JARAMOGI OGINGA ODINGA UNIVERSITY

OF SCIENCE AND TECHNOLOGY

TENDER DOCUMENT

FOR

TENDER NUMBER JOOUST/ONT/C3/39/2019-2020: Plumbing Drainage and Fire Fighting, Swimming pool Installation, Solar Water Heating Installation, Kitchen Equipment Installation, Bio digester Installation and Incinerator Installation the Research Centre at Miyandhe Campus - Bondo, Siaya County

CLOSING DATE 24TH JULY 2020

OPENING DATE 6TH AUGUST 2020

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INTRODUCTION

1.1 This standard tender document for procurement of works has been prepared for use by procuring entities in Kenya in the procurement of works (i.e Electrical and Mechanical Works – Including Erection on Site)

1.2 The following guidelines should be observed when using the document:-

(a) Specific details should be furnished in the tender notice and in the special conditions of contract (where applicable). The tender document issued to tenderers should not have blank spaces or options.

(b) The instructions to tenderers and the General Conditions of Contract should remain unchanged. Any necessary amendments to these parts should be made through Appendix to instructions to tenderers and special conditions of contract respectively.

1.3 (a) Information contained in the invitation to tender shall conform to the data and information in the tender documents to enable prospective tenderers to decide whether or not to participate in the tender and shall indicate any important tender requirements

(b) The invitation to tender shall be as an advertisement in accordance with the regulations or a letter of invitation addressed to tenderers who have been prequalified following a request for prequalification.

1.4 This document is based on PART 1 of the third Edition of the International Federation of Consulting Engineers (Federation Internationale des Ingenieurs Con Seils – FIDIC) Conditions of Contract for Electrical and Mechanical Works, 1987 (reprinted May 1988 with Editorial Amendments).

1.5 The cover of the tender document should be modified to include:-

i. Tender number.
ii. Tender name.
iii. Name of procuring entity.
iv. Delete name and address of PPOA

SECTION 1

SECTION I INVITATION TO TENDER

TENDER REF NO: JOOUST/ONT/C3/39/2019-2020

TENDER NAME: PLUMBING DRAINAGE AND FIRE FIGHTING, SWIMMING POOL INSTALLATION, SOLAR WATER HEATING INSTALLATION, KITCHEN EQUIPMENT INSTALLATION, BIO DIGESTER INSTALLATION AND INCINERATOR INSTALLATION THE RESEARCH CENTRE AT MIYANDHE CAMPUS - BONDO, SIAYA COUNTY

1.1 Jaramogi Oginga Odinga University of Science and Technology invites sealed bids from eligible candidates for Tender for Plumbing Drainage and Fire Fighting, Swimming pool Installation, Solar Water Heating Installation, Kitchen Equipment Installation, Bio digester Installation and Incinerator Installation the Research Centre at Miyandhe Campus - Bondo, Siaya County.

1.2 Tender documents with detailed specifications shall be downloaded free of charge at the University website **www.jooust.ac.ke** and Public Procurement Information Portal **www.tenders.go.ke.**Tenderers who download the tender document and intend to submit a bid are required to submit their particulars to the University through email: **proc@jooust.ac.ke** for the purpose of receiving any further clarification and\or addendum.

1.3 **THERE SHALL BE MANDATORY SITE VISIT TO BE HELD ON 10TH JULY 2020 FROM 10 AM AT THE ADMINISTRATION BLOCK SITE IN THE MAIN CAMPUS**

1.4 Dully filled tender documents are to be enclosed in plain sealed envelopes, marked with the tender number, tender description **and bearing no indication of the applicant**, clearly /marking each "**ORIGINAL TENDER**" and "**COPY OF TENDER**" should be deposited in the tender box at Jaramogi Oginga Odinga University of Science and Technology or be addressed to:-

The Vice Chancellor,
Jaramogi Oginga Odinga University of Science and Technology,
P.O. Box 210-40601
BONDO.

1.5 The tender document should reach on or before **24TH JULY 2020**

1.6 Due to COVID-19, the application documents will be open on **6TH AUGUST 2020** at the Assembly Hall, Main Campus in the presence of the candidates or their representatives who choose to attend.

NB: Due to ministry of health instructions on social distancing, the number of bidders/representatives will be limited

1.7 **BIDDERS MUST SERIALIZE THE BID DOCUMENT. THE UNIVERSITY SHALL NOT BEAR RESPONSIBILITY FOR THE LOSS OF ANY DOCUMENT.**

SECTION II:

INSTRUCTIONS TO TENDERERS

TABLE OF CLAUSES

INSTRUCTION TO TENDERERS

Note: The tenderer must comply with the following conditions and instructions and failure to do so is liable to result in rejection of the tender.

GENERAL

1. Definitions

(a) "**Tenderer"** means any person or persons partnership firm or company submitting a sum or sums in the Bills of Quantities in accordance with the Instructions to Tenderers, Conditions of Contract Parts I and II, Specifications, Drawings and Bills of Quantities for the work contemplated, acting directly or through a legally appointed representative.

(b) **"Approved tenderer**" means the tenderer who is approved by the Employer.

(c) Any noun or adjective derived from the word **"tender"** shall be read and construed to mean the corresponding form of the noun or adjective **"bid".** Any conjugation of the verb "tender" shall be read and construed to mean the corresponding form of the verb "bid."

(d) **"Employer"** means a Central Government Ministry, Local Authority, State Corporation or any other Public Institution.

2. Eligibility and Qualification Requirements

2.1 This invitation to tender is open to all tenderers who are eligible as stated in the appendix.

2.2 The procuring entity's employees, committee members, board members and their relative (spouse and children) are not eligible to participate in the tender.

2.3 To be qualified for award of Contract, the tenderer shall provide evidence satisfactory to the Employer of their eligibility under Sub clause 2.1 above and of their capability and adequacy of resources to effectively carry out the subject Contract. To this end, the tenderer shall be required to update the following information already submitted during prequalification:-

(a) Details of experience and past performance of the tenderer on the works of a similar nature within the past five years and details of current work on hand and other contractual commitments.

(b) The qualifications and experience of key personnel proposed for administration and execution of the contract, both on and off site.

(c) Major items of construction plant and equipment proposed for use in carrying out the Contract. Only reliable plant in good working order and suitable for the work required of it shall be shown on this schedule. The tenderer will also indicate on this schedule when each item will be available on the Works. Included also should be a schedule of plant, equipment and material to be imported for the

purpose of the Contract, giving details of make, type, origin and CIF value as appropriate.

(d) Details of subcontractors to whom it is proposed to sublet any portion of the Contract and for whom authority will be requested for such subletting in accordance with clause 4 of the Conditions of Contract.

(e) A draft Program of Works in the form of a bar chart and Schedule of Payment which shall form part of the Contract if the tender is accepted. Any change in the Program or Schedule shall be subjected to the approval of the Engineer.

(f) Details of any current litigation or arbitration proceedings in which the Tenderer is involved as one of the parties.

2.4 <u>Joint Ventures</u>

Tenders submitted by a joint venture of two or more firms as partners shall comply with the following requirements:-

(a) The tender, and in case of a successful tender, the Form of Agreement, shall be signed so as to be legally binding on all partners.

(b) One of the partners shall be nominated as being in charge; and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the partners.

(c) The partner in charge shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture and the entire execution of the Contract including payment shall be done exclusively with the partner in charge.

(d) All partners of the joint venture shall be liable jointly and severally for the execution of the Contract in accordance with the Contract terms, and a relevant statement to this effect shall be included in the authorization mentioned under (b) above as well as in the Form of Tender and the Form of Agreement (in case of a successful tender).

(e) A copy of the agreement entered into by the joint venture partners shall be submitted with the tender.

2.5 To quality for contract awards, the tenderer shall have the following:

(a) Necessary qualifications, capability experience, services, equipment and facilities to provide what is being procured.

(b) Legal capacity to enter into a contract for procurement

(c) Shall not be insolvent, in receivership, bankrupt or in the process of being wound up and is not the subject of legal proceedings relating o the foregoing.

(d) Shall not be debarred from participating in public procurement.

3. Cost of Tendering

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

3.2 The price to be charged for the tender document shall not exceed Kshs.5,000/=

3.3 The procuring entity shall allow the tenderer to view the tender document free of charge before purchase.

4. Site Visit

4.1 The tenderer is advised to visit and examine the Site and its surroundings and obtain for himself on his own responsibility, all information that may be necessary for preparing the tender and entering into a contract. The costs of visiting the Site shall be the tenderer's own responsibility.

