1962 M ASL
Longitude	35˚ 21' 32" E
Latitude	0˚ 44' 37" S
Max. solar radiation occurs during the month of February	

Extremely heavy rains fall during certain periods of the year and the contractor shall be deemed to have taken account of this fact both in his prices and his planning for the execution of the works.

5.2.41 Daily Solar Radiation on horizontal Surface

January : 23.2 MJ/m^2

July : 12.9 MJ/m^2

5.2.42 Water Analysis

The contractor should make sure that the water specification or quality complies with the manufacturer's recommendation for this installation i.e. the contractor should check the Water hardness, pH values etc.

pH	EC	TDC	CO_3	HCO_3	Total hardness
Calcium hardness	Chloride	Ca	Mg	Langlier Index	

5.2.43 Solar Water Heating Systems

The solar water heating installation shall comprise the following:

5.2.44 General

Supply, install, test and commission solar water heating system comprising collectors, detached storage tanks, hydraulic kit (where applicable), solar controller, interconnecting piping, insulation, valves, fittings and electrical elements complete with control and safety devices as specified.

5.2.45 Pressure rating

The system shall be rated to operate a minimum pressure of 30kPa and maximum of 400kPa.

5.2.46 Solar water heating system

The solar water heating system shall be of the indirect, detached type with the following minimum sizes and capacities at the specified panels orientation and inclination.

5.2.47 Particular requirements

Hot water storage tank : 21,000 litres
Orientation : North $\pm 15^0$
Inclination : $2^0 – 5^0$ from horizontal

Average solar panel energy output
July : 50 kWh/ m^2
January : 101kWh/m^2

Each panel of the of the solar water heating system shall be capable of providing as a minimum 200 litres of hot water at a supply temperature of not less than 65^0C per hour on a cloudy July day, without the use of electrical or boiler back up.

5.2.48 Piping

All hot and cold water pipe-work associated with the solar heating installation shall be galvanised mild steel, copper or other suitable material to be approved by the Engineer. Where the piping passes through the roof sheeting an approved method shall be use to ensure that possibility of water ingress in the building is mitigated.

5.2.49 Insulation

All hot water and heat exchange fluid pipes shall be insulated with weatherproof material equivalent to 25mm thickness of polyurethane foam and protected with gauge 22 aluminium cladding.

5.2.50 Installation

The solar heating panels shall be securely attached to the roof, and shall be installed directly onto the sloping roof or on a mounting frame as specified and indicated on the drawings.

The normal storage tank(s) shall NOT be required in this project as the hot water storage tanks shall be located in the boiler room. The heating fluid shall be piped to the heat exchanger in the hot water storage tanks and recirculated back to the solar panels.

5.2.51 Expansion relief valves and vacuum breaker /air release valves

The primary heating system shall be a closed system charged with heat exchanger medium complete with an expansion vessel, hydraulic kit, vacuum breaker / air relief valve at the highest point. The water storage tanks shall be provided with expansion relief valves piped back to the roof water storage tanks.

5.2.52 Pressure reducing valves

Pressure reducing valves shall be provided to regulate the water pressure where required.

5.2.53 Heating elements and thermostats

Heating elements and control thermostats shall be provided. The thermostat shall be provided with a high temperature cut out.

5.2.54 Additional Specifications

5.2.55 Welding

Welds are to be coded by an approved authority and every pipe weld shall have the code number of the welder stamped on it.

5.2.56 Installation

Hangers and supports
All hangers and supports shall be painted in accordance with general technical specification for painting.

5.2.57 Nuts and Bolts

Where nuts and bolts are used the following shall apply

For similar application all bolts shall be of the same length. Not more than five Threads and not less than two threads shall extend through nuts and washers shall be used on all practical aspects.

All bolts, nut and washers shall be cadmium plated unless otherwise specified and where applicable, tapered bolts and washers shall be used.

5.2.58 Vapour proofing of insulation

At least two coats of vapour proofing shall be applied to insulation and shall be of different colour.

5.2.59 Omission

Not all equipment for the successful completion of the project are described in the specification. Where this in the case, the contractor must follow accepted practice of a reasonable standard to the satisfaction of the Engineer.

5.2.60 Tests to be performed

The equipment shall be tested for satisfactory operation at the manufacturer's work before despatch.

All instruments used for testing shall be calibrated by an authority approved by the Engineer before testing commence.

5.2.61 On site Tests

The equipment shall be tested for satisfactory operation after erection and before practical completion and /or beneficial use.

5.2.62 Leakage Tests

Leakage tests must be performed during installation. The Engineer must be notified at least one week in advance of any testing.

5.2.63 Verification

Verification of the performance and power input shall be determined on site. A commissioning report with the final operational figures shall be made available to the engineer before the final commissioning.

5.2.64 Test results

The contractor shall supply the Engineer with results of any tests performed.

5.2.65 Commissioning schedule

The contractor shall submit to the Engineer a complete commissioning schedule at least two weeks before commissioning commences. The commissioning schedule shall contain all

commissioning activities, all equipment to be tested and all variables of the equipment to be checked.

5.2.66 O & M manuals, 'as build drawings', testing and commissioning

On successful completion of the installation, the contractor shall supply approved copies of the operating instruction and maintenance manuals, including "AS BUILD" drawings prior to commissioning and shall complete this testing and commissioning at least one week before final handover.

5.3.0 PARTICULAR SPECIFICATION FOR EXTERNAL HYDRANT

5.3.1 General

This particular specification details the requirement for the supply, installation and commissioning of the Fire Hydrants. The hydrants installation shall comply in all respects to the requirements of BS EN 14384: 2005 of Pillar Hydrants or the latest version of it.

5.3.2 Scope of Works

The Sub-Contractor shall supply, deliver, erect, test and commission underground screw-down type fire hydrants.

5.3.3 Fire Hydrant Details

(a) Hydrant body

The body of the hydrant shall be made of Grey Cast Iron complying with the requirements of BS EN 1561 having a tensile strength not less than that given for Grade 14.

(b) Hydrant Valve

The valve shall be faced with suitable resilient material. The threaded part of the valve, which engages with the spindle, shall be of bronze.

Body seating for the valves shall be of copper alloy complying with the requirements of BS 1400, or high tensile brass complying with the requirements of BS 2872 or BS 2874.

Valves shall be closed by turning the spindle cap in a clockwise direction when viewed from above and the direction of opening shall be permanently marked on the gland.

(c) Spindle & Spindle Cap

The spindle note shall be either of the same material as the spindle, or of copper alloy complying with the requirements of BS/1400 either type LG 2 or type LG 4. It shall have a squared top formed to receive either a cast iron spindle cap.

The spindle shall be made of copper alloy complying with the requirements of BS 2874, either type CZ114 or type CZ115, and it shall have a threaded machined of trapezoidal form.

The spindle cap shall be of Cast Iron secured to the spindle by an M12 hexagon socket set screw conforming to BS 4168.

(d) Hydrant outlet

The outlet flange of the hydrant shall have above nominal diameter 65mm, and shall be fitted with a screwed outlet – Both flanges shall be 50 mm conforming to BS 4504: Part 1: 1969

The screwed outlet shall be provided with a cap of Cast Iron or other suitable material. The cap shall cover the outlet thread completely and shall be attached to the hydrant by a chain

The distance between the axis of the outlet and the nearest point on the spindle fitting shall be not less than 100 mm.

The screwed outlet shall be made of: -

Copper alloy to BS 1400, type LG2G or DC BIC or
Copper alloy to BS 2872, type CZ114 or CZ115, or
Suitable spheroidal graphite iron to BS 2789 protected against corrosion accordance with CP 2008.

(e) **Drain Boss**

Each shall be provided with a suitable drain boss on the outlet side. This shall be located at the lowest practical point which will permit the filling of self-operating a drilled drip plug.

(f) **Jointing**

The hydrants shall have machined joint faces through out and the fitting of adjoining parts shall be such as to make sound joints, corresponding parts of hydrants of the same design and manufacture shall be interchangeable.

(g) **Hydrant coating**

The hydrant shall be coated in accordance to BS. 4164.

(h) **Surface Box**.

The clear opening of hydrant surface boxes at ground level shall not be less than 250mm x 380mm

The depth of frame shall normally be

a) for boxes located on footpaths: 100mm
b) for boxes located in roads: 125mm

(i) **Markings**

Surface box covers shall be clearly marked by having the words 'FIRE-HYDRANT' in letter not less than 30mm high, or the initials 'F.H.' in letters not less than 75mm high cost into the cover.

(j) **Surface Box Covers & Frames.**

The surface box frames and covers shall be graded in accordance with 2.1. of BS 497:1967 and shall meet the loading test requirement also given in BS 497

(k) **Testing**

The hydrants shall be deemed to have undergone the necessary hydrostatic and flow test at time of manufacture Necessary test certificates from the manufacturer shall be needed. The test, to conform to BS 750: 1977: Appendix a.1

5.3.4 Stand Pipes

One end of these shall have internal threads to couple with the 80mm diameter external threads of the screw down type fire Hydrant (BS 750 type 2 hydrants) outlet. The other shall have 65mm diameter internal threads to couple with the interconnector hose of the pumpset.

5.3.5 Hose Pipe

Each cotton synthetic fibre rubberised fire hosepipe to be 25mm metres long with 65mm diameter female instantaneous type connector.

5.3.6 Pressure Reducing Hydrant Outlets

Pressure reducing hydrant outlet shall be supplied and installed at outlet locations where the static and pump pressure exceeds 700 kPa.

The pressure reducing hydrant outlet shall be in the form of a parity valve incorporated in the hydrant outlet and valve assembly and connected to a drain pipe not less than 40 mm diameter. Alternatively, where specified, the pressure reducing hydrant outlet can be in the form of self-contained type without the use of the parity valve and drain pipe. It shall be capable to reduce the running pressure and satisfy the flow test requirements. The pressure reducing mechanism of the valve shall be located at downstream of the valve seat. Pressure reduction shall be achieved by means of hydraulic pressure balancing with metal diaphragm. An 100% effectiveness pressure reducing performance shall be maintained at all times of operation.

5.3.7 Hose Reels

Hose reels shall be of fixed or swing-out type to suit the site installation conditions of the site. The construction, testing, performance, working pressure, etc. shall be to NFPA Requirements. The length of hose shall be 30 m and bore 19 mm.

Drums shall be constructed of die-cast light alloy, hydraulically balanced, free from denting and twisting, and finished in red enamel. The hub and shaft shall be of brass, fitted with a device to prevent overrun of the hose, having a glandless centre seal. The entire assembly shall be drip free. Hoses shall be of reinforced rubber or P.V.C. tubing approved by the NFPA and shall be fitted with a copper alloy nozzle having slow- closure type lever-operated cock.

A hose guide complete with nylon or similar runners shall be supplied and installed adjacent to fixed type hose reels to enable the hose to be run out in any direction as required.

For the wall fixed pattern, wall-mounting brackets of substantial construction capable of supporting the entire weight of the hose reel and tubing under all operating conditions are required.

For the swing-out pattern, the support brackets and the swing-out arm shall be so designed as to enable the whole hose reel assembly be swung through 180^{o} in a horizontal plan.

Each hose reel nozzle shall be housed inside a glass fronted metal box. The box shall be fabricated from sheet metal not less than 0.8 mm thick with a hinged door with front break glass and padlocking facility. The metal box shall be painted and finished to the satisfaction of the Engineer. The break glass shall be of fragile type not more than 1.5 mm thick. The break glass shall be easily replaced. Common key shall be used for the padlocks. Five common keys shall be provided. A metal or plastic striker about 300 mm long, secured by steel chains, shall be provided for each box for the purpose of breaking the glass panel in case of emergency.

5.3.8 Cabinets

Cabinets for the housing of fire service inlets, hydrant outlets and hose reels will be provided by the Contractor unless otherwise specified. The Contractor shall furnish all necessary information to enable these cabinets to be designed and constructed including proposed dimensions for the cabinets and the dimensions, weights, etc. of the equipment supplied by him. All information supplied shall be based on BS 5041 Part 4.

Where hose reels are located in cabinets or recesses to which doors are fitted, the doors shall bear the words “FIRE HOSE REEL” in both English characters prominently and easily identifiable from all lines of sight in the surrounding. In the case of doors which can only be opened by pushing in

first, they shall also be annotated “PUSH TO OPEN” in both English. Hose reel cabinets fitted with doors shall not be locked and shall be easily identified and opened at time of emergency. All doors and markings will be provided by the Building Contractor unless otherwise specified.

5.3.9 Water Pumps

Water pumps for hydrant /sprinkler systems shall comply with the LPC Rules for Sprinkler Installations. Water pumps for hydrant /hose reel systems shall comply with BS 5306 Part 1. Pumps shall be manufactured by a manufacturer possessing certified ISO 9001/9002.

Sprinkler pumps shall be LPCB certified pumps or approved by any similar widely recognised independent regulatory body acceptable by the Engineer. Test certificate shall be submitted at the time of delivery.

There shall be at least one standby pump in addition to the duty pumps for each pump set. In addition, there shall be at least one jockey pump in each sprinkler pump set.

5.5 PARTICULAR SPECIFICATION FOR HOSE REEL & PORTABLE FIRE EXTINGUISHERS

5.5.1 General

This particular specification details the requirements for the supply, installation and commissioning of Fire Hose Reels and Portable Fire Extinguishers which shall conform to BS EN 3: 1996 and BS 7863: 1996, BS 5306 or NFPA 10. The hose reel and portable fire extinguishers shall have third party approval or listing such as LPCB and FM approval and or UL listing.

The Sub-Contractor shall include for all appurtenances and appliances not necessarily called for in this specification or shown on the Contract Drawings, but which are necessary for the successful completion and satisfactory functioning of the equipment.

5.5.1 Portable Fire Extinguishers

The Sub-Contractor shall supply, deliver, erect, test and commission all the portable fire extinguishers that are called for in this specification and shown on the Contract Drawings and listed in the Bills of Quantities.

5.5.1 Water / CO_2 Portable Fire Extinguishers

Portable 9-litre water filled CO_2 cartridge operated portable fire extinguishers shall comply with BS EN 3: 1996 and BS 7863: 1996 or NFPA 10. Unless manufactured with stainless steel, bodies shall have all internal surfaces completely coated with either lead tin, lead alloy or zinc applied by hot dipping. There shall be no visibly uncoated areas. The portable water / CO_2 fire extinguisher shall have LPCB approval or FM approval and or shall be UL listed.

The extinguishers shall be clearly marked with the following:

(a) Method of operation;
(b) The words 'WATER TYPE' (GAS PRESSURE) in prominent letters;
(c) Name and address of the manufacturer;
(d) The nominal charge for the liquid in imperial gallons and litres;
(e) The liquid level to which the extinguisher is to be charged;
(f) Instructions for periodical checking;
(g) The year of manufacture;
(h) A declaration to the effect that the extinguisher has been tested to a pressure of 350 p.s.i. (24.1 Bar); and
(i) The number of the British Standard or NFPA /UL-listing /FM-approval;
(j) The manufacturer's name and identification markings.

5.5.1 CO_2 Gas Portable Fire Extinguishers

Portable carbon dioxide fire extinguishers shall comply with BS EN 3: 1996 and BS 7863: 1996 or NFPA 10. The body shall be a seamless steel cylinder manufactured to BS 401, BS 1287 or BS 1288. The portable carbon dioxide fire extinguisher shall have LPCB approval or FM approval and or shall be UL listed.

The filling ratio shall comply with BS 5355 with valve fittings for compressed gas cylinders to BS 341. Where a hose is fitted, it shall be flexible and have a minimum working pressure of 3000 p.s.i. (206.85 bar). The hose is not to be under internal pressure until the extinguisher is operated.

The nozzle shall be manufactured from brass gunmetal, aluminium or stainless steel and may be fitted with a suitable valve for temporarily stopping the discharge if such means are not incorporated in the operating head.

The discharge horn shall be designed and constructed so as to direct the discharge and limit the entrainment of air. It shall be constructed of electrically non-conductive material.

The extinguishers shall be clearly marked with the following:

(a) Method of operation;
(b) The words 'CARBON DIOXIDE FIRE EXTINGUISHER' in prominent letters;
(c) Name and address of the manufacturer;
(d) The nominal gas content in kg;
(e) The words 'Recharge immediately after use';
(f) Instructions for periodical checking;
(g) The year of manufacture;
(h) A declaration to the effect that the extinguisher has been tested to a pressure of 350 p.s.i. (24.1 Bar); and
(i) The number of the British Standard or NFPA /UL-listing /FM-approval;
(j) The manufacturer's name and identification markings.

5.5.1 Dry Powder Portable Fire Extinguishers (9kg ABC Cartridge)

The portable dry powder fire extinguishers shall comply with BS EN 3: 1996 and BS 7863: 1996 or NFPA 10. The body shall be constructed of steel not less than the requirements of BS 1446 or aluminum to BS EN 485, BS EN 515: 1993 BS EN 573, and shall be suitably protected against corrosion. The portable dry powder extinguisher shall have LPCB approval or FM approval and or shall be UL listed.

The dry powder charge shall be non-toxic and retain its free flowing properties under normal storage conditions. Any pressurizing agent used as an expellant shall be in dry state, in particular compressed air.

The discharge tube and gas tube if either is fitted shall be made of steel, brass, copper or other not less suitable materials. Where a hose is provided it shall not exceed 1,060mm and shall be acid and alkali resistant. Provision shall be made for securing the nozzle when not in use.

The extinguishers shall be clearly marked with the following information:

(a) The words "Dry Powder Fire Extinguishers";
(b) Method of operation in prominent letters;
(c) The working pressure and the weight of the powder charge in kilogrammes;
(d) Manufacturer's name or identification mark;
(e) The words "RECHARGE AFTER USE" if rechargeable type;
(f) Instructions to regularly check the weight of the pressure container (gas cartridge) or inspect the pressure indicator on stored pressure types when fitted, and remedy any loss indicated by either;
(g) The year of manufacture;
(h) The pressure to which the extinguisher was tested;
(i) The number of the British Standard or NFPA /UL-listed /FM-approval; and
(j) Appropriate complete instructions for charging the extinguisher shall be clearly marked on the extinguisher or otherwise be supplied with the refill.

5.5.1 Fire Blanket

The fire blanket shall be made from Type 1 - Flat PVC Fabric Cover or any other fire proof material and to measure 1800 x 1800 mm and density of430gm/m² and shall be fitted with special tapes folded so as to offer instantaneous single action release blanket from storing jacket. The fire blanket shall have LPCB approval or FM approval and or shall be UL listed.

The fire blanket shall be capable of withstanding temperatures up to 550℃ and shall be rated in conformity to BS476 Part 4 and Class1 surface spread of flame to BS476 Part 7.

5.5.1 Boosted Hose Reel System

i. General

This section details the requirements for the supply, installation and commissioning of the hose reel installation. The hose reel installation shall comply in all respects to the requirements set out in C.O.P 5306 Part 1: 1976, B.S 5041 and B.S 5274.

The system shall comprise a pumped hosereel system.

ii. Hose Reel Pumps

The fire hose reel pumps shall consist of a duplicate set of multi-line centrifugal pumps from approved manufacturers. The pumps shall be capable of delivering 2.3 lit/sec at a running pressure of 3 bars or as specified in the contract drawings.

The pump casing shall be of cast iron construction with the impeller shaft of stainless steel with mechanical seal. In this case we shall not have separate pumps for hose reels but use the fire hydrant pump set.

iii. Control Panel

The control panel shall be constructed of mild steel 1.0mm thick sheet, be moisture, insect and rodent proof and shall be provided complete with circuit breakers and a wiring diagram enclosed in plastic laminate.

The pump shall be controlled by a flow switch and therefore the control panel shall include the following facilities:

a) 'On' push button for setting the control panel to live;
b) Green indicator light for indicating control panel live;
c) Duty / Stand-by pump auto change over;
d) Duty pump run green indicator light;
e) Stand-by pump run green indicator light;
f) Duty pump fail red indicator light;
g) Stand-by pump fail red indicator light;
h) Low water condition pump cut-out with red indicator light.

The pumps are to be protected by a low level cut-out switch to prevent dry pump run when low level water conditions occur in the water storage tank.

iv. Hose Reel

The hose reel to the installation shall consist of a recessed, swing-type hose reel as Angus Fire Armour Model III or from other approved manufacturers. The hose reel shall comply with B.S EN 671-1:1995 and EN 694 and is to be installed to the requirements of C.P. 5306 Part 1: 1976. The Hose reel shall have LPCB approval or FM approval and or shall be UL listed.

The hose reel shall be supplied and installed complete with a first-aid non-kinking 30 metres long hose with a nylon spray / jet / shut-off nozzle fitted. A screw down chrome - plated globe valve to B.S 1010 to the inlet to the reel is to be supplied.

The orifice to the nozzle is to be not less than 4.8mm to maintain a minimum flow of 0.4 lit / sec to jet.

The hose reels shall be installed at 1.5 metres centre above the finished floor level in locations shown in the contract drawings.

v. Pipe Work

The pipe work for the hose reel installation shall be galvanised wrought steel tubing heavy grade Class C to B.S 1387: 1967 with pipe threads to B.S 21 and be suitable for firefighting installations.

Pipe Fittings

The pipe fittings shall be wrought steel pipe fittings, welded or seamless fittings conforming to B.S. 1740 or malleable iron fittings to B.S 143. All changes in direction will be with standard bends or long radius fittings. No elbows will be provided.

Non-return Valves

The non-return valves up to and including 80mm diameter shall be to B.S. 5153: 1974.The valves shall be of cast iron construction with gunmetal seat and bronze hinge pin.

Gate Valves

The gate valves up to and including 80mm diameter shall be non-rising stem and wedge disc to B.S 5154: 1974 with screwed threads to B.S. 21 tapes thread.

Sleeves

Where pipe work passes through walls, floors or ceilings, a sleeve shall be provided one diameter larger than the diameter of the pipe, the space between them to be packed with mineral wool, to the Engineer's approval. The subcontractor shall maintain vertical piping in straight alignment with supports at each level plus a mid-story guide for pipe sizes 2" and smaller or as specified by the design engineer to allow for expansion/contraction.

Earthing

The hose reel installation shall be electrically earthed by a direct earth connection. The installation of the earthing shall be carried out in liaison with the Electrical Sub- contractor.

Finish Painting

Upon completion of testing and commissioning the hose reel installation, the pipe work shall be primed and finish painted with 2 No. coats of paints as per the standard hose reel color code or to the Engineer's requirements.

5.5.1 Testing and Commissioning

The hose reel installation shall be flushed out before testing to ensure that no builder's debris has entered the system. The installation is to be then tested to one and half times the working pressure of the installation to the approval of the Engineer. Simulated fault conditions of the pumping equipment are to be carried out before acceptance of the System by the Engineer.

5.5.1 Instruction Period

The Sub-contractor shall allow in his contract sum for instructing of the use of the equipment to the Client's maintenance staff. The period of instruction may be within the contract period but may also be required after the contract period has expired.

The period of time required shall be stipulated by the Client but will not exceed three days in which time the Client's staff shall be instructed on the operation and maintenance of the equipment.

5.5.1 Signage-Fire Instruction /Fire Exit

FIRE INSTRUCTION NOTICE

Print fire instruction on the Perspex plates with White Colour
Background measuring 510mm length x 380mm width x 4mm thick as follows;

FIRE INSTRUCTION NOTICE

In the event of fire;

1. Raise the alarm by actuating the nearest alarm system point, Sound Siren /gong or **Shout Fire**
2. Attack fire using the nearest available and appropriate fire equipment
3. Call nearest fire Brigade or Police 999 and inform your switchboard (PABX) Operator
4. Ensure that all personnel not involved in fire fighting evacuation to safety outside the building.
5. Close but **DO NOT LOCK** doors behind as you leave.
6. Evacuate the building using stairs or fire escapes. Do not use Lifts/escalators. Walk calmly. Avoid panic. Do not stop or return for personal belongings.
7. Assemble as per floor outside the building for roll call.

FIRE EXIT SIGN

Print Fire Exit signs on the Perspex plate, 4mm thick, with white colour background as follows: -

1. Lettering **IN RED COLOUR** of not less than 50mm in height;
2. A pendant sign bearing words, **FIRE EXIT** and with a directional arrow.

The sign must be capable of being read from both approaches to exit and so is double sided.

5.7 PARTICULAR SPECIFICATION FOR HOT WATER BOILERS

5.7.1 GENERAL

This section describes the requirements of hot water boilers. The hot water boilers shall be used as a back-up for solar water heating system which shall act as the primary source in the hospital hot water generation. The hot water generation system shall comprise of the following:

a) Solar water heating system;
b) Hot water boilers back-up;
c) Calorifiers with two (2) heat exchanger coils, lower heat exchanger shall be solar and upper boiler;
d) Mixing tank, to mix the boiler water and the calorifiers heating water;
e) Circulating pumps;
f) Interconnecting pipework with isolating and modulating valves as required;
g) Sensors and controls.

5.7.2 BOILER CHIMNEY

The boilers shall have a common chimney shared among the three boilers. The chimney shall be self-standing, adequately sized and fabricated from 6mm thick mild steel plates. The whole chimney shall be vertical, extending through the roof to terminate at least 3000m above the boiler house and shall be properly supported both at the base and along its height. The final exit shall be formed from a truncated cone to ensure a vertical flue exit for proper dispersion.

The whole chimney shall be externally lagged with a 50 mm thick fibre glass insulation and protected with 16 gauge galvanised mild steel sheet cladding.

5.7.3 DAILY OIL SERVICE TANK

The daily oil service tank shall be Type III conforming to BS 799 - 5 of 1800 litres capacity measuring 1220 x 1220 x 1220mm high. The tank shall be manufactured from 4 mm thick mild steel plate and tested in accordance with the requirements of BS 799 and shall be complete with a close fitting cover, inlet and outlet connections, drain insect proof vent and oil level indicator.

The tank shall be clad to a thickness of 50mm with fibre glass sheets of 0.4W/m² ºC thermal conductivity. The insulation shall be protected with 24 gauge galvanised mild steel sheeting. All joints shall overlap 50mm and secured by means of pop rivets. The tank shall be painted internally and externally with two coats of heat /oil resistant paint of approved quality.

The tank shall be provided with a withdrawable type electric oil immersion heater with thermal and a hot water oil capable of raising the contents from 15ºC to 30ºC in one hour.

The tank shall be mounted on a mild steel structure approximately 2.5m high with access ladder.

5.7.4 BOILER FEED TANK

The boiler feed tank shall be of 1800 litres capacity measuring 1220x1220x 1220mm high. The tank shall be fabricated from 6 mm thick mild steel plate, sand blasted and galvanised after manufacture and tested in accordance with the requirements of BS 417 and shall be complete with a close fitting cover, inlet connection and full way ball float valve, outlet connection, drain, overflow and insect proof vent. The boiler feed tank shall be mounted on a mild steel structure approx 2.5m high with access ladder and 600 mm wide platform all-round the tank.

5.7.5 CALORIFIER MOUNTINGS

The calorifier shall be provided with the following mountings:

a) Flanged and valved primary and return connections;
b) Flanged and valved secondary flow and return.;
c) Flanged and valved cold feed connection with full bore internal copper storage spurge pipe;
d) Spring loaded safety valves with padlock and key with outlet pipes of suitable size to discharge 18” above floor level;
e) Drain cock with union loose lever key;

f) 150mm dial thermometer;
g) 150mm dial pressure gauge complete with a suitable control cock;
h) Tapped bosses as required for thermostats;
i) All flanged stools and bosses shall project at least 50mm from the surface of the finished lagging on the shell.

The calorifier shall be complete with suitable cast iron or mild steel stools or cradles lined with 18 SWG copper where in contact with the calorifier sheath.

5.7.6 WATER CALORIFIERS

The calorifiers shall be water vertical storage type fabricated from mild steel and galvanised after manufacture. The calorifiers shall be complete with withdrawable galvanised mild steel heating coil outlet, return and make-up connections,150mm diameter pressure and temperature gauges, thermostats, vents, relief valves, coil supports and vessel supports manufactured and tested in accordance with the requirements of BS 853.

The heating coils shall be designed so as to raise the total vessel contents from 10ºC to 65ºC in two hours using primary hot water at 82ºC and 71ºC flow and return temperatures respectively.

The primary hot water flow into the heating coil shall be regulated by means of a 3 way diverting control valve through a calorifier mounted temperature sensing device in order to maintain the contents of the vessel at 65 ºC.

The calorifiers shall be insulated using 50 mmm thick jacket of pre-formed polyurethane foam, 40 kg/m³ density and 0.020 - 0.026 W/m°C thermal conductivity and cladded with 22 gauge galvanised mild steel sheeting.

All joints shall overlap 50mm and secured by means of pop rivets,

5.7.7 HOT WATER CIRCULATING PUMPS

The primary and secondary hot water circulating pumps shall be the centrifugal inline type complete with flanges and starters. The pump motors shall be totally enclosed and rated for continuous running. The pumps shall be manufactured from suitable corrosion resistant materials and designed to pump hot water of up to 100ºC temperature.

The pump lubrication system shall be designed in such a way as to preclude contamination of hot water by the lubricating medium.

5.7.8 BULK OIL STORAGE TANK

The oil storage tank shall be of 30,000 litres capacity measuring 2500mm diameter and 6100mm long. The tank shall be a double skinned mild steel horizontal cylindrical type of welded construction in accordance with EN 12285-1 suitable for underground installation.

The tank shall be provided with a 600mm diameter manhole with connections for filling contents, capped graduated dip-stick measurement provision, vent pipe, drain pipe, ultrasonic level indicator etc.
The tank shall be protected against corrosion and also be provided with leak detectors in the space between the shell plates.

The tank shall be underground as shown on the contract drawing and shall sit on two concrete cradles and held down as necessary. The tank shall then be covered with selected sand before final cover is done. The contractor shall ensure that external weight is transmitted to the tank. Four (4) external leak sampling points shall be provided as shown on the contract drawings.

5.7.9 OIL TRANSFER PUMP

The oil transfer pump shall be the rotary gear type complete with motor couplings, starter and base - plate. The pump shall transfer fuel oil from the bulk oil storage tank to the daily oil storage tank in the boiler house

The pump shall be capable of delivering 0.6 l/s against a discharge head of 20 metres and shall be designed for fully automatic operation, the actuating device being a float switch in the daily oil service tank. The pumps automatic start/stop mechanism shall be fitted with manual overriding device in order that the pump may be operated or stopped should fault occur in the automatic circuit.

The pump shall be housed in a suitable purpose made weather-proof cage to be fabricated by the sub-contractor

5.7.10 HAND OIL PUMP

The hand oil shall be of semi-rotary type capable of pumping fuel oil from the oil storage tank to the daily oil service tank. The pump shall be provided with 32mm diameter connections and shall be installed in the boiler house.

5.7.11 HOT WATER PIPEWORK

The hot water pipework shall be multi-layered composite pipes and fittings capable of carrying hot water of up to 90oC without damage. The pipework shall be insulated Fibre Glass reinforced PPRC PN 20 as George Fischer or equal and PPROVED.
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Pipe joints shall be made with couplings and sufficient unions shall be allowed so that fittings can be disconnected without cutting the pipe. Running nipples and long screws shall not be permitted.

All pipework 80mm diameter up to 150mm diameter shall be galvanised and shall comply with the above specification in all respects except that screwed flanges shall replace couplings and unions for the jointing of pipes. Flanges shall comply with the requirements, of BS 10 Table F and shall be spot faced to ensure that nuts and washers have firm seating.

Connections with equipment and valves shall be with flanged joints to BS 10 Table F. Flanges shall be of either the weld neck or slip-on-type whichever is more suitable for the particular application.

5.7.12 OIL PIPEWORK

All pipework in connection with oil service shall be of black mild steel manufactured in accordance with the requirements laid down in BS 1387.

Where flanged connections are employed they shall comply with the requirements of BS 10 Table F. in all other respects this pipework shall comply with the specification described for hot water pipework.

5.7.13 HOT WATER VALVES AND FITTINGS.

Gate Valves.