4.2 The tenderer and any of his personnel or agents will be granted permission by the Employer to enter upon premises and lands for the purpose of such inspection, but only upon the express condition that the tenderer, his personnel or agents, will release and indemnify the Employer from and against all liability in respect of, and will be responsible for personal injury (whether fatal or otherwise), loss of or damage to property and any other loss, damage, costs and expenses however caused, which but for the exercise of such permission, would not have arisen.

4.3 The Employer shall organize a site visit at a date to be notified. A representative of the Employer will be available to meet the intending tenderers at the Site.

Tenderers must provide their own transport. The representative will not be available at any other time for site inspection visits.

Each tenderer shall complete the Certificate of Tenderer's Visit to the Site, whether he in fact visits the Site at the time of the organized site visit or by himself at some other time.

TENDER DOCUMENTS

5. Tender Documents

5.1 The Tender documents comprise the documents listed here below and should be read together with any Addenda issued in accordance with Clause 7 of these instructions to tenderers.

a. Form of Invitation for Tenders
b. Instructions to Tenderers
c. Form of Tender
d. Appendix to Form of Tender
e. Form of Tender Surety
f. Statement of Foreign Currency Requirements
g. Form of Performance Security

h. Form of Agreement
i. Form of Advance payment Bank Guarantee
j. Schedules of Supplementary Information
k. General Conditions of Contract – Part I
l. Conditions of Particular Application – Part II
m. Specifications
n. Bills of Quantities
o. Drawings
p. Declaration Form

5.2 The tenderer is expected to examine carefully all instructions, conditions, forms, terms, specifications and drawings in the tender documents. Failure to comply with the requirements for tender submission will be at the tenderer's own risk. Pursuant to clause 22 of Instructions to Tenderers, tenders which are not substantially responsive to the requirements of the tender documents will be rejected.

5.3 All recipients of the documents for the proposed Contract for the purpose of submitting a tender (whether they submit a tender or not) shall treat the details of the documents as "private and confidential".

6. Inquiries by tenderers

6.1 A tenderer making inquiries relating to the tender documents may notify the Employer in writing or by telex, cable or facsimile at the Employer's mailing address indicated in the Invitation to Tender. The Employer will respond in writing to any request for clarification which he receives earlier than 7 days prior to the deadline for the submission of tenders. Written copies of the Employer's response (including the query but without identifying the source of the inquiry) will be sent to all prospective tenderers who have purchased the tender documents.

6.2 Clarification of tenders shall be requested by the tenderer to be received by the procuring entity not later than 7 days prior to the deadline for submission of tenders.

6.3 The procuring entity shall reply to any clarifications sought by the tenderer within 3 days of receiving the request to enable the tenderer to make timely submission of its tender.

7. Amendment of Tender Documents

7.1 At any time prior to the deadline for submission of tenders the Employer may, for any reason, whether at his own initiative or in response to a clarification requested by a prospective tenderer, modify the tender documents by issuing Addenda.

7.2 Any Addendum will be notified in writing or by cable, telex or facsimile to all prospective tenderers who have purchased the tender documents and will be binding upon them.

7.3 In order to allow prospective tenderers reasonable time in which to take the Addendum into account in preparing their tenders, the Employer may, at his discretion, extend the deadline for the submission of tenders.

PREPARATION OF TENDERS

8. Language of Tender

8.1 The tender and all correspondence and documents relating to the tender exchanged between the tenderer and the Employer shall be written in the English language. Supporting documents and printed literature furnished by the tenderer with the tender may be in another language provided they are accompanied by an appropriate translation of pertinent passages in the above stated language. For the purpose of interpretation of the tender, the English language shall prevail.

9. Documents Comprising the Tender

9.1 The tender to be prepared by the tenderer shall comprise:-

i. The form of tender and appendix thereto.
ii. A tender security.
iii. The priced Bill of Quantity and Schedule.
iv. The information on eligibility and qualification.
v. Any other materials required to be completed and submitted in accordance with the instructions to tenderers.

The Forms, Bills of Quantities and Schedules provided in the tender documents shall be used without exception (subject to extensions of the schedules in the same format and to the provisions of clause 13.2 regarding the alternative forms of Tender Surety].

10. Tender Prices

10.1 All the insertions made by the tenderer shall be made in INK and the tenderer shall clearly form the figures. The relevant space in the Form of Tender and Bills of Quantities shall be completed accordingly without interlineations or erasures except those necessary to correct errors made by the tenderer in which case the erasures and interlineations shall be initialed by the person or persons signing the tender.

10.2 A price or rate shall be inserted by the tenderer for every item in the Bills of Quantities whether the quantities are stated or not items against which no rate or price is entered by the tenderer will not be paid for by the Employer when executed and shall be deemed covered by the rates for other items and prices in the Bills of Quantities.

The prices and unit rates in the Bills of Quantities are to be the full [all-inclusive] value of the work described under the items, including all costs and expenses which may be necessary and all general risks, liabilities and obligations set forth or implied in the documents on which the tender is based. All duties and taxes and other levies payable by the Contractor under the Contract or for any other cause prior to the deadline for the

submission of tenders, shall be included in the rates and prices and the total tender prices submitted by the Tenderer.

Each price or unit rate inserted in the Bills of Quantities should be a realistic estimate for completing the activity or activities described under that particular item and the tenderer is advised against inserting a price or rate against any item contrary to this instruction.

Every rate entered in the Bills of Quantities, whether or not such rate be associated with a quantity, shall form part of the Contract. The Employer shall have the right to call for any item of work contained in the Bills of Quantities, and such items of work to be paid for at the rate entered by the tenderer and it is the intention of the Employer to take full advantage of unbalanced low rates.

10.3 Unless otherwise specified the tenderer must enter the amounts representing 10% of the sub-total of the summary of the Bills of Quantities for Contingencies and Variation of Prices [V.O.P.] payments in the summary sheet and add them to the sub-total to arrive at the tender amount.

10.4 The tenderer shall furnish with his tender written confirmation from his suppliers or manufacturers of unit rates for the supply of items listed in the Conditions of Contract clause 47 where appropriate.

10.5 The rates and prices quoted by the tenderer are subject to adjustment during the performance of the Contract only in accordance with the provisions of the Conditions of Contract. The tenderer shall complete the schedule of basic rates and shall submit with his tender such other supporting information as required under clause 47 of the Conditions of Contract Part II.

11. Currencies of Tender and Payment

11.1 Tenders shall be priced in Kenya Shillings and the tender sum shall be in Kenya Shillings.

11.2 Tenderers are required to indicate in the Statement of Foreign Currency Requirements, which forms part of the tender, the foreign currency required by them. Such currency should generally be the currency of the country of the tenderer's main office. However, if a substantial portion of the tenderer's expenditure under the Contract is expected to be in countries other than his country of origin, then he may state a corresponding portion of the contract price in the
currency of those other countries. However, the foreign currency element is to be limited to two (2) different currencies and a maximum of 30% (thirty percent) of the Contract Price.

11.3 The rate or rates of exchange used for pricing the tender shall be selling rate or rates of the Central Bank ruling on the date thirty (30) days before the final date for the submission of tenders.

11.4 Tenderers must enclose with their tenders, a brief justification of the foreign currency requirements stated in their tenders.

12. Tender Validity

12.1 The tender shall remain valid and open for acceptance for a period of ninety (90) days from the specified date of tender opening or from the extended date of tender opening (in accordance with clause 7.4 here above) whichever is the later.

12.2 In exceptional circumstances prior to expiry of the original tender validity period, the Employer may request the tenderer for a specified extension of the period of validity. The request and the responses thereto shall be made in writing or by cable, telex or facsimile. A tenderer may refuse the request without forfeiting his Tender Surety. A tenderer agreeing to the request will not be required nor permitted to modify his tender, but will be required to extend the validity of his Tender Surety correspondingly.

13. Tender Security

13.1 The tenderer shall furnish as part of his tender, a Tender Security in the amount and form stated in the Appendix to Instructions to Tenderers.

13.2 The tender security shall be 2 percent of the total tender price.

13.3 The tender security shall be valid for at least thirty (30) days beyond the tender validity period.

The format of the Surety shall be in accordance with the sample form of Tender Surety included in these tender documents; other formats may be permitted subject to the prior approval of the Employer. The Tender Surety shall be valid for thirty (30) days beyond the tender validity period.