All gate valves for connection to galvanised mild steel pipework shall be of cast iron construction in accordance with the requirements of BS 3464 Class 100.

Globe Valves

All globe valves required to be fitted to galvanised mild steel pipework shall be of cast iron construction in accordance with the requirements of BS 3961 Class 10.

Non-Return Valves.

All non-return valves shall be of the swing check type, of cast iron construction in accordance with the latest BS specification and rated for a working water pressure of 10 bar.

Y-Type Strainers.

These shall be of cast or malleable iron construction.

Control Valve

All control valve be sized economically to the requirement of the manufacturers and shall be of cast iron. All valve strainer, etc. shall be, depending on the size, either flanged in accordance with BS 10 Table E or Screwed in accordance with BS 21 –tapered pipe thread. Bronze valve and fittings shall not be permitted

5.7.14 FUEL OIL VALVES AND FITTINGS

Gate Valves.
All gate valves used on the oil pipework shall be of cast iron construction in accordance with the requirements of BS 3464 Class 100 and BS 3948.

Globe Valves
All gate valves used on the oil pipework shall be of cast iron construction in accordance with the requirements of BS 3961 Class 100.

Non- Return Valves.

All non- return valves shall be of the swing check type, of cast iron construction in accordance with the latest BS specification and rated for working pressure of 10 bar.

Strainers.

All strainers shall be of cast or malleable iron.

5.7.15 EXPANSION LOOPS AND ANCHORS

Where practicable the pipework system shall be provided with sufficient bends and changes of direction to absorb pipe expansion providing that the stresses are contained within the working limits prescribed in the relevant BS specifications. Along the walkways, where long straight runs are unavoidable, suitable expansion loops together with their associated pipe anchors shall be supplied. The expansion loops shall be of an approved design.

5.7.16 PIPE SUPPORTS

All horizontal pipework is to be adequately supported at distances not exceeding those stated in the following table.

Pipe Diameter (mm)	25	32	45	50	65	80	100
Distance (m)	2.4	2.4	2.7	3.0	3.3	3.3	3.6

Vertical pipe runs shall be supported at intervals not greater than 1½ times the distance shown above.

5.7.17 PIPE INSULATION.

All hot water pipework shall be insulated with pre-formed rigid polyurethane foam of the specified thickness, 40 kg/m³ density and 0.020 - 0.026 W/m°C thermal conductivity and cladded with 22-gauge aluminium sheeting. The rigid polyurethane foam shall be of closed unconnected cells resulting in water resistance and shall have very low moisture absorption characteristics.

The insulation sections shall fit closely to the pipe and be close butted. The aluminium cladding shall be fit closely and adequately overlap in all directions to protect the insulation from physical damage and exposure to water and moisture.

5.7.18 INSULATION

a) Pipe work in Plant Room and Distribution Mains

Pipe work in plant room and distribution mains shall be insulated using pre-formed rigid polyurethane foam of the specified thickness, 40 kg/m³ density and 0.020 - 0.026 W/m°C thermal conductivity and cladded with 22-gauge aluminium sheeting. For 65mm-100mm (2.5 to 4"), pipe insulation shall be 32mm (1.25") thick. For 40mm to 50mm (1.5 to 2") pipes, insulation shall be 25mm (1") thick.

All insulation within the plant room shall be protected with 22-gauge aluminium sheeting. All joints shall overlap by 50mm (2") and secured by rivets. All bends and tee pieces shall be neatly formed with patented rings and swaged segments.

b) Valve Strainers

All valves of 50mm bore and above shall be insulated with pre-formed rigid polyurethane foam and clad in aluminium to approval of the Engineer.

Pipe work shall finish 150mm each side of the valves below 50mm and a separate section of the insulation should then be fitted to cover the valve and the exposed pipe work either side of the valve.

This section of insulation shall then be covered with an aluminium sleeve formed in two parts and with suitable aperture for the valve spindle.

c) Internal Distribution Mains

The distribution mains within buildings shall be insulated with pre-formed rigid polyurethane foam sections finished with gauge 22 aluminium sheeting and secured with pop rivets or self-tapping screws as may be approved by the Engineer. The insulation shall be applied individually to each section of the pipework.

d) Chimneys

The boiler chimneys shall be insulated with 50mm thick asbestos free calcium silicate sections firmly secured to the cleats provided on the mild steel.

The insulation shall be protected by encasing with 16 gauge galvanised mild steel sheeting with all joints overlapped and secured with pop rivets. All bends to be formed with ring or swaged segments.

e) Calorifiers

The calorifiers shall be insulated using pre-formed rigid polyurethane foam sections of 50mm thickness and the thermal conductivity shall be 0.020 - 0.026 W/m°C.

The insulation on each calorifier shall be protected with 20-gauge aluminium sheeting. All joints to overlap 50mm and secured by means of pop rivets.

1) General

All pipe work in the boiler house and the distribution mains shall be provided with the colour identification symbols indicating the flow and return pipes and their purposes.

All pipe work must run in a neat and tidy manner as much as possible. Care is to be taken when fixing piping which has to be lagged to leave sufficient room between the pipes or the adjacent structure so that a space of 25mm is left between the finished face of the adjacent structure and the pipe insulation.

Pipework or fittings unduly marked by tools or flattened or otherwise distorted or damaged will be rejected.

Sets in steel copper pipe work are to be fire made or formed in a bending machine and must be truly concentric at any cross-section. Sets on adjacent pipes are to be so formed that they run parallel to each other and no set of bend is to have a joint of any kind in its length. Adequate

provision must be made for expansion and contraction and the sub-contractor will be held responsible for any defect caused through his neglect to observe this requirement. Pipes passing through the walls and floors shall be fitted with built in sleeves of sufficient diameter to permit movement of the pipe and of similar material to the pipe.

2) Testing

All the pipe work in connection with the hot and cold water pipes is to be tested in the presence of the Engineer and to the hydraulic pressure the Engineer deems satisfactory and for a minimum period of 1 hour.

These tests must be before any insulation work is undertaken or any pipe work is finally enclosed in any ducts, etc and due allowance is to be made in the tender for these tests.

The tenderer is to include for providing for all the testing equipment, temporary plugging and refilling etc.

3) Instruction Manuals

The Sub-contractor is to prepare and hand over to the Engineer on a site written receipt for duplicate copies to full operating and maintenance instruction for all mechanical equipment which he has installed under the Sub-contract.

PART 5:
BILLS OF QUANTITIES
KISII CANCER CENTRE – KISII COUNTY, KENYA

5 BILLS OF QUANTITIES

5.1 General Directions

(a) The Bills of Quantities are to be read in conjunction with the Conditions of Contract, the Specification, the Data Schedules and the Drawings for details of the description, quality, tests and strengths of materials to be used and the workmanship, conditions, obligations, liabilities and instructions generally which have to be complied with in carrying out this contract. The cost of complying with all Conditions of Contract, the Specification, the Data Schedules and the Bills of Quantities including all overhead charges and profit and carrying out of the Works shall be deemed to be spread over and included in the prices and sums in this Bill of Quantities.

(b) Each item which the Tenderer proposes to supply shall be priced by Tenderer with the exception of the item for which Provisional Sums have been allowed. The Tenderer shall insert in the appropriate column against each item allocated in United States Dollar (USD) as required by him and payments shall be made according to this allocation in the event of a contract.

If the Tenderer omits to price any item in the Bills of Quantities then the cost of such items will be held to be spread over and included in the prices given for other items of work.

(c) The Total of Tender shall be carried to the Form of Tender.

The Total of Tender shall include for the design, manufacture, inspection and testing, packing for shipment, insurance, customs dues, delivery to site, unloading, and all other charges, complete erection, testing, setting to work, finishing, painting, maintenance for a period of six calendar months and the instruction period all to the satisfaction of the Interior Designer and Engineer, of the items of Plant described or implied within the Specification and shown on the Drawings.

(d) Provisional Sums may be expended in part, in whole or totally deleted from the Contract. The tenderer shall take this into consideration when pricing the tender, as no claims for loss of profit, etc will be entertained.

(e) These Bills of Quantities have been measured from the Drawings listed, but do not purport to schedule the works in more detail or accuracy than is necessary to obtain a reasonable and comprehensive tender.

The contractor shall nevertheless be deemed to have included in his prices for all labour and all materials, accessories, components, quantities and commissioning to provide complete installation as described in Specification and shown on the Drawings as required by the true meaning and intent hereof. It shall be deemed that the contractor has included for all requirements contained within the Specification, Drawings, Data Schedules and Bills of Quantities.

(f) The Contractor’s attention is drawn to the fact that the quantities in these Bills of Quantities are estimated and they are not to be considered as limited or extending the amounts of work to be done by the Contractor.

(g) Irrespective of the requirements contained within the East African Standard method of Measurement it shall be deemed that the contractor has included all requirements contained within the Specification, Drawings, Schedules and Bills of Quantities.

6.1 Particular Instructions

1. Abbreviations used herein will be interpreted as follows: -

ABBREVIATION	MEANING
MM or mm	millimetre
LM or m	metre
m^2	square metre
m^3	cubic metre
kg	kilogramme
No.	Number / quantity

2. Prices given for supply and installation of pipework and ductwork per linear metre or per square metre shall include the supply, delivery and complete installation, including benchwork, painting, ducts, etc, with mechanical joints, unions, brackets and connection pieces, and all other necessary items to leave the installation in a complete and acceptable working order all as specified herein.

3. Sizes given after the item description under the reference “size” shall be interpreted as having millimetre units, unless otherwise specified.

4. The rate entered against each item shall be EXCLUSIVE of all Taxes. The sub-contract works are exempted from the importation duty, VAT and all other Customs Taxes by the Kenya Revenue Authority.