13.4 Any tender not accompanied by an acceptable Tender Surety will be rejected by the Employer as non-responsive.

13.5 The Tender Sureties of unsuccessful tenderers will be returned as promptly as possible but not later than fourteen (14) days after concluding the Contract execution and after a Performance Security has been furnished by the successful tenderer. The Tender Surety of the successful tenderer will be returned upon the tenderer executing the Contract and furnishing the required Performance Security.

13.6 The Tender Surety may be forfeited:

(a) if a tenderer withdraws his tender during the period of tender validity: or

(b) in the case of a successful tenderer, if he fails

(i) to sign the Agreement, or
(ii) to furnish the necessary Performance Security

(c) if a tenderer does not accept the correction of his tender price pursuant to clause 23.

14. No Alternative Offers

14.1 The tenderer shall submit an offer which complies fully with the requirements of the tender documents unless otherwise provided for in the appendix.

Only one tender may be submitted by each tenderer either by himself or as partner in a joint venture.

14.2 The tenderer shall not attach any conditions of his own to his tender. The tender price must be based on the tender documents. The tenderer is not required to present alternative construction options and he shall use without exception, the Bills of Quantities as provided, with the amendments as notified in tender notices, if any, for the calculation of his tender price.

Any tenderer who fails to comply with this clause will be disqualified.

15. Pre-Tender Meeting

15.1 If a pre tender meeting is convened the tenderer's designated representative is invited to attend a pre-
tender meeting, which if convened, will take place at the venue and time stated in the Invitation to Tender. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

15.2 The tenderer is requested as far as possible to submit any questions in writing or by cable, to reach the Employer not later than seven days before the meeting. It may not be practicable at the meeting to answer questions received late, but questions and responses will be transmitted in accordance with the following:

(a) Minutes of the meeting, including the text of the questions raised and the responses given together with any responses prepared after the meeting, will be transmitted without delay to all purchasers of the tender documents. Any modification of the tender documents listed in -–Clause 9 which may become necessary as a result of the pre-tender meeting shall be made by the Employer exclusively through the issue of a tender notice pursuant to Clause 7 and not through the minutes of the pre-tender meeting.

(b) Non attendance at the pre-tender meeting will not be cause for disqualification of a bidder.

16. Format and Signing of Tenders

16.1 The tenderer shall prepare his tender as outlined in clause 9 above and mark appropriately one set "ORIGINAL" and the other "COPY".

16.2 The copy of the tender and Bills of Quantities shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to

sign on behalf of the tenderer. All pages of the tender where amendments have been made shall be initialed by the person or persons signing the tender.

16.3 The complete tender shall be without alterations, interlineations or erasures, except as necessary to correct errors made by the tenderer, in which case such corrections shall be initialed by the person of persons signing the tender.

SUBMISSION OF TENDERS

17. Sealing and Marking of Tenders

17.1 The tenderer shall seal the original and copy of the tender in separated envelopes, duly marking the envelopes as "ORIGINAL" and "COPY". The envelopes shall then be sealed in an outer envelope.

17.2 The inner and outer envelopes shall be addressed to the Employer at the address stated in the Appendix to Instructions to Tenderers and bear the name and identification of the Contract stated in the said Appendix with a warning not to open before the date and time for opening of tenders stated in the said Appendix.

17.3 The inner envelopes shall each indicated the name and address of the tenderer to enable the tender to be returned unopened in case it is declared "late", while the outer envelope shall bear no mark indicating the identity of the tenderer.

17.4 If the outer envelope is not sealed and marked as instructed above, the Employer will assume no responsibility for the misplacement or premature opening of the tender. A tender opened prematurely for this cause will be rejected by the Employer and returned to the tenderer.

18 Deadline for Submission of Tenders

18.1 Tenders must be received by the Employer at the address specified in clause 17.2 and on the date and time specified in the Letter of Invitation, subject to the provisions of clause 7.4, 18.2 and 18.3.

Tenders delivered by hand must be placed in the "tender box" provided in the office of the Employer.

Proof of posting will not be accepted as proof of delivery and any tender delivered after the above stipulated time, from whatever cause arising will not be considered.

18.2 The Employer may, at his discretion, extend the deadline for the submission of tenders through the issue of an Addendum in accordance with clause 7, in which case all rights and obligations of the Employer and the tenderers previously subject to the original deadline shall thereafter be subject to the new deadline as extended.

18.3 Any tender received by the Employer after the prescribed deadline for submission of tender will be returned unopened to the tenderer.

19 Modification and Withdrawal of Tenders

19.1 The tenderer may modify or withdraw his tender after tender submission, provided that written notice of the modification or withdrawal is received by the Employer prior to prescribed deadline for submission of tenders.

19.2 The tenderer's modification or withdrawal notice shall be prepared, sealed, marked and dispatched in accordance with the provisions for the submission of tenders, with the inner and outer envelopes additionally marked "MODIFICATION" or "WITHDRAWAL" as appropriate.

19.2 No tender may be modified subsequent to the deadline for submission of tenders.

19.3 No tender may be withdrawn in the interval between the deadline for submission of tenders and the period of tender validity specified on the tender form. Withdrawal of a tender during this interval will result in the forfeiture of the Tender Surety.

19.4 Subsequent to the expiration of the period of tender validity prescribed by the Employer, and the tenderer having not been notified by the Employer of the award of the Contract or the tenderer does not intend to conform with the request of the Employer to extend the prior of tender validity, the tenderer may withdraw his tender without risk of forfeiture of the Tender Surety.

TENDER OPENING AND EVALUATION

20 Tender Opening

20.1 The Employer will open the tenders in the presence of the tenderers' representatives who choose to attend at the time and location indicated in the Letter of Invitation to Tender. The tenderers' representatives who are present shall sign a register evidencing their attendance.

20.2 Tenders for which an acceptable notice of withdrawal has been submitted, pursuant to clause 19, will not be opened. The Employer will examine the tenders to determine whether they are complete, whether the requisite Tender Sureties have been furnished, whether the documents have been properly signed and whether the tenders are generally in order.

20.3 At the tender opening, the Employer will announce the tenderer's names, total tender price, tender price modifications and tender withdrawals, if any, the presence of the requisite Tender Surety and such other details as the Employer, at his discretion, may consider appropriate. No tender shall be rejected at the tender opening except for late tenders.

20.4 The Employer shall prepare a tender opening register and minutes of the tender opening including the information disclosed to those present.

20.5 Tenders not opened and read out a tender opening shall not be considered further for evaluation, irrespective of the circumstances.

21 Process to be Confidential

21.1 After the public opening of tenders, information relating to the examination, clarification, evaluation and comparisons of tenders and recommendations concerning the award of Contract shall not be disclosed to tenderers or other persons not officially concerned with such process until the award of Contract is announced.

21.2 Any effort by a tenderer to influence the Employer in the process of examination, evaluation and comparison of tenders and decisions concerning award of Contract may result in the rejection of the tenderer's tender.

22 Clarification Tenders

22.1 To assist in the examination, evaluation and comparison of tenders, the Employer may ask tenderers individually for clarification of their tenders, including breakdown of unit prices. The request for clarification and the response shall be in writing or by cable, facsimile or telex, but no change in the price or substance of the tender shall be sought, offered or permitted except as required to confirm the correction of arithmetical errors discovered by the employer during the evaluation of the tenders in accordance with clause 24.

22.2 No Tenderer shall contact the Employer on any matter relating to his tender from the time of the tender opening to the time the Contract is awarded. If the tenderer wishes to bring additional information to the notice of the Employer, he shall do so in writing.

23 Determination of Responsiveness

23.1 Prior to the detailed evaluation of tenders, the Employer will determine whether each tender is substantially responsive to the requirements of the tender documents.

23.2 For the purpose of this clause, a substantially responsive tender is one which conforms to all the terms, conditions and specifications of the tender documents without material deviation or reservation. A material deviation or reservation is one which affects in any substantial way the scope, quality, completion timing or administration of the Works to be undertaken by the tenderer under the Contract, or which limits in any substantial way, inconsistent with the tender documents, the Employer's rights or the tenderers obligations under the Contract and the rectification of which would affect unfairly the competitive position of other tenderers who have presented substantially responsive tenders.

23.3 Each price or unit rate inserted in the Bills of Quantities shall be a realistic estimate of the cost of completing the works described under the particular item including allowance for overheads, profits and the like. Should a tender be seriously unbalanced in relation to the Employer's estimate of the works to be performed under any item or groups of items, the tender shall be deemed not responsive.

23.4 A tender determined to be not substantially responsive will be rejected by the Employer and may not subsequently be made responsive by the tenderer by correction of the non-conforming deviation or reservation.

24 Correction of Errors

Tenders determined to be substantially responsive shall be checked by the Employer for any arithmetic errors in the computations and summations. **Errors will NOT be corrected by the Employer as follows:**

(a) Where there is a discrepancy between the amount in figures and the amount in words, the amount in words will govern.

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

(c) The amount stated in the tender will be adjusted in accordance with the above procedure for the correction of errors and, with concurrence of the tenderer, shall be considered as binding upon the tenderer. If the tenderer does not accept the corrected amount, the tender may be rejected and the Tender Security may be forfeited in accordance with clause 13.

25 Conversion to Single Currency

25.1 For compensation of tenders, the tender price shall first be broken down into the respective amounts payable in various currencies by using the selling rate or rates of the Central Bank of Kenya ruling on the date twenty one (21) days before the final date for the submission of tenders.

25.2 The Employer will convert the amounts in various currencies in which the tender is payable (excluding provisional sums but including Dayworks where priced competitively) to Kenya Shillings at the selling rates stated in clause 25.1.

26 Evaluation and Comparison of Tenders

26.1 The Employer will evaluate only tenders determined to be substantially responsive to the requirements of the tender documents in accordance with clause 23.

26.2 The Employer reserves the right to accept any variation, deviation or alternative offer. Variations, deviations, alternative offers and other factors which are in excess of the requirements of the tender documents or otherwise result in the accrual of unsolicited benefits to the Employer, shall not be taken into account in tender evaluation.

26.3 Price adjustment provisions in the Conditions of Contract applied over the period of execution of the Contract shall not be taken into account in tender evaluation.

26.4 If the lowest evaluated tender is seriously unbalanced or front loaded in relation to the Employer's estimate of the items of work to be performed under the Contract, the Employer may require the tenderer to produce

detailed price analyses for any or all items of the Bills of Quantities, to demonstrate the relationship between those prices, proposed construction methods and schedules. After evaluation of the price analyses, the Employer may require that the amount of the Performance Security set forth in clause 29 be increased at the expense of the successful tenderer to a level sufficient to protect the Employer against financial loss in the event of subsequent default of the successful tenderer under the Contract.

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

26.6 The tender evaluation committee shall evaluate the tender within 30 days of the validity period from the date of opening the tender.

26.7 Persons not officially involved in the evaluation of tender shall not attempt in any way to influence the evaluation.

27. Preference where allowed in the evaluation of tenders shall not exceed 15%

AWARD OF CONTRACT

28 Award criteria

28.1 Subject to clause 27.2, the Employer will award the Contract to the tenderer whose tender is determined to be substantially responsive to the tender documents and who has offered the lowest evaluated tender price subject to possessing the capability and resources to effectively carry out the Contract Works.

28.2 The Employer reserves the right to accept or reject any tender, and to annual the tendering process and reject all tenders, at any time prior to award of Contract, without thereby incurring any liability to the affected tenderers or any obligation to inform the affected tenderers of the grounds for the Employer's action.

29. Notification of Award and signing of contract

29.1 Prior to the expiration of the period of tender validity prescribed by the Employer, the Employer will notify the successful tenderer by cable, telefax or telex and confirmed in writing by registered letter that his tender has been accepted. This letter (hereinafter and in all Contract documents called "Letter of Acceptance") shall name the sum (hereinafter and in all Contract documents called "the Contract Price") which the Employer will pay to the Contractor in consideration of the execution and completion of the Works as prescribed by the Contract.

29.2 Upon the furnishing of a Performance Security by the successful tenderer, the unsuccessful tenderers will promptly be notified that their tenders have been unsuccessful.

29.3 At the same time the employer notifies the successful tenderer that his tender has been accepted, the employer shall notify the other tenderers that their tender s have been unsuccessful.

29.4 Within fourteen [14] days of receipt of the form of Contract Agreement from the Employer, the successful tenderer shall sign the form and return it to the Employer together with the required Performance Security.

29.5 The parties to the contract shall have it signed within 30 days from the date of notification of contract award unless there is an administrative review request.

29.6 A tenderer who gives false information in the tender document about is qualification or who refuses to enter into a contract after notification of contract award shall be considered for debarment from participating in future public procurement.

30. Performance Guarantee

30.1 Within twenty eight [28] days of receipt of the notification of award from the Employer, the successful tenderer shall furnish the Employer with a Performance Security in an amount stated in the Appendix to Instructions to Tenderers.

30.2 The Performance Security to be provided by the successful tenderer shall be an unconditional Bank Guarantee issued at the tenderer's option by an established and a reputable Bank approved by the Employer and located in the Republic of Kenya and shall be divided into two elements namely, a performance security payable in foreign currencies (based upon the exchange rates determined in accordance with clause 35.4 of the Conditions of Contract) and a performance security payable in Kenya Shillings. The value of the two securities shall be in the same proportions of foreign and local currencies as requested in the form of foreign currency requirements.

30.3 Failure of the successful tenderer to lodge the required Performance Security shall constitute a breach of Contract and sufficient grounds for the annulment of the award and forfeiture of the Tender Security and any other remedy under the Contract the Employer may award the Contract to the next ranked tenderer.

31. Advance Payment

An advance payment, if approved by the Employer, shall be made under the Contract, if requested by the Contractor, in accordance with clause 33.1 of the Conditions of Contract. The Advance Payment Guarantee shall be denominated in the proportion and currencies named in the form of foreign currency requirements. For each currency, a separate guarantee shall be issued. The guarantee shall be issued by a bank located in the Republic of Kenya, or a foreign bank through a correspondent bank located in the Republic of Kenya, in either case subject to the approval of the Employer.

31. Corrupt and fraudulent practices.

The procuring entity requires that tenderers observe the highest standard of ethics during the procurement process and execution of contract. A tenderer shall sign a declaration that he has not and will not be involved in corrupt or fraudulent practices.

SECTION III

APPENDIX TO INSTRUCTIONS TO TENDERERS

INSTRUCTIONS TO TENDERERS REFERENCE	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERERS
1.1	The employer is the **Vice Chancellor**, Jaramogi Oginga Odinga University of Science and Technology.
1.7	Qualification criteria as set out in the tender evaluation criteria
1.8	N/A
1.9	Joint venture or individual tenderers only.
1.13	N/A
2.3	Or through email address: proc@jooust.ac.ke
3.2.(e)	N/A
3.4	N/A
3.6	Validity period of 90 days
3.8	Tender surety shall be valid for 30 days beyond the validity of tender from the date of tender opening.
3.12 (b)	N/A
3.14	One original and a copy of the original
3.18	Bid security of 2% OF THE TENDER SUM from a reputable bank recognized by the Central Bank of Kenya
5.2	Alternative bids not allowed
5.7	N/A: PPAD 2015 Applies
5.9	N/A
5.12	N/A
6.5	Successful tenderer to provide performance security of 10% of the Sub-Contract sum from reputable bank recognized by Central Bank of Kenya prior to Sub-Contract signing.
6.8	N/A
6.12	-The word "valuation" should read "variation" -Variation shall apply as prescribed by the Public Procurement and Asset Disposal Act, 2015
6.13	Shall be 60 days from the date of receipt of the request
8.0	Due diligence shall be conducted before award in accordance with the Public Procurement and Asset Disposal Act, 2015
9.0	Tenderer shall be required to provide litigation history which may be subjected to due diligence to ascertain the possibility of negatively affecting performance.

SECTION III

CONDITIONS OF CONTRACT (Including erection on site)
PART I – GENERAL CONDITIONS

PART I – General Conditions, shall be those forming Part I of the "Conditions of Contract for Electrical and Mechanical Works – Including Erection on Site, Thirth Edition 1987, re-printed 1988 with Editorial Amendments" prepared by the Federation

Internationale des Ingenieurs – conseils (FIDIC). The Conditions are subject to variations and additions set out in Part II hereof entitled "Special Conditions".