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	PROPOSED KISII CANCER CENTRE **SANITARY FITTINGS - SUPPLY AND INSTALLATION** **Special Note: All rates shall be exclusive of ALL Taxes. The sub - contract works are excempted from the import duty, VAT, and all other Customs taxes by the Kenya Revenue Authority** Supply, deliver, install, test and commission the following sanitary appliances complete with all the accessories including all connections to the services, waste, jointing to water supply overflows, supports and all plugging and screwing to walls and floors. **Note:** (i) All sanitary fittings shall be in approved colour. (ii) The Model and Ref No. indicated is only a guide to the type and quality of fittings. (iii) Equivalent and Approved models may be acceptable.				
	P1.1 Water Closet (WC) Suite Back to wall WC suite in approved colour complete as Duravit D-Code ref # 211509 and ref # 0067390, with heavy duty soft close matching seat and cover with metal top fixred (chrome plated) hinges ref. no. 0067390. The unit shall come complete with back entry concealed one and half inches low pressure flush valves as DOCOLFLAT cod 00931744 polished chrome with a double layer of Nickel with all necessary assecories to function as a unit.	65	No		
	P1.2 Water Closet (WC) Suite Back to wall WC suite in approved colour complete as Duravit D-Code ref # 211509 and ref # 0067390, with heavy duty soft close matching seat and cover with metal top fixred (chrome plated) hinges ref. no. 0067390. The unit shall come complete with back entry concealed one and half inches low pressure flush valves as DOCOLFLAT cod 00931744 polished chrome with a double layer of Nickel with all necessary assecories to function as a unit.	22	No		
C	**WC Cistern - Rate Only** Geberit Kombifix Delta Range concealed cistern for WC (article no. 110.150.00.1), height 1140mm, front actuated with Delta S/Steel Anti Vandal actuator (article no. 115.101.00.1), including flush pipe and pan connector, water supply connection with angle stop valve, protection cover for service opening and protection cover for flush pipe, fixed with included fastening materials in "PreWall" brick. All with Geberit conditional guarantee.or equal and approved.	1	No		
D	**P1.4 Urinal Bowls** Ceramic urinal bowl with concealed inlet including jet Nozzle, Inlet set, 40mm heavy duty plastic bottle trap and 40mm diameter chrome plated outlet with grating firmly fixed on the wall with chrome plated screws. The fittings shall be as Duravit D-code or equal and approved. Mount so that the rim of the Urinal is not More than 17" AFFL	29	No		
E	**P1.4 Urinal Bowl Divisions** Ceramic urinal bowl divisions separating the above described urinal bowls fixed firmly on the wall. The fittings shall be as Duravit stark 3 #8500000000 or equal and approved.	29	No		
F	**P1.4 Urinal Bowl Flush Valves** 32mm urinal bowl flush valve for the above urinal bowls complete with, back entry with integral vacuum breaker, non-hold-open features and non-return valve, inlet control stop and wall plate comprising flush valve, bent chrome plated flush pipe and rubber pipe connector. The flush valve to be push button type. The fittings shall be as Cobra or equal and approved.	22	No		
	Total Carried to Collection Page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	P2.1 Countertop Wash hand basin (WHB)				
K	Countertop Wash hand basin size 560 x 465mm with one tap holes and chain stay hole as Duravit stark 3 Ref #0302560000, 32mm diameter chrome plated pop up waste ref #50100000, chrome plated bottle trap (32mm 'P' trap) ref: #52053000, 2No angle valve ref: #13902000. The basin shall have a single level basin mixer with extra long handle as Hansgrohe Focus care ref: #31910000. All to be as Duravit and Hansgrohe brands or equal and approved.	99	No.		
	P2.2 Wash hand basin (WHB)				
J	560mm Wall mounted Medical wash hand basin without overflow complete with 1No. tap hole , wall brackets complete with pillar mounted "lever action mixer tap" fitting, 1/2 with swivel nozzle and divided flow" chrome grid waste 11/4" and white plastic bottle trap 11/4" P-trap .The WHB shall be as DURAVIT while the mixer tap shall be as JAGUAR FLR-CHR-5033B or approved equivalent.	24	No.		
	P2.8 Double compartment scrub sink				
L	1.6mm thick x1500mm long stainless steel surgeons scrub sink with Left hand outlet Complete with 3No. wall mounted Lever action mixer taps , 40mm Chrome plated Waste fitting and an s trap. The mixer taps shall be as JAGUAR FLR-CHR-5166 or approved equivalent	4	No.		
	P2.9 Triple compartment scrub sink				
M	1.6mm thick x2000mm long stainless steel surgeons scrub sink with Left hand outlet Complete with 3No. wall mounted Lever action mixer taps , 40mm Chrome plated Waste fitting and an s trap. The mixer taps shall be as JAGUAR FLR-CHR-5166 or approved equivalent	1	No.		
	P3.1 Shower Fittings				
N	4-Way Thermostatic Shower mixer with adjuastable shower head as Tapis 9B6417A, and Telephone Shower with wall bracket as Hansgrohe or approved equivalent.	24	No		
	P3.1 Shower seat				
O	Reversible solid phenolic folding shower seat, waterproof, black edged, frame manufactured in stainless steel AISI 304, satin finish and with a wall bracket to assure the maximum safety. Suitable to achieve barrier-free accessibility in bathrooms. Capable of weight load upto 113kg . The seat to come complete with concealed mounting plates, anchors and any other necessary accessories for the proper functioning of the unit. Seat to be as Mediclinics ref: AM0500 or equal and approved.	24	No		
	P4.1 Cleaners Sink				
P	Grade 430 (17/10) Stainless Steel dhobi sinks of size 540 x 430mm deep as manufactured by Franke ref #ET101, complete with 1 No. 1/2 " diameter chrome plated bib tap Docol ref #00222806, 32mm diameter heavy duty plastic bottle trap as Franke ref Spazio 1. The sink to come complete with waste fitting and plug. All to be as Franke/Docol or equal and approved.	9	No		
	P4.2 Sluice sink				
Q	1600x600mm Sluice sink manufactured from 1.2 mm thick, grade (304) stainless steel with a satin polish finish. The top shall be turned down on all four edges and fitted with a 110 mm dia. outlet sluice hopper at one end and a washing up bowl next to the sluice hopper set for 40 mm waste outlet. It shall have Flush grated waste , Plastic cistern with a 7 litre capacity cistern with chain pull ,stainless steel flush pipe, and fitted with a 15 mm HP brass valve, plastic float and CP metal flushing lever handles. The unit shall be wall mounted with stainless steel front leg supports which give a working height of 900 mm and have adjustable feet that can be screwed to the floor for extra stability. It shall havewall mounted lever mixer taps as Jaguar FLR-CHR-5166, and waste 40mm, chrome plated waste pipe for the hopper .The sink shall be as Franke G22027R or approved equivalent	7	No		
	Total Carried to Collection Page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	P4.4 Single compartment sink				
R	Single compartment self rimming drop-in (or undermount) medical hand wash sink. 18 gauge (1.2 mm), type 304 stainless steel. Sink compartment is angled to reduce splashing and waste is offset to reduce the risk of any bacteria contamination and splashing. Exposed surfaces to be #4 satin finished. Undercoated to reduce condensation and resonance. Includes waste fitting, bottle trap, sound deadening pads, factory applied rim seal, cutout template, and factory installed EZ TORQUE™ fasteners. Certified to ASME A112.19.3-2008 / CSA B45.4-08. Right rear waste location. Includes 1 1/2" (38 mm) duplex waste assembly with rubber stopper and 1 1/2" (DN38) brass tailpiece. With faucet ledge. The sink shall have a single lever basin mixer with extra long handle as Hansgrohe Focus care ref: #31910000, and 2No angle valve ref: #13902000. To be as Franke Model: HWS6810P-3/3. or equal and approved.	60	No		
	P4.5 Single compartment sink				
S	A stainless steel sink top manufactured from 1.2 mm with ribbed drainer, no tap-holes, no overflow, no chain hole, no upstand, edges rimmed and turned down,size 600x600mm, complete with Concealed fixing clips and Stainless steel support framework, pillar mounted "lever action mixer tap" fitting, 1/2 with swivel nozzle and divided flow" as JAGUAR FLR-CHR-5033B, chrome grid waste 11/4" and white plastic bottle trap 11/4" P-trap	9	No		
	P4.6 Double compartment sink				
T	Double compartment self rimming drop-in sink with faucet ledge. Center back waste location. 18 gauge (1.2 mm), type 316 (EN1.4401 17/12/2) stainless steel. Exposed surfaces are #4 satin finished. Undercoated to reduce condensation and resonance. Includes factory applied rim seal, factory installed EZ TORQUE™ fasteners and 3 1/2" (89 mm) crumb cup strainer with 1 1/2" (DN38) type 316 (EN1.4401 17/12/2) stainless steel tailpiece. Certified to ASME A112.19.3-2008 / CSA B45.4-08. Center back waste location, 3 1/2" (89 mm) type 316 crumb cup waste. The sink shall have 2No single lever basin mixer with extra long handle as Hansgrohe Focus care ref: #31910000, and 4No angle valve ref: #13902000. To be as Franke Model: LBD6408/316P or equal and approved.	5	No		
	P4.7 Triple compartment sink				
U	Triple compartment self rimming drop-in sink with faucet ledge. 18 gauge (1.2 mm), type 304 (CNS 18/10) stainless steel. Exposed surfaces are #4 satin finished. Undercoated to reduce condensation and resonance. Complete with waste fittings, factory applied rim seal, and factory installed EZ TORQUE™ fasteners. Certified to ASME A112.19.3-2008 / CSA B45.4-08. Center waste location. Includes 3 1/2" (89 mm) crumb cup strainer with 1 1/2" (DN38) brass tailpiece. The sink shall have 3No. single lever basin mixer with extra long handle as Hansgrohe Focus care ref: #31910000, and 6No angle valve ref: #13902000. To be as Franke Model: LBD6408/316P or equal and approved.	1	No		
	P4.8 Double compartment sink-Sluice room				
V	Double compartment self rimming drop-in sink with faucet ledge. Center back waste location. 18 gauge (1.2 mm), type 316 (EN1.4401 17/12/2) stainless steel. Exposed surfaces are #4 satin finished. Undercoated to reduce condensation and resonance. Includes factory applied rim seal, factory installed EZ TORQUE™ fasteners and 3 1/2" (89 mm) crumb cup strainer with 1 1/2" (DN38) type 316 (EN1.4401 17/12/2) stainless steel tailpiece. Certified to ASME A112.19.3-2008 / CSA B45.4-08. Center back waste location, 3 1/2" (89 mm) type 316 crumb cup waste. The sink shall have 4No. single lever basin mixer with extra long handle as Hansgrohe Focus care ref: #31910000, and 2No angle valve ref: #13902000. To be as Franke Model: LBD6408/316P or equal and approved.	6	No		
	Total Carried to Collection Page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	P 4.9 Double Bowl Double Drainer Kitchen Sink Double bowl double drainer stainless steel kitchen sink of size 2000 x 600mm as manufactured by ASL or equal and approved. The bowl size to be 430 x 420 x 250mm deep complete with chrome plated 40mm waste fittings, plugs, chain stays, overflow, heavy duty plastic bottle trap with 75mm deep seal and chain waste fitting.	6	No		
	Kitchen Sink Tap Single Sink tap, 15mm, as Cobra or equal and approved chrome plated wall mounted with overarm swivel outlet, Carina head for kitchen sink. The tap to have a flow rate of 4 litres/min.	6	No		
	ACCESSORIES				
A	**Mirrors** 6mm thick polished plate glass silver backed mirror with bevelled edges, size 610 x 610mm, plugged and screwed to wall with 4No. chrome plated dome capped screws. The mirror shall rest against a layer of 5mm thick foam.	192	No		
B	**Toilet Roll Holder** Steel White Epoxy duel wall mounted two roll paper dispenser as MEDCLINICS ref PR0784 or equal and approved	65	No		
C	**Soap Dispenser** Automatic wall-mounted liquid soap dispenser of 1 L capacity, manufactured in stainless steel AISI 304, 0.8 mm thick. Level display located in the front part of the soap dispenser. Operates with an AC adapter. Order reference DJ0037A/C/CS-TRAFO to receive the automatic soap dispenser able to be connected to the mains with the AC adapter. It shall be as Mediclinics ref: DJ0037ACS or equal and approved.	170	No		
D	**Paper towel dispensers** Manual paper towel dispenser, surface mounted made of stainless steel AISI 304, satin finish, Fully welded body, 0.8mm thick with burr-free edges. Seamless one-piece lid, 0,8mm thick, fixed to the body by means of 2 rivets that allows swinging down of lid for replenishment. Back-plate, 0.8 mm thick, with multiple slots for easy installation. The towel tray opening has bound edges to minimize tearing of paper towels. Slot at the front that indicates the content level. It shall be as Mediclinics ref: DT0106CS or equal and approved.	150	No		
E	**Paper towel disposal bin** Sanitary napkin disposal bin with lid, 6 L of capacity, wall mounted or floor standing made of stainless steel AISI 304, satin finish body and lid, 0.8 mm thick. It shall be as Mediclinics ref: PP0006CS or equal and approved.	50	No		
F	**Robe Hook** Chrome plated robe hook mounted with concealed screws. To be as Hansgrohe or equal and approved	130	No		
G	**Hinged support rail** Safety vertical swing grab bar made AISI 304 stainless steel, satin finish 32 mm diameter tube with a built-in toilet paper holder and a heavy-duty wall plate, 3 mm thick, with 6 attachment points that provides rigid support. The rail shall be as Mediclinics ref: #BG0800CS or equal and approved.	22	No		
H	**Grab bars** Straight grab bar with snap flange made of AISI 304 stainless steel, for horizontal, vertical or slanting installation. The set shall be as Mediclinics ref: #BR0600CS or equal and approved.	88	No		
I	**Bed pan Rack** Franke model BBR Bedpan and Bottle Rack designed to hold plastic and stainless steel bedpans and bottles, manufactured from grade 304 (18/10) stainless steel 8mm diameter round bars and stainless steel flat bar mounting brackets. Bottle holders to be on the front of the unit to ensure ergonomic function. Unit complete with stainless steel drip tray which can be removed for cleaning and the ends of the bottle rods are fitted with rubber grommets. Unit fixed to wall with 4 off anchor bolts (bolts specified elsewhere. It shall be as Franke ref: #BBR6 or equal and approved.	12	No		
J	**SUSPENDED SEPARATION TOILET** Reference 00012450 Lemer Pax patented suspended separation toilet for the separation of urine and fecal matter in iodine 131 treatment rooms. Radioactive urine will be diverted to the decay tanks while non radioactive fecal matter is evacuated into the sewer. The toilet to be radioprotected, including at the syphon.	4	No		
K	**SHIELDED WASTE BIN** Reference 0005828 EASYDROP shielded waste bin of capacity 20 litres and overall dimensions 417 x 48 x 809 mm (L x D x H), with 10 mm lead shielding over all sides for radiation protection.	3	No		
	Total Carried to Collection Page				

COLLECTION PAGE FOR SANITARY FITTINGS SUPPLY

Item	Description		Amount (USD.)
		.....	
1	Total carried forward from page 9-1	.....	
		.....	
3	Total carried forward from page 9-2	.....	
		.....	
4	Total carried forward from page 9-3	.....	
		.....	
5	Total carried forward from page 9-4	.....	
Total for SANITARY FITTINGS SUPPLY Carried to Summary Page			

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	PROPOSED KISII CANCER CENTRE **COLD WATER**				
	Internal Plumbing Works Supply, deliver and install pipes, tubing and fittings as described and shown on the drawings. The pipes shall be PN 25 PPR pipes where exposed to adverse weather condition and all conforming to the current European standards for PPR installations and to the Engineers approval, pipe jointing shall be by polyfusion or use of electric coupling. Rates must allow for all Metal/plastic threaded adaptors where required for the connection of sanitary fixtures, valves, sockets, sliding and fixed joints, support raceways, isolating sheaths, elastic materials, expansion arms and bends, crossovers, couplings, clippings, connectors, joints etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holder bats plugged and screwed for the proper and satisfactory functioning of the system. The pipes will be pressure tested before the plastering of wall commences and as per the manufacturers recommended testing pressures. **PPR Pipes**				
A	75mm diameter	350	Lm		
B	63mm ditto	600	Lm		
C	50mm ditto	1000	Lm		
D	40mm ditto	900	Lm		
E	32mm ditto	600	Lm		
F	25 mm ditto	1600	Lm		
	Bends				
G	25mm diameter	361	No.		
H	32mm diameter	66	No.		
I	40mm diameter	42	No.		
J	50mm ditto	9	No.		
K	63mm ditto	14	No.		
L	75mm ditto	4	No.		
	Total carried to collection page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	TEES				
A	25 x 25 mm	169	No.		
B	32x25mm	60	No.		
C	32 x 32 mm	8	No.		
D	40x25mm	36	No.		
E	40X32 mm	49	No.		
F	40 x 40 mm	8	No.		
G	50 x 25 mm	7	No.		
H	63x25mm	6	No.		
I	63x32mm	2	No.		
J	63x40mm	4	No.		
K	63x50mm	2	No.		
L	63x63mm	4	No.		
M	75 x 40mm	3	No.		
N	75 x 50 mm	1	No.		
O	75 x 75 mm	1	No.		
	REDUCERS				
P	32X25 mm	27	No.		
Q	40x32 mm	14	No.		
R	40x25mm	6	No.		
S	50x25mm	7	No.		
T	50x40 mm	10	No.		
U	63x32 mm	1	No.		
V	63x40mm	2	No.		
W	63x50mm	3	No.		
X	75x75 mm	1	No.		
	Unions				
Y	25mm diameter pipe unions	25	No.		
Z	32mm diameter pipe unions	8	No.		
A1	40mm diameter pipe unions	8	No.		
B1	50mm diameter pipe unions	29	No.		
C1	65mm diameter pipe unions	6	No.		
D1	75mm diameter pipe unions	4	No.		
	Total carried to collection page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	Threaded Fittings				
A	20mm male/female threaded 90° bend/Elbow	25	No.		
B	25mm male/female threaded 90° bend/Elbow	10	No.		
C	32mm male/female threaded 90° bend/Elbow	19	No.		
D	40mm male/female threaded 90° bend/Elbow	32	No.		
E	25mm male threaded tee	15	No.		
F	32mm male threaded tee	6	No.		
G	40mm male threaded tee	24	No.		
H	50mm male threaded tee	12	No.		
	Plugs				
I	20mm diameter pipe threaded plug	4	No.		
J	25mm ditto	5	No.		
K	32mm ditto	3	No.		
	Valves				
L	25mm diameter approved medium pressure screw down full way non-rising stem wedge gate valve to BS 5154 PN 20 for series B rating, with wheel and head joints to steel tubing and complete with round male threaded transition fittings.	40	No.		
M	32mm ditto	23	No.		
N	40mm ditto	28	No.		
O	50mm ditto	15	No.		
P	65mm ditto	14	No.		
Q	75mm ditto	10	No.		
R	65mm non-return valve	2	No.		
S	50mm ditto	2	No.		
T	75mm pressure reducing valve	4	No.		
U	100mm paddle flange	10	No.		
	Pipe Sleeves				
V	150mm diameter heavy duty PVC pipe sleeves for crossing over columns and beams.	10	Lm		
W	100mm diameter ditto.	20	Lm		
X	75mm diameter ditto.	15	Lm		
Y	65mm diameter ditto.	20	Lm		
Z	50mm diameter ditto.	20	Lm		
	Total carried to collection page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	Concrete Water Tank Fittings - Paddle Flanges Provide the following connections to concrete water tank done by others. Connections to be in **Galvanised Mild Steel paddle flanges:**				
A	250mm diameter rainwater inlet pipe.	3	No		
B	75mm diameter outlet pipe for pumps	8	No		
C	250mm diameter outlet pipe for fire pumps	2	No		
D	250mm diameter for vent/overflow pipe	3	No		
E	20mm diameter for level indicator	3	No		
F	25mm diameter for low level cut outs	4	No		
G	250mm diameter tank inter-connection.	3	No		
H	150mm diameter for fire system test line	2	No		
I	110mm washout connection complete with gate valve	3	No		
	Water Storage Tank -steel				
J	Supply, deliver and assemble a roof water tank, made of pressed steel sectional tank plates 6mm thick plates sand blasted and galvanized after manufacture (type 1) and of size 1000 x 1000 mm. Capacity of tank to be 18,000 litres and of preferred dimensions 3000mm x 3000mm x 2000mm high. The tank to come complete with inlet, outlet, overflow and washout connections, tank cover, manhole and cover, mosquito proof inspection vent, internal stays, internal & external ladder, jointing material, bolts and nuts, etc all galvanised after manufacture. Also included is two coats of non-toxic bituminous paint on the inside of the tank. The tank shall have connections for 63mm diameter mains inlet pipe, 63mm diameter outlet pipe 75mm diameter vent/overflow and level indicator	4	No.		
	Total carried to collection page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	HOT WATER INSTALLATIONS				
	Internal plumbing installations				
	Supply, deliver and install pipes, tubing and fittings as described and shown on the drawings. The pipes shall be **insulated** Fibre Glass Reinforced PPRC pipes PN 20 as George Fischer or equal and approved. The pipes shall conform to the current European standards for PPRC installations and to the Engineers approval, pipe jointing shall be by polyfusion or use of electric coupling. Rates must allow for all Metal/plastic threaded adaptors where required for the connection of sanitary fixtures, valves, sockets, sliding and fixed joints, support raceways, isolating sheaths, elastic materials, expansion arms and bends, crossovers, couplings, clippings, connectors, joints etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holder bats plugged and screwed for the proper and satisfactory functioning of the system. The pipes will be pressure tested before the plastering of wall commences and as per the manufacturers recommended testing pressures.				
A	25mm Diameter pipe	1500	LM		
B	32mm Diameter pipe	550	LM		
C	40mm Diameter pipe	350	LM		
D	50mm Diameter pipe	400	LM		
E	63mm Diameter pipe	120	LM		
F	75mm Diameter pipe	70	LM		
	Bends				
G	26mm ditto	139	No		
H	32mm ditto	28	No		
I	40mm ditto	7	No		
J	50mm ditto	14	No		
K	63mm ditto	10	No		
L	75mm ditto	10	No		
	Tees				
M	25 x 25 mm	20	No		
N	32x25mm	6	No		
O	32 x 32 mm	2	No		
P	40x25mm	6	No		
Q	40X32 mm	4	No		
R	40 x 40 mm	30	No		
S	50 x 25 mm	40	No		
	Total carried to collection page			**USD**	