Note

i. The standard text of the General Conditions of Contract must be retained intact to facilitate its reading and interpretation by tenderers. Any amendments and additions to the General Conditions, specific to a given Contract, should be introduced in the Special Conditions or in the Appendix to Form of Tender.

ii. The Special Conditions take precedence over the General Conditions of Contract.

iii. Copies of the FIDIC Conditions of Contract can be obtained from:

FIDIC Secretariat
P.O.Box 86
1000 Lausanne 12
Switzerland
Fax: 41 21 653 5432
Telephone 41 21 653 5003

PREAMBLE TO GENERAL CONDITIONS

Commencement Date (Sub-clause 1.1.1.(I))

The date for commencement of the Works is _____**SEPTEMBER 2020**_____

The Employer (Sub-clause 1.1.12.)

The Employer is **JARAMOGI OGINGA ODINGA UNIVERSITY OF SCHIENCE AND TECHNOLOGY**

The Engineer (Sub-clause 1.1.15)

The Engineer is _____

Time for Completion (Sub-clause 1.1.35.)

The Time for Completion is __**12 months**_____ from the commencement Date.

Contractor's Profit (Sub-clause 1.6.)

The percentage to cover profit entitlement, where appropriate, is _**N/A**_____%.

Ruling Language (Sub-clause 5.1.)

The version in **ENGLISH** language (ruling language) shall prevail.

Day to Day Communications (Sub-clause 5.2.)

The language for day to day communications is ENGLISH_____

Programme to be Furnished (Sub-clause 12.1.)

The Programme must be submitted in the form of ____MICROSOFT PROJECT_____

Electricity, Water, Gas and Other Services (Sub-clause 14.3.)

Supplies on the Site are:

a. Electricity**:_____KENYA POWER_____**

b. Water: _____**SIAYA BONDO WATER AND SANITATION**____

Employer's Equipment (Sub-clause 14.4.)

The following Employer's equipment is available for use by the Contractor under the Employer's operation: _____N/A_____
_____
_____
_____

Working Hours (Sub-clause 18.3.)

The normal working hours are _____**8.00AM-5.00PM AS PER NEMA GUIDLINES**_____
_____
_____

Delay in Completion (Sub-clause 27.1.)

Failure to meet the Time for Completion entitles the Employer to reduction in Contract Price as follows:

Amount per day _____N/A_____

Maximum _____N/A_____

Prolonged delay (Sub-clause 27.2.)

Maximum amount recoverable from the Contractor by the Employer:

_____N/A_____
_____

Terms of Payment (Sub-clause 33.1.)

In addition to the provisions under Clause 33, the terms of payment shall be:
_____
_____
_____

Payment in Foreign Currencies (Sub-clause 35.1.)

Payment in foreign currencies shall be arranged as follows:
_____N/A_____
_____
_____

Rates of Exchange (Sub-clause 53.3.)

The rates of exchange for the purpose of the Contract are:
_____N/A_____
_____
_____

Payment against Provisional Sums (Sub-clause 36.4. (b))

The percentage to be applied to Provisional Sums shall be _____%.

Maximum Liability (Sub-clause 42.2.)

The maximum liability of the Contractor to the Employer shall be _____N/A_____

Insurance of Works (Sub-clause 43.1)

The deductible limits in the insurance cover of the Works shall not exceed
_____
___

Sub-clause 43.1. (a)
The additional risks to be insured are:
_____
_____
_____

Third Party Liability (Sub-clause 43.3)

The amount of insurance against third party liability taken out by the Contractor shall not be less than:
_____
_____

Payment on Termination for Employer's Default (Sub-clause 46.3)

The additional amount payable by the Employer on termination shall not exceed:
_____
_____

Labour, Materials and Transport (Sub-clause 47.1.)

The method of calculating adjustments for changes in costs shall be:
_____
_____
_____

Notices to Employer and Engineer (Sub-clause 49.2.)

The address of the Employer for notices is:
_____
_____
_____

The address of the Engineer for notices is:
_____
_____
_____

Applicable Law (Sub-clause 51.1.)

The applicable law is _____ law.

Procedural Law for Arbitration (Sub-clause 51.2)

The procedural law for arbitration is _____

Language and Place of Arbitration (Sub-clause 51.3)

The language of arbitration is _____ language.

The place of arbitration is _____

PART II – SPECIAL CONDITIONS

(The Clauses referred to in Part II – Section A are those where the provision in the General Conditions (Part I) refer to an alternative solution to be stated in Part II. The provisions in the General Conditions will apply unless an alternative solution is given in Part II – Section A. The clauses in this section need therefore not be completed, but must be completed if alternative solutions to the relevant Part I provisions are necessary.)

1.0 Conditions Precedent to Commencement (Sub-clause 1.1.1.)

The following financial and administrative requirements are conditions precedent to commencement.

_____
_____
_____

2.0 Defects Liability Period (Sub-clause 1.1.11.)

The Defects Liability Period is _____ days.

3.0 Engineer's Duties (Sub-clause 2.1.)

The Engineer requires the consent of the Employer before exercising the following duties:

_____
_____
_____

4.0 Operation and Maintenance Manuals (Sub-clause 6.6.)

Operation and Maintenance Manuals shall be in English language.

5.0 Manufacturing Drawings (Sub-clause 6.9.)

The Contractor is required to disclose to the Engineer or the Employer confidential information as follows:

_____
_____
_____

6.0 General Obligations (Sub-clause 8.1.)

6.1 The following facilities will be provided by the Employer:

_____
_____
_____

6.2 The facilities will be provided at the following rates:

_____
_____
_____

7.0 Performance Security (Sub-clause 10.1)

The Contractor shall obtain a Performance Security of an amount Kshs.

8.0 Contractor Equipment (Sub-clause 14.1)

The following items of Contractor's Equipment will be provided free of charge by the Employer for the Contractor's use:

_____
_____
_____

9.0 Price Variation

9.1 Contract price variations shall not be allowed for contracts not exceeding one year (12 months)

9.2 Where contract price variation is allowed, the variation shall not exceed 15% of the original contract price.

9.3 Price variation requests shall be processed by the procuring entity within 30 days of receiving the request.

10.0 Extension of Defects Liability Period (Sub-clause 30.4)

In the event of suspension the Defects Liability Period shall not last more than ____ days after the date the works would have been delivered but for the suspension.

11.0 Method of Application (Sub-clause 33.2)

Application for payment shall be made as follows:

_____

_____

_____

12.0 Payment (Sub-clause 33.5.)

11.1 The period for payment shall be:

_____

_____

11.2 The place for payment shall be:

_____

_____

13.0 Delayed Payment (Sub-clause 33.6.)

The interest rate for delayed payment is simple interest at a rate three percentage points above the Central Bank of Kenya's average rate for base lending prevailing as of the first day the payment becomes over due.

14.0 Payment by measurement (Sub-clause 33.8)

The provisions for measurement are:

_____

_____

_____

15.0 Customs and Import Duties (Sub-clause 48.1.)

The Contractor shall pay and be reimbursed by the Employer for the following customs, import duties and taxes in consequence of the importation of the Plant:

_____

_____

_____

16.0 Arbitration (Sub-clause 50.2)

The rules of arbitration shall be those contained in the Arbitration Act of the Laws of Kenya.

SECTION V:

SPECIFICATIONS

SECTION II

GENERAL MECHANICAL SPECIFICATION

2.1 General

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

2.2 Quality of Materials

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

All products or materials not manufactured by the Sub-Contractor shall be the products of reputable manufacturers and so far as if they had been manufactured by the Sub-Contractor.

Materials and apparatus required for the complete installation as called for by the Specification and Contract Drawings shall be supplied by the Sub-Contractor unless mention is made otherwise.

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

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

2.3 Regulations and Standards

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

(a) The Kenya Government Regulations.

(b) The United Kingdom Institution of Electrical Engineering Regulations for the electrical equipment of buildings.

(c) The United Kingdom Chartered Institution of Building Services' Guides.

(d) The Kenya Bureau of Standards Specifications.

(e) British Standards and Codes of Practice as published by the British Standards Institution.

(f) The Local Council By-laws.

(g) The electricity Supply Authority By-laws.

(h) The Kenya Building Regulations.

2.4 Electrical Requirements

Plant and equipment supplied under this Sub-Contract shall be complete with all necessary motor starters, control boards, and other control apparatus. Where control panels incorporating several starters are supplied they shall be complete with a main isolator.

The supply power up to and including local isolators will be provided and installed by the Electrical Sub-Contractor. all other wiring shall be as described in the Particular Specification.

The sub-contractor shall supply three copies of all schematic, cabling and wiring diagrams for the Engineer's approval.

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

All electrical plant and equipment supplied by the Sub-Contractor shall be rated for the supply voltage and frequency obtained in Kenya, that is 415 volts, 50HZ, 3-phase or 240 volts, 50HZ, 1-phase as specified in the particular specification.

Any equipment that is not rated for the above voltage and frequencies may be rejected by the Engineer.

2.5 Transport and Storage

All plant and equipment shall, during transportation be suitably packed, crated and protected to minimise the possibility of damage, and to prevent corrosion or other deterioration.
On arrival at site all plant and equipment shall be examined and any damage to parts and protective priming coats made good before storage or installation.

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

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

2.6 Site Supervision

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

2.7 Installation

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

2.8 Testing

2.8.1 General

All testing shall be carried out to the entire satisfaction of the Engineer.

The following sub-clause are intended to define the Sub Contractor's responsibilities with respect to testing and inspection.

2.8.2 Materials Tests

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

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

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

If stock material, which has not been specifically manufactured for the plant and equipment specified is used, then the sub-contractor shall submit satisfactory evidence to the Engineer that such materials conform to the requirements stated herein in which case test of material may be partially or completed waived. Certified mill test reports of plates, piping and other materials shall be deemed acceptable.

2.8.3 Manufactured Plant and Equipment - Works Tests

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

The sub-contractor shall give two week's notice to the Engineer of the manufacturer's intention to carry out work tests and inspection.

The Engineer or his representative shall be entitled to witness such tests and inspections. The costs of such tests and inspections shall be borne by the Sub-Contractor.

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

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

2.8.4 Pressure testing

All pipework installation shall be pressure tested in accordance with the requirements of the various sections of this Specification. The installation may be tested in sections to suit the progress of the works but all tests must be carried out before the work is buried or concealed behind building finishes. All tests must be witnessed by the Engineer or his representative, and the Sub-Contractor shall give 48 hours notice to the Engineer of his intention to carry out such tests.

Any pipework that is buried or concealed before witnessed pressure tests have been carried out shall be exposed at the expense of the Sub-Contractor and the specified tests shall then be applied.

The Sub-Contractor shall prepare test certificates for signature by the Engineer and shall keep a progressive and up-to-date record of the sections of the work that have been tested.

2.9 Colour Coding

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

2.10 Welding

2.10.1 Preparation

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

2.10.2 Method

All welding shall be carried out by the electric arc process using covered electrodes in accordance with B.S. 639.

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

2.10.3 Welding Codes and Construction

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

a) Pipe Welding

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

b) General Welding

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

2.10.4 Welder's Qualifications

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

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

SECTION III

GENERAL PLUMBING AND DRAINAGE SPECIFICATION

SECTION III

GENERAL PLUMBING AND DRAINAGE SPECIFICATION

3.0 General

This section specifies the general requirements for plant, equipment and materials.

3.1 Authoritative Standards and Codes of Practice

The authoritative standard referred to in this Specification are B.S or B.S Codes of practice. Should the contractor wish to substitute any other authoritative standard or code of practice for any referred to in the specification, he must submit details of any such standard or code of practice with two copies of the document for approval by the Architect. Approval will only be given to use an alternative standard or code of practice if the Architect considers the proposed standard or code or practice will produce work of a standard equal or better than that of the specified standard or code of practice.

The whole of the plumbing works is to be executed by a registered plumber and drain layer in strict accordance with the Regulations of the Local Authorities and to the satisfaction of the Architect.

3.2 Materials

3.2.1 Pipework and Fittings

(a) Black Steel Pipework

All black steel pipework up to 65mm nominal bore shall be manufactured in accordance with B.S.1387 medium Grade, with tapered pipe threads in accordance with B.S. 21. All fittings shall be malleable iron and manufactured in accordance with B.S. 143.

Pipe joints shall be screwed and socketed and sufficient couplings unions shall be allowed so that fittings can be disconnected without cutting the pipe. Running nipples and long screws shall not be permitted Unless exceptionally approved by the Engineer.

All black steel pipework, 80mm nominal bore up to 150mm nominal bore, shall be manufactured to comply in all respects with the specification for 65mm pipe, except that screwed and bolted flanges shall replace unions and couplings for the jointing of pipes to valves and other items of plant. All flanges shall comply with the requirements of B.S. 10, to the relevant classifications contained hereinafter under section C of the Specification.

(b) Galvanised Steel Pipework

Galvanised steel pipework shall be manufactured to comply in all respects with the standards described for black steel pipework in paragraph (a) above.

Galvanising shall be carried out in accordance with the requirements of B.S. 1387 and B.S 143 respectively.

(c) Copper Tubing

All copper tubing shall be manufactured in accordance with B.S.2871 from C.160 'Phosphorus De-oxidized Non-arsenical Copper' in accordance with B.S. 1172.

Pipe joints shall be made with soldered capillary fittings and connections to equipment shall be with compression fittings manufactured in accordance with B.S.864.

Short copper connections tubes between galvanised pipework and sanitary fitments shall not be used because of the risk of galvanic action.

If, as may occur in certain circumstances, it is not possible to make the connections in any other way than by the use of copper tubing, then a brass straight connector shall be positioned between the galvanised pipe and the copper tube in order to prevent direct contact.

(d) Cast Iron Pipework

i) Internal iron pipework and fittings for use above ground in connection with internal buildings services, shall be manufactured with spigot and socket joints of the weight required by the Local Authority and shall comply fully with the requirements of B.s. 416.

All joints on cast iron spigot and socket pipes shall be made with an approved cold caulking compound and contraction which may take place.

All cast iron pipework, branches, tees, bends and other fittings shall be supplied complete with inspection covers for cleaning purposes. These inspection covers shall be included as part of the fittings and shall comply with the requirement of B.S. 416.

ii) External Services

Cast iron pipework which is used in connection with buried external services, shall be manufactured, coated and tested in accordance with the requirements of B.S. 1211.

All buried cast iron bends, elbows swept tees and other fittings, shall comply with the requirements of B.S.1130.

Jointing on external cast iron pipes shall be carried out in accordance with one of the methods described in B.S. Code of Practice 301, Clause 505c (v) to the approval of the Engineer.

(e) Pitch Fibre Pipework

Pitch Fire Pipework and fittings for use in connection with external drainage services shall be manufactured in accordance with the requirements of B.S. 2760. Pipes shall be connected by means of purpose made tapered joints manufactured in accordance with B.S. 2760.

Until such time as the use of pitch impregnated fibre pipes is covered by a Code of Practice, the jointing laying and cutting of these pipes shall be carried out in accordance with the requirement of B.S. 2760.

(f) Concrete Pipe

Where concrete pipe and fittings are used in connection with the conveyance of surface water or sewage under atmospheric pressure, they shall be manufactured in accordance with the requirements of B.S.556 Class 1 except where otherwise stated.

The joints of concrete pipe and fittings may be one of the following depending upon application and conditions:

1. Flexible spigot and socket type

2. Flexible rebated type (Stormwater drainage only)

3. Ordinary spigot and socket type

4. Ordinary rebated type (Stormwater drainage only).

Joints (1) and (2) shall be sealed with suitable rubber gaskets manufactured in accordance with B.S. 2494 except where they are likely to be contaminated by oil products in which case the gaskets shall be manufactured in accordance with B.S. 3514.

Joints (3) and (4) shall be made with an approved cement mortar mix.

(g) Asbestos Cement Pressure Pipes

Where asbestos cement pressure pipes and fittings are used in connection with external, above, ground or buried water services, they shall be manufactured in accordance with the requirements of B.S. 486.

The classification of these pipes falls into four classes:

A., B., C., and D. respectively, and the class to be used shall depend upon the pressure conditions pertaining at Site.

Where cast iron detachable joints are used for connecting pipes, the material shall comply with B.S. 1452 and be suitably protected with a non-toxic compound against corrosion.

When jointing components are made in any other material for which there is no B.S. Specification, then the materials used shall be of a quality not less than that required by this standard.

Rubber jointing rings shall be used for sealing purposes and shall comply with the requirements of B.S. 2494, except where they are likely to be contaminated by oil products, in which case the gaskets shall be manufactured in accordance with B.S. 3514.