Item	Description	QTY	Unit	Rate (USD)	Amount (USD)
	Tees continued				
A	50 x 50mm	20	No		
B	75 x 40mm	10	No		
C	75 x 50 mm	12	No		
D	75 x 75 mm	9	No		
	REDUCERS				
E	32X25 mm	11			
F	40x32 mm	6			
G	40x25mm	4			
H	50x25mm	1			
I	50x40 mm	1			
J	63x32 mm	2			
K	63x40mm	3			
L	63x50mm	4			
	Valves-mepla				
M	75 mm diameter ball valve,NPW, with actuator lever, flanged. Ball and spindle made of brass, PTFE-coated and complete with mapress pressing connections.	8	No		
N	63mm ditto	20	No		
O	50mm ditto	10	No		
P	40mm ditto	15	No		
Q	32mm ditto	20	No		
R	26mm ditto	60	No		
S	32mm Diameter thermostatic balancing valve for automatic balancing of the various branches of hot water recirculation circuits. To come complete with adaptors and all necessary accessories. To be as Caleffi 116..series or equal and approved.	8	No		
T	**Insulation** Allow for pipework, bends, tees, valves etc insulation with 25mm thick pre-formed industrial grade closed-cell cross-linked thermal insulation material with thermal conductivity not exceeding 0.033 W/m.K at 20°C mean, minimum density of 30 kg/m3 complete with factory applied and fully bonded reinforced aluminium foil facing. The joints shall be by the manufactures recomended glue and /or jointing tape. The entire insulation shall be finnished off with stainless steel cladding.				
U	40mm Diameter pipe	350	LM		
V	50mm Diameter pipe	400	LM		
R	63mm Diameter pipe	120	LM		
S	75mm Diameter pipe	70	LM		
	Total carried to collection page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	External Plumbing Works				
	Excavations				
A	Excavate trench in red soil /murram for water pipes not exceeding 1000mm deep and average 750mm deep, part return in, fill, ram and surplus cart away.	400	Lm		
B	Excavate trench in soft rock for water pipes not exceeding 1000mm deep and average 750mm deep, part return in, fill, ram and surplus cart away.	0	Lm		
C	Excavate trench in hard rock for water pipes not exceeding 1000mm deep and average 750mm deep, part return in, fill, ram and surplus cart away.	0	Lm		
D	Allow for keeping the excavated trenches free of water either by bailing or by pumping.	1	Item		
	HDPE PN 16 Pipe in 150mm concrete sorround				
E	50mm diameter HDPE Pipe PN 16 with all necessary fittings	400	Lm		
F	63mm diameter HDPE Pipe PN 16 with all necessary fittings	80	Lm		
G	Ditto but 25 mm diameter	145	Lm		
	Bends				
H	50mm diameter bends/elbows	10	No		
	Tees				
I	50x25mm tee	8	No		
J	50mm diameter tee	8	No		
	Reducers				
K	50 x 25mm diameter reducing sockets	10	No		
	Bends				
L	50 mm diameter bend	15	No		
	Valves				
M	50mm diameter approved high pressure screw down full way non-rising stem wedge gate valve to BS 5154 PN 20 for series B rating, with wheel and head joints to tubing and complete with round male threaded transition fittings and associated unions.	8	No		
N	25mm ditto	8	No.		
	Stand Pipe				
O	15mm diameter chrome plated bib tap suitable for connecting hose pipe complete with threaded adaptors. The tap to be complete with 5meter long 20mm diameter pipe, bends etc.	6	No		
	Pipe Connectors and Adaptors				
P	50mm diameter threaded tee adaptor for connecting valves.	12	No		
Q	50mm diameter ring seal joints for joining pipes	20	No		
R	Threaded joints adaptors	6	No		
	Total carried to Collection page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
A	**Potable Water Pressurising Pumpset** Set of three (3) automatic electrically driven variable speed booster pumps, working on one duty, assisting and the other standby with automatic changeover, capable of delivering 5 L/S against a head of 70 meters with a three phase power source. The pumpset shall be complete with 100 litres pressure vessel and all accessories required for proper and satisfactory operation. It includes pressure switches, time delay switch, a switch to protect against dry run, timer, gate valves, non-return valves, inlet & outlet manifolds, pressure gauges, float level regulator, strainer etc . The pump to be as Grundfos model **Hydro - Multi - E 3CRE 20 - 4** or approved equivalent. Pump to be installed on mild steel frame with approved paint.	1	set		
B	**Control and Control Panel** Control panel for above pumps with contactors, over voltage and under voltage protection relays, MCBs, phase failure protection, timer, 120 meters long float switch control cable to the roof tanks, start/stop push buttons and indicator lights. All these shall be housed in a lockable cabinet (with integral isolator) made from SWG 18 mild steel sheet that is oven powder coated. There shall also be an adjustable time delay switch to ensure pumping cycles are controlled to not more than 6 per hour. It should include a change-over switch to enable the pumps to work alternately.	1	Item		
C	**Non Potable Water Pressurising Pumpset** Set of automatic electrically driven twin booster pump. One duty and the other one standby with automatic changeover, capable of delivering 1.5 litres per sec against a head of 40 meters with a three phase power source. The pumpset shall be complete with 300 litres pressure vessel (as Dayliff pressure set or equal and approved) and all accessories required for proper and satisfactory operation. It includes pressure switches, time delay switch, a switch to protect against dry run, timer, gate valves, non-return valves, water level indicator, float level regulator, 75mm diameter foot valve and strainer. The pump to be as Grundfos model **CMBE Twin 5 - 62** or approved equivalent. Pump to be installed on mild steel frame with approved paint.	1	set		
D	**Control and Control Panel** Control panel for above pumps with contactors, over voltage and under voltage protection relays, MCBs, phase failure protection, timer, 150 meters long float switch control cable to the roof tanks, start/stop push buttons and indicator lights. All these shall be housed in a lockable cabinet (with integral isolator) made from SWG 18 mild steel sheet that is oven powder coated. There shall also be an adjustable time delay switch to ensure pumping cycles are controlled to not more than 6 per hour. It should include a change-over switch to enable the pumps to work alternately.	1	Item		
	Total carried to Collection page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	ELECTRICAL WORKS				
A	Allow for electrical works wiring and fitting to above pumps, control panel and float switches, from isolator provided by others with 3 metres distance.	1	Item		
	Valve Chamber				
B	Valve chamber size 750x750x600mm deep with 100mm concrete (1: 3: 6) base 100mm block sides rendered all round in cement and sand (1:4) and with approved hinged and flanged cast iron cover and frame including all necessary excavation, disposal and formwork.	4	No		
	Indicator Plates				
C	Standard precast concrete Sluice/Gate valve marker post marked ‘SV’ or 'GV' set in concrete (1:3:6) base, including formwork, excavations backfilling and disposal. The plate to be painted with blue gloss oil paint.	4	No		
	Water Line Markers				
D	Standard precast concrete ware line marker, post marked ‘WL’ set in concrete (1:3:6) base, including formwork, excavations backfilling and disposal. The plate to be painted with blue gloss oil paint.	6	No		
	Total carried to Collection page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	Bulk Water Meters				
A	110mm bulk water meter as for the connection to the main supply of water to site.	1	No.		
	Water Meter Chamber				
B	Meter chamber size 600x450x600mm deep with 100mm concrete (1: 3: 6) base 50mm block sides rendered all round in cement and sand (1:4) and with approved hinged and flanged cast iron cover and frame including all necessary excavation, disposal and formwork.	1	No		
	Sterilization				
C	Allow for flushing out and sterilizing the whole system with chlorine to the satisfaction of the Project Engineer.	1	Item		
	ACCESS PANELS FOR MECHANICAL SERVICES				
D	Access panels size 600 x 600 made of Aluminium with powder coating and thickness 1.4mm. The panels to be as MADA PLUS Panels or equal and approved.	20	No.		
	Testing and Commissioning				
E	Allow for pressure testing, colour coding of pipes and commissioning of the water reticulation and plumbing installation to the satisfaction of the Engineer.	1	Item		
	Total carried forward to collection page				

COLLECTION PAGE FOR PLUMBING AND RETICULATION INSTALLATION

Item	Description		Amount (USD.)
1	Total carried forward from page PD-1	....	
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6	Total carried forward from page PD-6	....	
7	Total carried forward from page PD-7	....	
	Total carried forward from page PD-8	....	
8	Total carried forward from page PD-9	....	
9	Total carried forward from page PD-10	....	
Total for PLUMBING & WATER RETICULATION INSTALLATION Carried to Summary Page			

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	INTERNAL FOUL WATER DRAINAGE				
	Supply, deliver and install the following UPVC, MUPVC, soil and waste systems respectively to B.S 5255 with fittings fixed to Manufactures Printed instructions and manufactured by reputable manufacturers. Tenderers must allow in their pipework prices for all the couplings, clippings, connectors, joints etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holder bats plugged and screwed for the proper and satisfactory functioning of the system.				
	MuPVC and uPVC Waste and Soil pipework				
A	100mm diameter heavy gauge golden brown UPVC pipe	1800	Lm		
B	100mm diameter heavy gauge grey mUPVC pipe	665	Lm		
C	50mm diameter waste pipe	200	Lm		
D	40mm diameter waste pipe	350	Lm		
E	32mm diameter waste pipe	50	Lm		
	Bends				
F	100mm diameter bend with access	20	No.		
G	100mm diameter long radius bend	42	No.		
H	100mm diameter sweep/45° bend	200	No.		
I	50mm diameter sweep/45° bend	50	No.		
J	40mm diameter sweep/45° bend	140	No.		
	Tees				
K	100mm diameter sweep/45° tee	100	No.		
L	50mm diameter sweep/45° tee	15	No.		
M	40mm diameter sweep/45° tee	180	No.		
N	32mm diameter sweep tee	24	No.		
	CHANNEL AND GRATING				
	Channel size 1000 x 220mm made of grade 316 stainless steel complete with the following;				
	Grating to match but 25mm high	8	No.		
	Ditto but channel with 50mm side inlet	5	No.		
	Ditto but channel with 800 X 300mm size	8	No.		
	Ditto but channel with 940 X 300mm size	18	No.		
	Total carried to collection page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	Access Caps				
A	150mm diameter access cap	30	No.		
B	100mm diameter access cap	165	No.		
C	50mm diameter access cap	60	No.		
D	40mm diameter access cap	150	No.		
E	32mm diameter access cap	100	No.		
	Boss Connectors				
F	100 x 40mm diameter boss connector	100	No.		
G	100 x 50mm diameter boss connector	70	No.		
	Reducing Sockets				
H	150 x 100 reducing socket	10	No.		
I	150 x 50 reducing socket	4	No.		
J	100 x 50 reducing socket	25	No.		
K	100 x 40 reducing socket	20	No.		
L	50 x 40 reducing socket	15	No.		
	Single Branch				
M	100mm diameter single branch with 50mm dia. adaptor	20	No.		
	WC Connectors				
N	100mm diameter WC connector	70	No.		
	Traps				
O	4-Way 100 x 50mm diameter floor trap and stainless steel grating	60	No.		
P	100 mm diameter P-trap	20	No.		
Q	Standard 300 x 300 x 450mm masonry gully trap complete with 125mm thick reinforced concrete cover.	15	No.		
	Weathering Slates and Vent Cowls				
R	100mm diameter weathering slate and apron.	42	No.		
S	100mm diameter vent cowl	42	No.		
	CSSD Department				
	GMS Class C pipework				
T	100mm diameter GMS class C pipework complete with all fittings i.e Tees, bends, reducers, insulation and any other necessary items for the proper function of the system.	80	Lm		
	Total carried to collection page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	Excavations for Pipes				
A	Allow for excavation in black cotton soil/murram for drainage pipes not exceeding 1500mm deep and average 900mm deep, part return in, fill, ram and surplus cart away.	400	LM		
	External Foul Drainage				
B	Provide, lay and join 150mm UPVC golden brown class 41 sewer pipe with flexible (rubber rings) joints including concrete bed and haunch.	400	LM		
	Manholes and Inspection Chambers				
C	Construct inspection chamber size 600 x 450mm and averaging 750mm deep constructed in 100mm thick concrete base (1:3:6), approved 150mm block sides rendered all around in cement and sand (1:4). It shall have an approved heavy duty cast iron cover and frame as manufactured by E.A Foundry works. Include all necessary excavations, disposal and form work. To be as manhole type 'A'.	0			
D	400 x 400mm concrete gulley with angle line frame ms 50 x 50 x 6mm thick and with steel grating cover finished with two coats of red oxide.	30	No.		
E	1000 mmm wide x minimum 500mm deep concrete trench with angle line frame stainless steel 50 x 50 x 6mm thick and with steel grating cover finished with two coats of red oxide.	0			
	Grease Trap				
F	Supply and install pre-fabricated Grease trap Type C, Model FVGTRAPC-M as HEPWORTH or equal and approved	1	No.		
	Standard Oil Interceptor				
G	Allow for pipework interconnection for a standard oil interceptor with 3No. 900 x 900 x 1500mm chambers, vent pipe, pipe fittings and connections, manhole covers and all other associated builders work.	1	No		
	Medical waste decay tank system				
H	Allow for design, supply, install, test and commisioning a medical waste decay system consisting of three tank chambers operating in parallel. The system should be capable of receving waste from clinical laboratory, Iodine room, surgery and emergency, pharmacy and Chemotherapy area. The tank should be able to hold the waste for a period of not less than 45 days before discharge to the sewer trunk. the system should come complete with but not limited to the following features; Three chamber receiving and storage tanks, radiation and level sensors, Electrical Control Panel, an automatic monitoring system that operates on sensor feedback and SCADA & BMS output provision. The unit to be as ELI MODEL DK-TS01	1	Item		
	Testing and Commissioning				
I	Allow for pressure testing, colour coding of pipes and commissioning of the drainage installation to the satisfaction of the Engineer.	1	Item		
	Total carried to collection page				

COLLECTION PAGE FOR INTERNAL FOUL WATER DRAINAGE INSTALLATION

Item	Description		Amount (USD.)
1	Total carried forward from page PD-11	…… ……	
2	Total carried forward from page PD-12	…… ……	
3	Total carried forward from page PD-13	…… ……	
Total for FOUL WATER DRAINAGE INSTALLATION Carried to Summary Page			

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	INTERNAL STORM WATER DRAINAGE				
	Supply, deliver and install the following high pressure pipes, class D, with fittings fixed to Manufactures Printed instructions and manufactured by reputable manufacturers. Tenderers must allow in their pipework prices for all the couplings, clippings, connectors, joints etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holder bats plugged and screwed for the proper and satisfactory functioning of the system.				
	High Pressure Pipework				
A	200 mm diameter high pressure pipework	200	LM		
B	100mm diameter high pressure pipework	550	Lm		
	Bends				
C	100mm diameter sweep bend	20	No.		
D	100mm diameter/45° bend	40	No.		
	Reducers				
E	200 x 150mm diameter reducer		No		
F	150 x 100mm diameter reducer	20	No		
G	150 x 50mm diameter reducer	10	No		
H	**Pipe Connectors and Adaptors**				
I	150mm diameter ring seal joints for joining pipes	20	No		
J	Threaded joints adaptors	20	No		
K	150 mm cast iron fulbora of approved manufacturer	5	No.		
L	100 mm heavy duty plastic fulbora of approved manufacturer	30	No.		
	Total carried to collection page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	Manholes and Inspection Chambers				
A	Construct inspection chamber size 600 x 450mm and averaging 750mm deep constructed in 100mm thick concrete base (1:3:6), approved 150mm block sides rendered all around in cement and sand (1:4). It shall have an approved heavy duty cast iron cover and frame. Include all necessary excavations, disposal and form work. To be as manhole type 'A'.	20	No.		
	Sump Pump				
B	A submersible pumps capable of delivering 4.2m^3/hr against 15M head, power rating 0.55KW, single phase, 50HZ, complete with control panel, associated electrical works, protection against dry run, on/off neon lights, control/pump status display panel, audio alarm with manual silencer to indicate when the pump is faulty, float switch and all necessary controls	6	No.		
	Testing and Commissioning				
C	Allow for pressure testing, colour coding of pipes and commissioning of the drainage installation to the satisfaction of the Engineer.	1	Item		
	Total carried to collection page				