(h) P.V.C. (Head) Pressure Pipe and Fittings

All PVC pipes and fittings shall be manufactured in accordance with B.S. 3505: 1968.

i) Jointing

The method of jointing to be employed shall be that of Solvent Welding, using the pipe and manufacturers approved cement. Seal ring joints shall be introduced where it is necessary to accommodate thermal expansion.

ii) Anchoring

All bends, valves and hydrant tees etc., in the line of the water main shall be adequately anchored to resist thrust due to internal water pressure. A concrete block shall be cast under and around the pipe and between it and sides of the trench. Well rammed material shall be used to support the pipe and either side of the concrete.

iii) Pipe Bed

Pipe shall be uniformly laid on a 75mm thick bed, (the full width of trench) of fine grained material (sand or red soil) and must not be allowed to rest on the joint or on stones etc.

iv) Supports to Fittings

In underground installations care shall be taken to ensure that heavy components such as valves are fully supported so that no weight is carried by the pipeline.

v) Backfilling

For the protection of the pipe initial backfilling shall be carried out as soon as possible after laying. The initial backfill shall be fine grained material thoroughly compacted around the pipe and consolidated to a depth of 6" above the crown of the pipe at no time shall heavy rocks, stones or other objects be included in the balance of the backfill that might protrude through the initial backfill layer and come into contract with the pipe.

vi) Testing

Pipelines shall be tested in sections under the internal water pressure- normally one and half times the maximum allowable working pressure for the class of pipe used. Testing shall be carried out as soon as practicable after laying and when the pipeline is adequately anchored. Precautions shall be taken to eliminate all air form the test section and to fill the pipeline slowly to avoid risk of damage due to surge.

I) A.B.S. Waste System

Where indicated on the drawings and schedules, the sub-contractor shall supply and fix A.B.S. waste pipes and fittings.

Pipes, traps and fittings shall be in accordance with the relevant British Standards, including B.S. 3943 and fixed generally in accordance with manufacturer's instructions, and B.S. 5572:1978.

Jointing of pipes shall be carried out by means of solvent welding. The manufacturer's recommended method of joint preparation and fixing shall be followed.

Standard brackets, as supplied for use with this system, shall be used wherever possible. Where the building structure renders this impracticable the Sub-Contractor shall provide purpose made supports, the centres of which shall bot exceed one metre.

Expansion joints shall be provided as indicated. Supporting brackets and pipe clips shall be fixed on each side of these joints.

j) PVC Soil system

The sub-Contractor shall supply and fix PVC soil pipe and fittings as indicated on the drawings and schedules.

Pipes and fittings shall be in accordance with relevant B.S. including B.S. 4514, and fixed to the manufacturer's instructions, and B.S. 5572.

The soil system shall incorporate synthetic rubber gaskets as provided by the manufacturers whose fixing instructions shall be strictly adhered to.

connections to W.C. and pans shall be effected by the use of a W.C. connector, gasket and cover, sized to suit pan outlet.

Suitable supporting brackets and pipe clips shall be provided at maximum of one metre centres.

The Sub-Contractor shall be responsible for the joint into the Gully Trap on Drain as indicated on the drawings.

3.2.2 VALVES

(a) Draw-off Taps and Stop Valves (up to 50mm Nominal Bore)

Draw off taps and valves up to 50mm nominal bore, unless otherwise stated or specified, for attachment or connection to sanitary fitments shall be manufactured in accordance with the requirements of B.S. 1010.

(b) Gate Valves

All gate valves 80mm nominal bore and above, other than those required for fitting to buried water mains shall be of cast iron construction, in accordance with the requirement of B.S. 3464. All gate valves required for fitting to buried water mains shall be of cast iron construction in accordance with the requirements of B.S. 1218.

All gate valves upto and including 65mm nominal bore shall be of bronze construction in accordance with the requirements of B.S. 1952.

The pressure classification of all gate valves shall depend upon the pressure conditions pertaining to the Site of Works.

(c) Globe Valves

All globe valves up to and including 65mm nominal bore shall be of bronze construction in accordance with the requirements of B.S. 3961.

The pressure classification of all globe valves shall depend upon the pressure conditions pertaining to the Site of Works.

(d) Check or Non-Return Valves

All check or non-return valves 800mm nominal bore and above shall be of the swing check type of cast iron construction in accordance with the requirements of B.S. 4090.

The pressure classification of all check or non-return valve shall depend upon the pressure conditions pertaining to Site of the Works.

(e) Ball Valves

All ball valves for use in connection with hot and cold water services shall be of the portsmount type in accordance with the requirements of B.S. 1212, constructed from bronze or other corrosion resistant materials. These valves fall into three pressure classifications as follows:-

(i)	Low Pressure	-	3.58 b maximum
(ii)	Medium Pressure	-	7.72 b maximum
(iii)	High Pressure	-	12.62b maximum

The pressure classification required for each ball valve will be designated in the description of its associated equipment contained in section IV of the Specification.

(f) Manually Operated Mixing Valves

Mixing valves for shower fittings and other appliances being provided under the Sub-Contract Works shall be manufactured in accordance with the requirements of B.S. 1415 from bronze or other corrosion resistant materials.

3.2.3 WASTE FITMENT TRAPS

(a) Standard and Deep Seal P & S Traps

Where standard or deep traps are specified they shall be manufactured in suitable non-ferrous materials in accordance with the full requirements of B.S. 1184.

In certain circumstances, cast iron traps may be required for cast iron baths and in these instances bath traps shall be provided which are manufactured in accordance with the full requirements of B.S. 1291.

(b) Anti-Syphon Traps

Where anti-syphon traps are specified, these shall be similar or equal to the range of traps manufactured by Terrain - their self-resealing traps or by Marley extrusions Ltd. - their Antisyphon Traps

3.2.4 PIPE SUPPORTS

(a) General

This Sub-Clause deals with pipe supports securing pipes to the structure of buildings for above ground application.

The variety and type of supports shall be kept to a minimum and their design shall as such as to facilitate quick and secure fixing to metal, concrete, masonry or wood.

Consideration shall be given when designing supports, to the maintenance of desired pipe falls and the restraining or pipe movement to a longitudinal axial direction only.

The Sub-Contractor shall supply and install all steelwork forming part of the pipe support assemblies and shall be responsible for making good any damage to builders work associated with the pipe support installation.

The Sub-Contractor shall submit all his proposals for pipe supports to the Engineer for approval before any erection work commences.

(b) Steel and Copper Pipes and Tubes

Pipe runs shall be secured by pipe clips connected to pipe hangers, wall brackets, or trapeze type supports. 'U' bolts shall not be used as a substitute for pipe clips without the prior approval of the Engineer. An approximate guide to the maximum permissible supports spacings in metres for steel and copper pipe and tube is given in the following table for horizontal runs.

Size Minimal Bores	Copper Tube to B.S. 659	Steel Tube to B.S. 1237
15mm	1.25	2.0m
20mm	2.0m	2.5m
25mm	2.0m	3.0m
40mm	2.5m	3.0m
50mm	2.5m	3.5m
65mm	3.0m	3.5m
80mm	3.0m	3.5m
100mm	3.0m	4.0m
125mm	3.0m	4.5m
150mm	3.5m	4.5m

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

c) Cast Iron and Asbestos Cement Spigot and Socket Jointed Pipes

Cast iron and asbestos cement socketed pipes shall generally be supported at every socket joint by means of either holderbats secured rigidly to the structure, or purpose made straps for attachment to rigid steel support brackets. When holderbats are used, they shall conform to the requirements of B.S. 416.

Suitable anchors shall be provided at all changes of pipe directions, junctions and tees, to counterpart the effect of end of thrust loads.

(d) Asbestos Cement Pressure Pipes

Asbestos cement pipes with either cast iron detachable joints or asbestos cement screw joints shall be supported and anchored on either side of the joint.

Pipe hangers and trapeze type supports shall not be suitable for the suspension of asbestos pressure pipes unless they are designed with suitable restrictions to prevent swinging while at the same time providing the necessary support requirements.

Within building, asbestos pressure pipes shall be carried either on concrete supports or on rigidly fixed steel wall brackets. Suitable anchors shall be provided at all

changes of pipe direction, junctions and tees to counterpart the effect of end thrust loads.

(e) Concrete and Pitch Fibre Pipes

These pipes shall not be used for above ground application.

(f) Expansion Joints and Anchors

Where practicable, cold pipework systems shall be arranged with sufficient bends and changes of direction to absorb pipe expansion providing that the pipe stresses are contained within the limits prescribed in the relevant B.S. Specification.

The Sub-Contractor shall pay particular care when supporting cast iron and asbestos cement pipes in order to ensure that settlement and building movement do not break the pipe joints.