COLLECTION PAGE FOR STORM WATER DRAINAGE INSTALLATION

Item	Description		Amount (USD.)
1	Total carried forward from page PD-15	……	
2	Total carried forward from page PD-16	……	
Total for INTERNAL STORM WATER DRAINAGE INSTALLATION Carried to Summary Page			

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	FIRE PROTECTION				
	Supply, deliver and install the following fire fighting equipment in positions indicated on the contract drawings or as shall be instructed by the Engineer. Supply and install the following fire fighting installation and equipment as described and shown on the drawings. Tenderers should allow for all fittings, jointings couplings including unions and clamps where necessary for the proper functioning of the installation when pricing.				
	Hosereel Installation				
	Hosereel				
A	20mm diameter 30m long swinging type hose reel complete with delivery valve, mild steel feed pipe, isolation valve, pressure gauge, guide and all other accessories as "Angus Fire Armour" or equal and approved.	25	No.		
	Fire Hose Cabinet				
B	Surface mounted fire hose cabinet manufactured from electro galvanised steel sheet with folded edges and curled hose plate edges and painted with electro static powder coating, 180oC baked. The cabinet size shall be capable of housing 30m hosereel and 3No. portable extinguishers as described should conform to BS EN 671-1.	25	No.		
	GMS Pipework, Class C				
C	25mm diameter pipework	50	Lm		
D	65 mm diameter pipework	600	Lm		
	Extra Over Pipework				
	Bends				
E	25mm diameter bends	15	No.		
F	65mm diameter bends	50	No.		
	Total carried to Collection Page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	Tees				
A	25mm diameter equal Tees	25	No.		
B	65 X 25 mm diameter equal Tees	30	No.		
C	65 X 65 mm diameter Tees	10	No.		
D	100 X 65 mm diameter Tees	10	No.		
E	100 X 100 mm diameter Tees	10	No.		
	Valves				
F	25mm diameter approved medium pressure screw down full way non-rising stem wedge gate valve to BS 1952, with wheel and head joints to steel tubing.	25	No.		
G	65mm diameter ditto	8	No.		
	Reducers				
H	65 x 25 mm diameter reducer	20	No.		
	Unions				
I	25mm diameter pipe unions	50	No.		
J	65 mm diameter pipe unions	20	No.		
	Painting				
K	Allow for painting of the hosereel installation with 2 coats of super gloss paint on a primer coat to the approval of the Project Engineer.	1	Item		
	Standard Printed Labels				
L	Standard printed lables for the fire cupboards.	25	No.		
	Pressure Reducing Valve				
M	25mm diameter Pressure Reducing Valve UL listed	25	No.		
N	25mm diameter Lockshield valve, UL listed	25	No.		
O	Pressur gauge	25	No.		
P	65mm diamter pressure reducing landing valve, UL listed	25	No.		
	Testing and Commissioning				
Q	Allow for pressure testing, colour coding of pipes and commissioning of the entire installation to the satisfaction of the Engineer.	1	Item		
	Total carried to Collection Page				

COLLECTION PAGE FOR FIRE HOSEREEL INSTALLATION

Item	Description		Amount (USD.)
1	Total carried forward from page.....	.....	
2	Total carried forward from page	.....	
	Total for FIRE HOSEREEL INSTALLATION Carried to Summary Page		

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	Portable Fire Extinguishers				
	Supply, deliver, install, test and commission the following LPCB approved portable fire extinguishers and conforming to BS EN 3 / BS 1449.				
A	**Water/Carbon Dioxide Gas Fire Extinguisher** 9 litres water/carbon dioxide gas portable fire extinguisher complete with pressure gauge, initial charge and mounting brackets.	30	No		
B	**Carbon Dioxide Gas Fire Extinguisher** 5kg carbon dioxide gas portable fire extinguisher complete with pressure gauge, initial charge and mounting brackets.	30	No		
C	**Dry Chemical Powder Fire Extinguisher** 9kg dry chemical podwer portable fire extinguisher complete with pressure gauge, initial charge and mounting brackets.	30	No		
D	**Automatic Dry Chemical Powder Fire Extinguisher** 12 kg automatic dry chemical podwer fire extinguisher complete with pressure gauge, initial charge, glass bulb, sprinkler head and mounting base. The operating temperature of the bulb shall be 68^{o}C. The unit shall be mounted on the concrete slab ceiling using purpose-made screws.	8	No		
	Manual Alarm Bell				
E	9" (225mm) manual operated alarm bell (Gong)	10	No		
F	**Fire Blanket** Fire blanket made of cloth woven with pre-asbestos yarn or any other fire proof material and to measure 1800 x 1210 mm. It shall be fitted with special tapes folded so as to offer instantaneous single action to release blanket from storing jacket to BS 1721.	4	No		
G	**Fire Notices** Allow for fire signage for the hose reel system, fire exits and fire instructions as as described in the particular specifications and to the Project Engineer's approval.	18	No		
	Total Carried to Collection Page				

COLLECTION PAGE FOR PORTABLE FIRE EXTINGUISHERS INSTALLATION

Item	Description		Amount (USD.)
1	Total carried forward from page	…… ……	
Total for PORTABLE FIRE EXTINGUISHERS INSTALLATION Carried to Summary Page			

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	FIRE FIGHTING PUMPS (WET RISER AND HOSE REEL)				
A	Supply and install packaged wet riser and fire hose reel pumping set as NAFFCO or equal and approved comprising of duty and standby pumps. One pump shall be electrically driven and the other one diesel driven, complete with starting motor etc. and capable of delivering at least 1380 Litres/min. against a pressure of at least 7 bar to BS 12845, with a jockey pump of capacity 2 Lires/ second. and a pressure head of 7 bar. The pumps to have inlet/outlet testing manifolds and automatic control panel complete with connections to equipment incorporated on a common pumps base frame. All pumps to be on welded mild steel frame for installation to be with alignment facilities and mountings. The system to be complete with OS and Y valves, including delivery check valves, delivery stop valves, non-return valves, pressure switches, pressure vessels etc as required for proper functioning of the pump set.	1	Set		
	Fire Pump Control Panel				
	Supply and install dual control panel for the above three Fire pumps complete with appropriate retard chamber, overload protection, phase failure protection, automatic change over switch, star-delta starter for electric pumps, neon indicators for tripping and resetting plus any other necessary control accessories to operate all the three pumps, including BMS stop/run, fault indication Volt-free Contact. Control panel to be as SPP or equal and approved	1	No.		
B	Supply 250 mm diameter inlet and outlet manifolds complete with the necessary tees for connection to the pumps, Strainers, antivortex etc	1	Set		
C	50mm diameter high pressure ball valve for the tank	1	No		
D	Fuel tank 200 litres	1	No		
E	Fuel for the pump system	200	Litres		
F	Allow for a sum of painting the whole installation to the approval of the Engineer as per F.O.C. rules	1	Item		
G	Allow for Electrical connections from isolator supplied by others within three metres of control panel, to all machines and equipment of the wet riser system.	1	Item		
H	Allow for submission of 'As installed drawings' two copies for plan and Isometric layout of the Installation, including operation and maintenance manuals.	1	Item		
	Test Line				
I	Test line comprising of pressure gauges across the pumps and flow meter	1	Item		
J	Allow for setting to work, testing and commissioning of the whole system to the satisfaction of the Engineer	1	Item		
	Total Carried to Collection Page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	VALVES				
A	150mm diameter OS and Y valves	3	No		
B	100mm ditto	6	No		
C	50mm ditto	3	No		
	NON RETURN VALVES				
D	100mm diameter OS non return valve	2	No		
	WET RISER INSTALLATION				
E	Supply, install, test and commision the following fittings for wet riser.				
	Sheet Metal Box				
F	Inlet breeching sheet metal box with wired glass door secured with spring locks openable from inside by smashing the glass and releasing the locking devices on the lock. Approximate size to be 595 x 295 x 395mm high.	1	No		
	Four Way Fire Brigade Breeching Inlet				
G	150mm diameter inlet breeching with four way inlets, each inlet consisting of a 65mm diameter male instantaneous coupling with a non-return valve and black cap secured with a short length of chain.	1	No		
	Landing Valve				
	65 mm diameter, UL Listed gunmetal gate pattern landing valve with flanged inlet and female instantaneous outlet fitted with plug secured by short chains and fixed on 100mm diameter dry riser pipe.	20	No		
	Fire Hose				
H	65mm diameter, 30 metres long canvas fire hose complete with branch pipe, nozzle, female instantaneous coupling head, hanging hook and other associated fittings for its proper functioning.	10	No		
	Wet Riser Pipe				
I	Supply and installation of Galvanized mild steel piping and fittings with screwed & socketed joint to medium grade class “B” to BS. 1387.				
	GMS Pipework				
J	100mm diameter pipe	90	LM		
	Extra over Pipework				
	Bends/Elbows				
K	100mm diameter bends/elbows	50	No		
L	65mm diameter bends/elbows	50	No		
	Tees				
M	100 x 100 x 100mm tee	20	No		
N	100 x 100 x 65mm tee	50	No		
	Total Carried to Collection Page				

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	Reducers				
A	100 x 65mm reducer	14	No		
	Valves				
B	65mm isolating valve with its associated unions	47	No		
C	65mm diameter flange	47	No		
	Painting				
D	Allow for painting of the dry riser installation with 2 coats of super gloss paint on a primer coat to the approval of the Project Engineer.	1	Item		
	Working and Record (As-installed) Drawings				
E	Prepare and submit **three sets** of working and record (as-installed) plan and isometric layout drawings to easily readable scale, A1 or A0 paper size format as follows; i) general arrangement drawings of all equipment, plant etc. ii) routes - types and sizes and arrangement of all pipework iii) wiring (electrical & control) details iv) any other details as per specifications Drawings are to be submitted in soft copy (AutoCAD 2004 format) & hard copy to the client, the Architect and the Engineer. Allow for preparation & submitting draft and three final copies of operation, instruction and maintenance manuals to Engineer's approval.	1	Item		
				0.00	
	Testing and Commissioning				
F	Allow for testing and commissioning of the dry riser, Hosereel and portable fire extinguishers installations to the satisfaction of the Engineer.	1	item		
	Total Carried to Collection Page				

COLLECTION PAGE FOR FIRE PUMPS AND WET RISER INSTALLATION

Item	Description		Amount (USD.)
1	Total carried forward from page	……	
1	Total carried forward from page	……	
1	Total carried forward from page	……	
	Total for FIRE PUMPS AND WET RISER INSTALLATION Carried to Summary Page		

Item	Description	QTY	Unit	Rate (USD)	Amount (USD)
	PROPOSED KISII CANCER CENTRE				
	Steam Installations				
	Schedule 40 black mild steel **seamless** pipework as described with screwed, welded or flaged joints with heavy weight beaded malleable iron fittings, fitted and supported from the building structure, including all accessories, air vents, supports, hangers, holder bats, fixtures and any required builders work and coring all to proper and satisfactory completion.				
A	20mm Diameter pipe	12	LM		
B	25mm Diameter pipe	50	LM		
C	32mm Diameter pipe	40	LM		
D	40mm Diameter pipe	30	LM		
E	50mm Diameter pipe	18	LM		
F	65mm Diameter pipe	100	LM		
G	100mm Diameter pipe	40	LM		
	Bends				
H	25mm dia	10	No		
I	32mm dia	40	No		
J	40mm ditto	2	No		
K	50mm ditto	3	No		
L	65mm ditto	20	No		
M	100mm ditto	12	No		
N	125mm ditto	8	No		
O	150mm ditto	4	No		
	Tees				
P	150X150X150	1	No		
Q	125X125X125	1	No		
R	100X100X100	2	No		
S	65X65X65	10	No		
T	50X50X50	10	No		
U	40X40X40	5	No		
V	32X32X32	10	No		
W	25X25X25	6	No		
	Reducers				
X	125 x 65	5	No		
Y	50 x 40	2	No		
Z	50 x 32	8	No		
A1	50 x 25	1	No		
B1	40 x 32	8	No		
	Carried To Collection Page			**USD**	

Item	Description	QTY	Unit	Rate (USD)	Amount (USD)
	Reducers continued				
A	40 x 25	1	No		
B	32 x 25	10	No		
	Insulation				
A	Allow for for pipework insulation with 50mm thick Pipe Insulation moulded out of heavy density resin bonded inorganic glass fibers pre-formed with thermal conductivity not exceeding 0.033 W/m.K at 20°C mean, minimum density of 30 kg/m3, jacketed a polymer film exterior surface that is smooth, durable, cleanable, wrinkle resistant, resists water staining and doesn't support mould growth. The joints shall be by the manufactures recomended adhesives and /or jointing tape. The entire insulation shall be finnished off with gauge 22 aluminium sheet cladding.				
B	20mm Diameter pipe	12	LM		
C	25mm Diameter pipe	50	LM		
D	32mm Diameter pipe	40	LM		
E	40mm Diameter pipe	30	LM		
F	50mm Diameter pipe	18	LM		
G	65mm Diameter pipe	100	LM		
H	100mm Diameter pipe	40	LM		
	Fittings and Accessories				
K	100mm Non return valve	2	No		
L	50mm Safety and safety relief valve	2	No		
M	100mm Diameter Isolating/shutoff valve	2	No		
N	Processing Vessels Steam Connection				
O	- 25mm diameter isolating valve	10	No		
P	- 25mm diameter Non return valve	7	No		
Q	- 25mm strainer	7	No		
R	- 25mm expansion joints	7	No		
S	- Set of temperature and pressure gauges	7	No		
T	- 25mm modulating valve	6	No		
U	- 25mm sight glass	7	No		
V	- 25mm diameter Float & Thermostatic steam trap capable of 5bar pressure difference.	8	No		
	Condensate Lifting Unit				
W	Allow fo a condensate lifting unit, 50 liters capacity with duplicate float operated condesate pumps, each capable of 0.5 l/s at 20m head and operationg on duty and standby. The unit to be adequately insulated, ventilated and shall be complete with wired control panel and any other accessories for completion and satisfactory perfomance.	1	No		
	OIL PIPEWORK				
X	40mm diameter black mild steel pipework to BS 1387 medium grade complete with tapered threads, pipe joints, fittings, couplings, unions, supports ect as necessary for completion and satisfactory perfomance of the installation.	50	LM		
Y	25mm diameter ditto	30	LM		
	Carried To Collection Page			**USD**	

Item	Description	QTY	Unit	Rate (USD)	Amount (USD)
	OIL PIPE FITTINGS AND VALVES				
A	40mm diameter bend	6	No.		
B	25 mm ditto	8	No.		
C	40mm diameter equal tee	2	No.		
D	40mm diameter isolalting valve	4	No.		
E	25 mm diameter reducer	2	No.		
F	25 mm line oil strainer	2	No.		
G	25mm diameter isolating valve	2	No.		
H	40mm fusible link operated safety valve	2	No.		
I	Allow for 12 kw pipework trace heater.	1	No.		
J	Insulation for 25mm diameter pipe for heated oil line	10	LM		
	Supports				
K	Allow for all the necessary supports, fixtures, anchors, hanngers, wooden insulating blocks, expansion joints, anti-vibration devices etc.	1	Item		
	Identification				
L	Allow for all necessary equipment and pipework identification, including plates, discs, labels, charts, colour coding, flow direction arrows etc all to the relevant british standards.	1	Item		
	Testing and commissioning				
M	Allow for all necessary testing and commissioning, including flushing, charging, purging of air, cleaning, balancing and operating the completed installations and providing fuel and power.	1	Item		
	Protective painting and decorative painting				
N	Allow for all necessary protective painting and decorative painting, including removing protective coating or wrapping and cleaning and polishing exposed surfaces.	1	Item		
	BLOW-DOWN PIT				
O	Construct a masonry boiler blow - down pit with suitable cover of size 1.2 x 1.2 x 1.5 m deep and connect the blow down pit to storm drainage system.	1	Item		
	Carried To Collection Page			**USD**	

Item	Description	QTY	Unit	Rate (USD)	Amount (USD)
	KISII CANCER CENTRE				
	STEAM INSTALLATIONS -COLLECTION PAGE				
	COLLECTION				
	From Page SI - 1				
	From Page SI - 2				
	From Page SI - 3				
	Carried Forward to Summary Page			**USD**	

Item	Description	QTY	UNIT	Rate	AMOUNT
	Fire Hydrant Installation Supply and installation the following fittings for Fire Hydrant				
	Fire hydrant Box				
A	External surface mounted fire hydrant cabinet manufactured from electro galvanised steel sheet with folded edges and curled hose plate edges and painted with electro static powder coating, 180^{o}C baked. The cabinet to have adequate space to house, 30m long hose with nozzle and 2No. portable fire extinguishers and should conform to BS EN 671-1. To be as Germania or equal and approved.	5	No		
	Hydrant Valve				
B	2 way wet type fire pedestal hydrant of 4" diameter flanged inlet connection, the body shall be out grey cast iron to BS 1503.	5	No		
	Fire Hose				
C	65mm diameter, 30 metres long canvas fire hose complete with branch pipe, nozzle, female instantaneous coupling head, hanging hook and other associated fittings for its proper functioning.	5	No		
	Associated Pipework Supply, deliver and install PN 25 High Density Polyethylene (HDPE) pipework produced to BS EN 12201 and suitable for fusion welding. The pipework shall be supplied with the necessary fiitings isolation, hydrant valves and other metalic sections adaption. The pipes shall be installed in 750 deep trenches and compacted after installation				
	Underground Pipework				
D	180mm diameter PN 25 HDPE pipework.	1450	LM		
E	75mm diameter ditto	15	LM		
	Extra over Pipework				
	Bends/Elbows				
F	180mm diameter bends/elbows	11	No		
	Tees				
G	180 x 100 x 180mm tee	5	No		
H	180 x 75 x 180mm tee	2	No		
	Reducers				
I	180 x 110mm reducer	5	No		
J	150 mm diameter butterfly isolating valves	6	No		
K	Supply and install 100mm galvanised class C heavy grade wet riser pipework to BS 1387 and fittings to BS 143 to conform to ASTM/ANSI/ASME. The joints shall be flanged, and the tenderers must allow in their prices for jointings, couplings, supports, plugging and clamping, reducers, tees, nipples, mortices, pipe sleeves through structural members, etc	200	LM		
	Total Carried to Collection Page				

Item	Description	Unit	Qty	Rate	AMOUNT
	Valves				
A	65mm flanged oblique landing valve.	10	No		
B	100 x 65 x 100 mm diameter flanged tee	10	No		
C	100mm diameter drain valve	5	No		
D	100mm diameter Air release valve	5	No		
E	100mm diameter Pressure reducing valve	2	No		
F	100mm diameter Non Return valve	2	No		
G	**Pipe Sleeves** Allow for 'class 41' PVC pipe sleeves for crossing over pathways and driveways. The sleeves will be encased in 150mm concrete sorround.	15	LM		
H	**Valve chamber** Valve chamber size 750x750x600mm deep with 100mm concrete (1: 3: 6) base 100mm block sides rendered all round in cement and sand (1:4) and with approved hinged and flanged heavy duty cast iron cover and frame including all necessary excavation, disposal and formwork.	6	No		
I	**Testing and Commissioning** Allow for setting to work, testing and commissioning of the whole system to the satisfaction of the Engineer.	1	Item		
	Total Carried to Collection Page				

COLLECTION PAGE FOR FIRE HYDRANT INSTALLATION

Item	Description			Amount (USD.)
1	Total carried forward from page	……………		
2	Total carried forward from page	……………		
	Total for Fire Hydrant- Carried to Summary Page -Sub Totals			

Item	Description	Qty	Unit	Rate (USD.)	Amount (USD.)
	- 2 NO. GUARD HOUSES -				
	SANITARY FITTINGS Supply, deliver, install, test and commission the following sanitary appliances complete with all the accessories including all connections to the services, waste, jointing to water supply overflows, supports and all plugging and screwing to walls and floors.				
	Note: (i) All sanitary fittings shall be in approved colour. (ii) The Model and Ref No. indicated is only a guide to the type and quality of fittings. (iii) Equivalent and Approved models may be acceptable.				
A	**Water Closet (WC) Suit** Close-coupled WC suite in approved white colour complete with horizontal outlet to BS 3402 with 7.5 litre valveless ceramic cistern and fittings including siphon,15mm diameter bottom inlet ball valve, 20mm diameter side overflow, plastic flush bend, inlet connection, ecoflush system with push button and heavy plastic seat and cover with chrome plated hinges. All as Nova/ Tapis Eros WC Suite.	2	No		
B1	**Wall Hung Wash Hand Basin (WHB)** Wash hand basin size 510 x 300mm in approved white colour with tap holes and chain stay hole, 32mm diameter chrome plated waste, concealed wall brackets, and chrome plated single tap hole. The wash hand basin to be as Nova/ Tapis Eros Washhand basin with pedestal.	2	No		
B2	Wash hand basin heavy duty plastic bottle trap (32mm 'P' trap) with 75mm seal.	2	No		
B3	Wash hand basin pillar, 15mm, chrome plated as Tapis Jeals Victorian Basin Tap ref # 12002T4.	4	No		
C	**Toilet Roll Holder** Toilet roll holder wall hung in chrome finish as Nova	2	No		
D	**Robe Hook** Robe hook in Satin Aluminium to be mounted by concealed screws to wall wedges. To be as Nova	2	No		
E	**Flexible Tubing** 15mm diameter x 300mm long flexible connectors complete with integral chrome plated angle valve as Jaguar Astra with wall flange for connecting the sanitary fitting to water supply.	6	No		
F	**Mirror** 6mm thick polished plate glass silver backed mirror with beveled edges, size 450 x 450mm, Plugged and screwed to wall with 4No. chrome plated dome capped screws. The mirror shall rest against a layer of 5mm thick foam.	2	No.		
	Total Carried to Sanitary fittings- Collection Page				

COLLECTION PAGE FOR SANITARY FITTINGS

Item	Description		Amount (USD.)
1	Total carried forward from page 9-40	…… ……	
Total for Sanitary fittings- Carried to Summary Page -Sub Totals			

Item	Description	Qty	Unit	Rate (USD.)	Amount (USD.)
	Internal Plumbing Works Supply, deliver and install PP-R (Polypropylene Random Co-polymer) PN20 pipes, tubing and fittings as described and shown on the drawings. The pipes and fittings shall be produced as per DIN 8078 and DIN 16962, and shall meet or exceed the requirements of DVS 2207, current standards for PP-R installations and to the Engineers approval. All joints shall be assembled employing solvent cements that meet or exceed the requirements of ASTM F493. Rates must allow for all Metal/plastic threaded adaptors where required for the connection of sanitary fixtures, valves, sockets, sliding and fixed joints, support raceways, isolating sheaths, elastic materials, expansion arms and bends, crossovers, couplings, clippings, connectors, joints etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holder bats plugged and screwed for the proper and satisfactory functioning of the system. The pipes will be pressure tested before the plastering of wall commences and as per the manufacturers recommended testing pressures.				
	PP-R Pipes				
A	20mm diameter pipework	6	Lm		
B	25mm diameter pipework	20	Lm		
	Bends				
C	20mm diameter bend	12	No.		
D	25mm diameter bend	14	No.		
	Tees				
E	25mm equal tee	4	No.		
	Reducers				
F	25 x 20mm diameter reducer	6	No.		
	Threaded Brass Elbow/bend				
G	20mm male/female threaded brass elbow/bend	12	No.		
H	25mm male/female threaded brass elbow/bend	10	No.		
	Threaded Brass Adapter				
I	25mm male/female threaded brass adapter	7	No.		
	Threaded Brass Coupling				
J	25mm male/female threaded brass coupling	14	No.		
	Total carried to collection page				

Item	Description	Qty	Unit	Rate (USD.)	Amount (USD.)
	Valves				
A	25mm diameter approved medium pressure screw down full way non-rising stem wedge gate valve to BS 5154 PN 20 for series B rating, with wheel and head joints to steel tubing and complete with round male threaded transition fittings. The gate valve to be as PEGLER or approved equivalent.	6	No.		
	Unions				
B	25mm diameter pipe union	6	No.		
	Total carried to collection page				

COLLECTION PAGE FOR GUARD HOUSE PLUMBING

Item	Description		Amount (USD.)
1	Total carried forward from page 9-42	……	
2	Total carried forward from page 9-43	……	
		……	
		……	
Total for GUARD HOUSE Plumbing Carried to Summary Page -Sub Totals			

Item	Description	Qty	Unit	Rate (USD.)	Amount (USD.)
	INTERNAL FOUL WATER DRAINAGE Supply, deliver and install the following UPVC, soil and waste systems respectively with fittings fixed to Manufactures Printed instructions and manufactured by reputable manufacturers. Tenderers must allow in their pipework prices for all the couplings, clippings, connectors, joints etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holder bats plugged and screwed for the proper and satisfactory functioning of the system.				
	uPVC Waste and Soil pipework				
A	100mm diameter heavy gauge golden brown UPVC pipe	6	Lm		
B	100mm diameter heavy gauge UPVC pipe	12	Lm		
C	50mm diameter waste pipe	6	Lm		
D	32mm diameter waste pipe	6	Lm		
	Bends				
E	100mm diameter short radius bend (uPVC)	4	No.		
F	100mm diameter sweep bend	3	No.		
G	32mm diameter sweep bend	4	No.		
	Tees				
H	32mm diameter sweep tee	4	No.		
	Total carried forward to collection page				

Item	Description	Qty	Unit	Rate (USD.)	Amount (USD.)
	Access Caps				
A	32mm diameter access cap	2	No.		
	WC Connectors				
B	100mm diameter WC connector	2	No.		
	Traps				
C	50mm Trapped Floor Gully (279.2) with 150 x 150 mm gully inlet grating (282.6)	2	Item		
	Weathering Slates and Vent Cowls				
D	100mm diameter weathering slate	2	No.		
E	100mm diameter vent cowl	2	No.		
F	100mm Trapped Gully consisting of a 'P'-Trap Spigot Outlet (1849.4), 154 x 154mm MS Cover (1845.4.501), and 10mm Square hopper (1845.4m)	2	No.		
	Manholes and Inspection Chambers				
G	Gully trap chamber size 350x350x450mm deep, in masonry walling, housing a uPVC gully trap with drain pipe, 50mm thick P.C.C. cover with vent-hole etc.. Include all necessary excavations, disposal and making good.	2	No.		
H	Construct inspection chamber size 600 x 450mm and averaging 750mm deep constructed in 100mm thick concrete base (1:3:6), approved 150mm block sides rendered all around in cement and sand (1:4). It shall have an approved light duty cast iron cover and frame. Include all necessary excavations, disposal and form work.	2	No.		
	Testing and Commissioning				
I	Allow for testing and commissioning of the both external and internal drainage system installations to the satisfaction of the Engineer.	1	Item		
	Total carried to collection page				

COLLECTION PAGE FOR GUARD HOUSE DRAINAGE

Item	Description		Amount (USD.)
1	Total carried forward from page 9-45	…… ……	
2	Total carried forward from page 9-46	…… ……	
Total for GUARD HOUSE Drainage Carried to Summary Page -Sub Totals			

Item	Description	Qty	Unit	Rate (USD.)	Amount (USD.)
	Portable Fire Extinguishers Supply, deliver, install, test and commission the following portable fire extinguishers and conforming to BS EN 3 / BS 1449.				
A	**Dry Chemical Powder Fire Extinguisher** 9kg All purpose dry chemical podwer portable fire extinguisher complete with pressure gauge, initial charge and mounting brackets.	2	No		
Total for GUARD HOUSE Fire Protection Carried to Summary Page -Sub Totals					

SUB TOTALS COLLECTION PAGE FOR GUARD HOUSE

Item	Description		Amount (USD.)
1	Total carried forward for Sanitary Fittings	…… ……	
2	Total carried forward for Plumbing	…… ……	
3	Total carried forward for Drainage	…… ……	
4	Total carried forward for Portable Fire Extinguishers	…… ……	
	Total for 2 No. Guard house		
Total for 2NO. GUARD HOUSE P&D Carried to Summary Page -Sub Totals			

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	Server Room Fire Suppression Installation **FM 200 FIRE SUPRESSION SYSTEM** **Supply , Installation, testing and commissioning, as per the particular specification and upon approval of working drawings of the following items.**				
	SERVER ROOM				
A	FM 200 cylinder of capacity 65 kg, constructed from approved high pressure steel tank to NFPA 2001. The cylinder shall be factory filled with FM 200, and superpressurised with dry nitrogen to 25 bar at	1	No		
B	FM 200 360 degrees nozzle, each of flow rate 2.5 kg/s	4	No		
C	150 mm diameter alarm bell	2	No		
D	Yodalarm complete with flashing light	2	No		
E	Smoke and Heat detector to function as a double knock system, as PYRO-CHEM model or equal	2	No		
F	Allow for fire signage as shown in the tender drawings for EVACUATE" sign and "DO NOT ENTER" sign as described in the particular specifications no less than 50mm high and to the Project	1	No		
G	FM 200 Control panel complete with necessary cabling, system indicator unit, flashing lights, and manual release and signage as shown in the tender drawings.	1	No		
	PIPEWORK AND FITTINGS			-	
	Prices for pipework shall include the following for coupling, connectors, manifold, flexible hose,fixing brackets and plugs, bends, tees, and jointing to fittings etc, including jointing tapes, compounds			-	
				-	
H	Seamless schedule 40, 25mm diameter black mild steel pipe, painted red.	15	LM		-
I	40mm ditto	32	LM		-
J	Testing and commissioning of the entire system to the satisfaction of the engineer, INCLUDING a room intergrity test	1	item		-
	Total Carried to Fire suppression Collection Page				-

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	CT-SCAN Room Fire Suppression Installation **FM 200 FIRE SUPRESSION SYSTEM** **Supply , Installation, testing and commissioning, as per the particular specification and upon approval of working drawings of the following items.**				
	CT-SCAN ROOM				
A	FM 200 cylinder of capacity 65 kg, constructed from approved high pressure steel tank to NFPA 2001. The cylinder shall be factory filled with FM 200, and superpressurised with dry nitrogen to 25 bar at 21^{o}C. The cylinder to be complete with discharge pressure switch,vent check, pressure gauge, low pressure switch, manual release(&abort), pressure relief provision, electric valve actuator,valve assembly including check valves, mounting brackets, control heads, siren and all necessary accesories.	1	No		
B	FM 200 360 degrees nozzle, each of flow rate 3 kg/s	4	No		
C	150 mm diameter alarm bell	2	No		
D	Yodalarm complete with flashing light	2	No		
E	Smoke and Heat detector to function as a double knock system, as PYRO-CHEM model or equal	2	No		
F	Allow for fire signage as shown in the tender drawings for EVACUATE" sign and "DO NOT ENTER" sign as described in the particular specifications no less than 50mm high and to the Project Engineer's approval.	1	No		
G	FM 200 Control panel complete with necessary cabling, system indicator unit, flashing lights, and manual release and signage as shown in the tender drawings.	1	No		
	PIPEWORK AND FITTINGS Prices for pipework shall include the following for coupling, connectors, manifold, flexible hose,fixing brackets and plugs, bends, tees, and jointing to fittings etc, including jointing tapes, compounds etc, together with fixing pipe sleeves and the necessary builders works, all as required in the pipework installation.				
H	Seamless medium grade 25mm diameter galvanised mild steel pipe, painted red.	15	LM		
I	40mm ditto	32	LM	-	
J	Testing and commissioning of the entire system to the satisfaction of the engineer, INCLUDING a room intergrity test	1	item		
	Total Carried to Fire suppression Collection Page				-

Item	Description	Qty	Unit	Rate (USD)	Amount (USD)
	MRI Room Fire Suppression Installation **FM 200 FIRE SUPRESSION SYSTEM** **Supply , Installation, testing and commissioning, as per the particular specification and upon approval of working drawings of the following items.**				
	MRI ROOM				
A	FM 200 cylinder of capacity 118 kg, constructed from approved high pressure steel tank to NFPA 2001. The cylinder shall be factory filled with FM 200, and superpressurised with dry nitrogen to 25 bar at 21oC. The cylinder to be complete with discharge pressure switch,vent check, pressure gauge, low pressure switch, manual release(&abort), pressure relief provision, electric valve actuator,valve assembly including check valves, mounting brackets, control heads, siren and all necessary accesories.	1	No		
B	FM 200 360 degrees nozzle, each of flow rate 3.0 kg/s	4	No		
C	150 mm diameter alarm bell	2	No		
D	Yodalarm complete with flashing light	2	No		
E	Smoke and Heat detector to function as a double knock system.	2	No		
F	Allow for fire signage as shown in the tender drawings for EVACUATE" sign and "DO NOT ENTER" sign as described in the particular specifications no less than 50mm high and to the Project Engineer's approval.	1	No		
G	FM 200 Control panel complete with necessary cabling, system indicator unit, flashing lights, and manual release and signage as shown in the tender drawings, all as PYRO-CHEM or equal and approved.	1	No		
	PIPEWORK AND FITTINGS Prices for pipework shall include the following for coupling, connectors, manifold, flexible hose,fixing brackets and plugs, bends, tees, and jointing to fittings etc, including jointing tapes, compounds etc, together with fixing pipe sleeves and the necessary builders works, all as required in the pipework installation.				
H	Seamless medium grade 25mm diameter galvanised mild steel pipe, painted red.	15	LM	-	
I	40mm ditto	32	LM		
J	Testing and commissioning of the entire system to the satisfaction of the engineer, INCLUDING a room intergrity test	1	item		
	Total Carried to Fire suppression Collection Page				-

Item	Description	Amount (USD)
1	Total brought forward for SERVER room fire suppression (page FS-1)	-
2	Total brought forward for CT-SCAN room fire suppression (page FS-2)	-
3	Total brought forward for MRI room fire suppression (page FS-3)	-
	Total for fire suppression Carried to plumbing and drainage Summary Page	

PROPOSED KISII CANCER CENTRE

PLUMBING, DRAINAGE AND FIRE PROTECTION INSTALLATION SUMMARY PAGE

Item	Description	Total Cost (USD)
1	Total for preliminaries and general items	
2	Total for Sanitary Fittings - Supply	
3	Total for Plumbing and reticulation Installation	
4	Total for Internal Foul Drainage Installation	
5	Total for Rain Water Drainage Installation	
6	Total for Hosereel Installation	
7	Total for portable fire extinguisher Installation	
8	Total for Fire Pumps and wet riser Installation	
9	Total for Fire Hydrant Installation	
10	Total for Steam pipework installation	
11	Total for Fire Suppression (FM 200)	
12	Guard houses Plumbing and Drainage	
	Sub Total	
13	**Allow for Contingency amount**	**50,000**
Total for Plumbing, Drainage and fire fighting installation carried to Form of Tender (Excluding VAT)		

Amount in words………………………………………………………………………………………..................

……………………………………………………………………………………………..………………………..

Tenderer's Name and Stamp
……………………………………..…………………..………………………………………………………..…………………………………
……………………………………………………..…………………

Address
…………………………………………………………………………………...……………..……..…………………………………….....…
…………………………………………………….....……………

Period To Execute The Works ……..…………………………..……....…………………………………..

Tenderer’s V.A.T No ….…………………………………………………….…………………………………….

Tenderer’s P.I.N No …………………………………………………………………………………...……. ……….

Tenderer's Signature ………………………………… Date……………………..………………………...………

Witness Signature ………………………………….. Date……………………..………………………..………

DATA SCHEDULE A - GENERAL

Item	Description	Manufacturer	Name of Local Agent	Delivery to Site in weeks
1	PPR Pipes			
2	uPVC and muPVC Pipes			
3	Water Closet			
4	Wash Hand Basin			
5	Dhobi Sink			
6	Shower Fittings			
7	Bath tabs			
8	Booster Pumps			
9	Fire Hydrant Pumps			
10	Hose reel pumps			
11	Solar Panels + Hot water tank			
12				

Clearly marked catalogues and manufacturer's brochures must be attached to the tender document for all key items. Failure to attach shall be make the tender non-responsive.

DATA SCHEDULE B – SPECIAL TOOLS

The Tenderer shall list hereunder his recommended list of tools for the plant supplied under this contract. The list shall be priced individually. A Provisional Sum is to be included in the Schedule of Prices.

Item No.	Description	Amount in KShs.
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Note: Tenderer to submit details of tools for which prices have been entered

Total for Special Tools KShs. _____

DATA SCHEDULE C – SPARE PARTS

The Tenderer shall list hereunder his recommended list of spares covering a period of one years for the plant supplied under this Contract. The list shall be priced individually. A Provisional Sum is to be included in the Schedule of Prices.

Item No.	Description	Amount KShs.
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Total for Spare Parts KShs.

Note: Tenderer to submit details of spare parts for which prices have been entered.

DATA SCHEDULE D – SUB CONTRACTORS

If the whole of the plant and equipment is not to be manufactured at the Tenderer's own works, he shall give the names and addresses of the firms to whom various items will be sub-contracted.

	Item	Name and Address of Sub-Contractor
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____

DATA SCHEDULE E – MANUFACTURERS, PLACES OF ASSEMBLY, TESTING AND INSPECTION

Item	Manufacturer	Place of Manufacture	Place of Inspection and Testing
1. PPR Pipes			
2. uPVC and muPVC Pipes			
3. Water Closet			
4. Wash Hand Basin			
5. Dhobi Sink			
6. Shower Fittings			
7. Bath tabs			
8. Booster Pumps			
9. Fire Hydrant Pumps			
10. Hose reel pumps			
11. Solar Panels + Hot water tank			
12. Others (Specify)			

DATA SCHEDULE F – DELIVERIES

The times to be entered below are the periods in weeks from the date of acceptance of the Tender in the event of a Contract.

In the column headed “Method of Shipping”, the Tenderer is to state whether items are to be shipped by sea or air and road or rail and whether as general cargo, in containers, etc. Each item of plant, equipment or materials shall be entered.

Item	Time of Despatch Ex-Works	Shipping Route From	To	Method of Shipping	Time of Arrival on Site

PART G – Standard Testing Forms

Pressure Test Log Sheet

for water services installations.

Project: _____
_____
_____

(A) **For Plastic Pipes (uPVC pipes, CPVC, CPVI, PE pipes, ABS pipes, PB pipes, PP-R Type 3 pipes etc)**

I. Preliminary Test

Test begin at _____(at least 15 bar) (a) _____ bar

Pressure after 30 minutes (b) _____ bar

Pressure after 60 minutes (c) _____ bar*1

*1 - shall not be more than 0.6 bar after 30 minutes

Leakage ☐ yes ☐ no

II. Main Test

Start after preliminary test completed _____ (c) _____ bar

Pressure after 120 minutes (d) _____ bar*2

*2 - shall not be more than 0.2 bar

Leakage ☐ yes ☐ no

(B) **For Metal Pipes (stainless steel pipes, copper pipes etc)**

Test begin at _____(at least 15 bar) (a) _____ bar

Pressure after 30 minutes (b) _____ bar

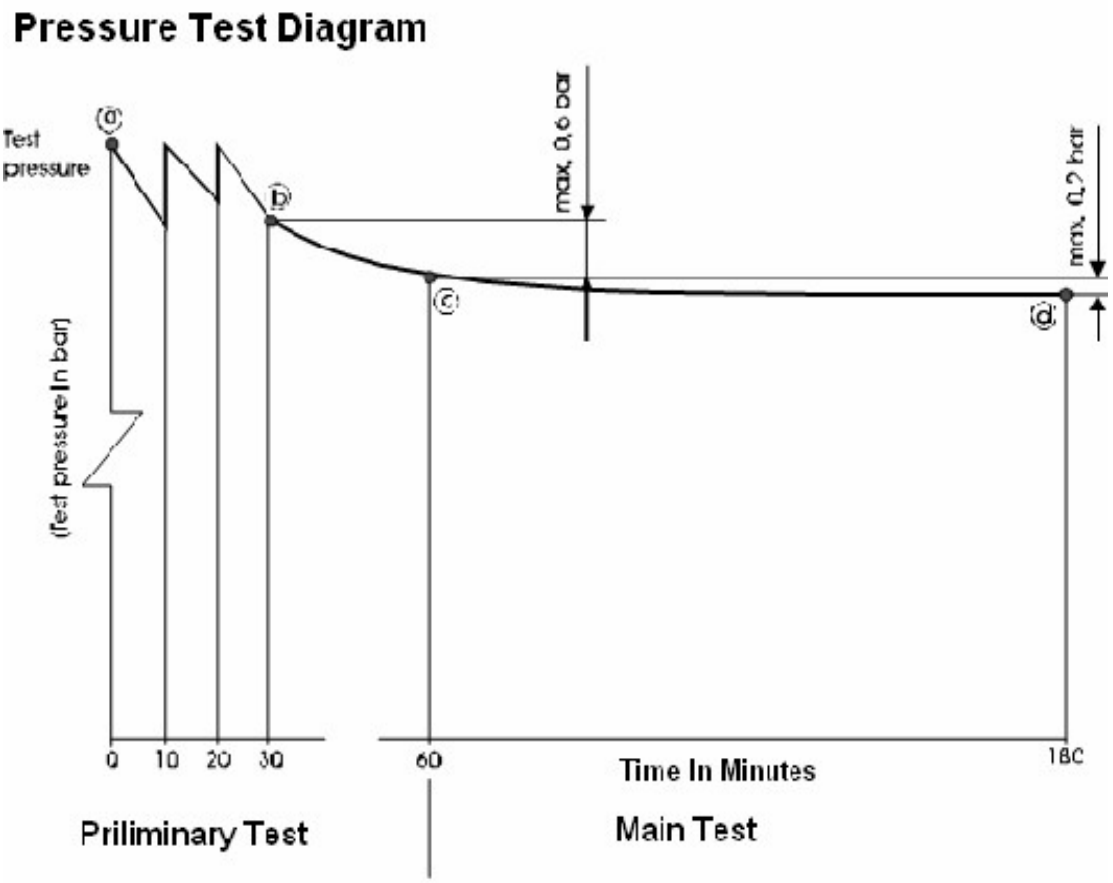
Leakage ☐ yes ☐ no

Installer/Company/ Contractor:_____

Supervisor _____
Designation_____

Date: _____ Completed by: _____

Pressure Test Diagram



PART H – Applicable References

SCHEDULE OF APPLICABLE MECHANICAL SERVICES STANDARDS

The following BS standards are the general specifications used for mechanical services. The latest or superseding versions shall apply.

BS 7671	specifications for requirements for electrical installations
BS 1387	specifications for steel pipes
BS 143	specifications for threaded pipe fitting
BS 4434	specifications for safety code for refrigeration systems
BS 4504	specifications for flange fittings
BS 599	specifications for pump testing
BS 1394	specifications for plastic piping system
BS 4082	specifications for external dimensions for vent-in-line centrifugal pipes
BS 5257	specifications for horizontal end suction centrifugal pump
BS 1452	specifications for the manufacture of cast iron casting
BS 1400	specifications for copper alloy ingots and copper alloy and high conductivity copper castings
BS 4999 s	specifications for general pump motors
ISO 2858	specifications for end suction centrifugal pumps
BS 5257	specifications for end suction centrifugal pumps
BS 848	specifications for noise of fans
BS 5256	specifications for fan blades
BS 476 PART 6	specifications for fire blankets
BS 3638	specifications for sound absorbent specifications
BS 6540	specifications for air filters
BS 4773	specifications for testing and rating air terminal devices
BS 1387	specifications for dimensions and weights of steel tubes
BS 3601	specifications for carbon steel pipes and tubes
BS 21	specifications for pipe threads for tubes and fittings
BS 143	specifications for malleable cast iron and cast copper alloy threaded pipe fittings
BS 1256	specifications for malleable cast iron and cast copper alloy threaded pipe fittings
BS 4504	specifications for pipe flanges
BS 4190	specifications for nuts and bolts
BS 4865	specifications for gaskets
BS 1965 PART 1	specifications for butt welding pipe fittings for pressure purposes
API 1104	specifications for welds
BS 2640 CLASS II	specifications for class II oxy-acetylene welding of copper steel pipework
BS 1453	specifications for filler materials
BS 4515	specifications for welding of steel pipelines on land and off-shore
BS 2971	specifications for class II arc welding of carbon steel pipework for carrying fluids
BS 3974 PART 1 &2	specifications for pipe supports
BS 5404 PART 1	specifications for flange valves
BS 5154	specifications for valves
BS 5152	specifications for cast iron gate valves
BS 1400	specifications for copper alloy ingot and cast alloy and high conductivity copper casting
BS 5153	specifications for cast iron check valves for general purposes.
BS 5159	specifications for cast iron and carbon steel ball valves for general purposes
BS 2456	specifications for float operated valves for cold water systems
BS1212 PART 3	code for installation of float valves
BS 4504 PN16	specifications for flanges
BS 2879	specifications for draining pipes
BS 1780	specifications for bourdon tube pressure and vacuum gauges
BS 5235	specifications for dail type expansion thermometers
BS 4434	specifications for safety and environmental aspects in the design, construction and installation of refrigeration appliances.

BS 1306	specifications for copper and copper alloy pressure piping systems
BS 5720	c.o.p mechanical ventilation and air conditioning
BS 2972	specifications for thermal inspection
BS 476 PART 1	specifications for fire blanket
BS 6231	specifications for pvc insulated cable
BS 2757	specifications for thermal classification
BS 1387	specifications for screwed and socket steel tubes
ASTM F441	specifications for chlorinated poly plastic pipe
ASTM D2846	specifications for cpvc
ASTM F438	specifications for socket type chlorinated pvc pipe fittings
ASTM 439	specifications for socket type chlorinated pvc pipe fittings
ASTM F1970	specifications for socket type chlorinated pvc pipe fittings
ASTM F402	standard practice for safe handling of solvent cements
BS 3505 : 1968	specifications for unplastisised poly vinly chloride pressure pipes for cold water systems
BS 1172	specifications for non- arsenic copper
BS 5572:1978	code of practice for sanitary pipework
BS 3943	specifications for plastic waste pipes
BS 1218	specifications for gate valves
BS 1952	specifications for valves, mountings and fittings
BS 3464	specifications for materials for water taps and stop valve seat washers
BS 1291	specifications for waste traps
BS 1449	specifications for spring steel.
BS 3376; 1960	specifications for open fire burning solid mineral fuels
BS 5423	specifications for portable fire extinguishers
BS 5423,1977	specifications for fire extinguishers
BS 5041	specifications for landing valves for wet risers
BS 5274	specifications for fire hose reels
BS EN671-1:1995	specifications for hose reels.
BS 1740	specifications for wrought steel pipe fitting
NFPA 13	standard for installation of sprinkler systems

SCHEDULE OF TENDER DRAWINGS

The following drawings are available on request

1	M-P-01	GROUND FLOOR PLAN – PLUMBING LAYOUT
2	M-P-02	FIRST FLOOR PLAN – PLUMBING LAYOUT
3	M-P-03	SECOND FLOOR PLAN – PLUMBING LAYOUT
4	M-P-04	THIRD FLOOR PLAN – PLUMBING LAYOUT
5	M-P-05	FOURTH FLOOR PLAN – PLUMBING LAYOUT
6	M-P-06	ROOF LEVEL PLAN – PLUMBING LAYOUT
7	M-D-01	GROUND FLOOR PLAN – DRAINAGE LAYOUT
8	M-D-02	FIRST FLOOR PLAN – DRAINAGE LAYOUT
9	M-D-03	SECOND FLOOR PLAN – DRAINAGE LAYOUT
10	M-D-04	THIRD FLOOR PLAN – DRAINAGE LAYOUT
11	M-D-05	FOURTH FLOOR PLAN – DRAINAGE LAYOUT
12	M-D-06	ROOF LEVEL PLAN – DRAINAGE LAYOUT