Where piping anchors are supplied, they shall be fixed to the main structure only. Details of all anchor design proposals shall be submitted to the Engineer for approval before erection commences.

The Sub-Contractor when arranging his piping shall ensure that no expansion movements are being transmitted from pumps to piping systems or vice versa.

(g) Jointing Pipes

Joints shall be made strictly in accordance with the manufacturer's instructions. The Sub-Contractor shall make use of the technical advisory services offered by manufacturers for instructing pipe jointers in the methods of assembling joints.

Where manufacturers recommend the use of special jointing tackles, the sub-contractor shall use these for the assembly of all joints to pipes. Sockets shall be laid looking uphill unless otherwise approved.

Before making any joints, all jointing surfaces shall be thoroughly cleaned and dried and maintained in such condition until the joints have been completely made or assembled. Notwithstanding any flexibility provided in the pipe joints, pipes must be securely positioned to prevent avoidable movement during and after the making of the joint.

The space between the end of the spigot and the should of the socket of flexibly jointed piped when jointed shall be as recommended by the manufacturer or ordered by the Engineer.

After flexibly jointed pipes, other than PVC pipes have been jointed the gaps between the barrel of the pipes and the internal face of the socket shall be sealed with puddle clay, inculcate rope yarn or other approved material. The rope yarn or other material must have treated so as not to support bacterial growth.

Where loose collars are used to join the pipes cut for closers, special tools shall be employed to keep the inside of the pipes flush and the collar concentric with the pipe while the joint is being made.

Pipes provided with spigot and socket joints of the self-centering, instantaneous joint type, such as the rubber ring push fit joint, shall be laid and jointed strictly in accordance with the makers instructions. Generally the joint ring shall be cleaned and inspected for cuts and defects, and socket and spigot examined to ensure freedom from oil, grease, tar and grit. The makers recommended lubricant will be used.

(h) Cast Iron Joint Fittings

Cast iron detachable joint collars and flanges shall be tested by striking lightly with a spanner immediately before they are placed and if thy fail to ring true shall be set aside and not incorporated in the work until proven sound.

The flanges shall be correctly positioned and the component parts including any insertion ring cleaned and dried.
Insertion rings shall be fitted smoothly to the flange without folds or wrinkles. The face and bolt holes shall be brought fairly together and the joints shall be made by gradually and evenly tightening bolts in diametrically opposed positions. Only standard length spanners shall be used to tighten the bolts. The protective coating if any, of the flange shall be made good when the joint is completed.

Bolt threads shall be wrapped with PTFE tape where directed before use.

No washers shall be used on flanged pipework to be laid below ground. Bolts shall be as specified and shall be of the correct length, leaving a maximum of two threads exposed.

(i) Solvent Welded Joints

Only the solvent cement recommended by the manufacturer for his pipe joint system shall be used and his instructions on the making of the joint shall be closely followed.

Excess solvent cement shall not be applied to the inside of the pipe socket and all surplus solvent shall be removed from the joint and the pipe. Any solvent falling on the trench formation shall be removed by excavating the contaminated soil.

Solvent welded pipes jointed outside the trench shall not be lowered into the place until the elapse of time recommended by the manufacturer. The time allowed for curing shall be increased with lower temperatures.

3.2.5 Connection of Tubing to Cold Storage Tanks, Hot Water Cylinders and Sanitary Fittings

Each connection of tubing to cold water storage tanks shall be made by drilling a hole in the tank side and using a long screw, union and two backnuts all well screwed up in red lead. Joints of tubing to flanged and bossed connections of hot water cylinders shall be made with a boiler screw, union and backnut screwed up in red lead.

Connections to sanitary fittings shall be made with 450mm lengths of copper tubing bent to shape as required with copper to iron couplings at each end, and red lead joint to joint union of fittings and tubing.

All sanitary-ware fittings shall be left in a clean and good condition to the satisfaction of the Engineer.

All fittings shall be fixed in accordance with the manufacturer's instructions and shall comply with the general requirements of B.S. Code of Practice 305 and the Particular requirements of the latest applicable B.S. Specification.

Lavatory basin brackets shall be cut and pinned to walls in cement mortar including making good rendering, tiling or plastering etc.

3.2.6 Pipe Sleeves

Main runs of pipework are to be fitted with sleeves where they pass through walls and floors. Generally the sleeves shall be of P.V.C. except where they pass through the structure, where they shall be mild steel. The sleeves shall have 6mm - 12mm clearance all around the pipe, or for insulated pipework all around the insulation. The sleeve will then be packed with slag wool or similar.

3.2.7 Cutting Pipes

Iron pipes shall be cut by a method and with apparatus which provides a clean square cut of the pipe and of the lining, if any, without damage to pipe or lining.

All cut or trimmed ends, and the parts of any pipe on which the coating may have suffered damage shall be recoated with bitumen before the pipes are laid. The external area at cut spigot ends of ductile iron pipes shall be ground for a distance of at least 125mm.

Asbestos-cement pipes shall be cut by hacksaw or other approved means to a square and even finish without splitting or fracturing the wall of the pipe. A percentage of the pipes ordered shall be supplied with fully turned barrels and these pipes will be set aside for use in cutting specific lengths. When no fully turned pipes are available a hand operated turning machine shall be used to prepare the ends of cut pipes for Johnson Couplings, barrel joints or collar joints.

Pitch-impregnated fibre pipes shall be cut by saw and where necessary the end shall be filled or machined to the required 2 degrees taper.

Concrete pipes shall be cut to a square and even finish without splitting or fracturing the wall of the pipe. Reinforcement shall be cut back flush with the concrete and bare metal protected with bituminous paint or cement grout as directed.

Only steel pipes supplied rounded throughout their length shall be used as cut pipes to form closures. The cutting shall be done by an approved method and apparatus which provides a clean square cut, without separation of the lining from the pipe wall. Minor damage to the lining may, if permitted be repaired on site in accordance with the manufacturer's instructions. Where in the opinion of the Engineer the damage is serious the pipe or special shall be returned to the manufacturer for reconditioning.

3.2.8 Pipes Built into Structures

The outside surface of all pipes and special castings to be built into structures shall be thoroughly cleaned immediately before installation. Where ordered protective coatings to metal pipes shall be removed from the sections to be built in, while the external surfaces of fireclay and concrete pipes shall be roughened to form a key for concrete or mortar. Sheathing to steel pipes shall be cut away from the sections to be built-in and after erection the protection shall be completed by applying approved bituminous material around the barrels of pipes at the junctions with structures.

Pipes passing through water retaining walls and floors shall, where possible, be built into the structure in-situ. Shuttering shall be formed closely to the outside of the pipes, and concrete shall be placed and compacted thoroughly round pipe and puddle flange, if any.

Where fixing in the course of construction is not possible, temporary opening in structures, formed to the dimensions shown by the Engineer shall be left where indicated or directed to accommodate the subsequent erection of pipes and special castings. In water retaining structures, they shall taper to a smaller dimension towards the external faces of structures and shall include where indicated a waterstop. In basements, dry chambers at pumping stations etc., temporary openings shall taper to a smaller dimensions towards the internal faces of structures and shall also include, where indicated a waterstop.

Prior to in-filling, all surfaces against which fresh concrete is to be placed shall be prepared as specified, while the external surfaces of pipework shall be prepared as described in this clause.

3.2.9 Setting Valves

Care must be taken to prevent damage to all valves, fire hydrants and the like, and their ancillary equipment. Valves etc., and ancillary apparatus shall be stored in clean conditions and in a manner that excludes all water. Where directed, head-stock, motors, gearing or indicators shall be removed, adequately labelled for identification, stored carefully in weather-proof premises and be reconnected after erection of the valves. Frost cocks shall be kept clean and free from obstruction. Electrical equipment shall be protected from damp and the damp-proofing seals shall remain intact until the electrician is ready to connect up the equipment.

The gunmetal faces and seats of all valves must be kept clean. No valve shall be closed without first wiping the faces with a clean cloth. The cavity beneath the valve door shall be thoroughly cleaned by hand. In the event of accident, fouling matter shall be either dissolved or carefully removed by methods that do not involve scraping or gunmetal faces.

All valves shall be set so that operating spindles are truly vertical unless otherwise detailed or directed.

Every stuffing box shall be examined when the main is charged with water and leaking boxes shall be adjusted or replaced with square plaited lubricated hemp packing or approved manufacture. The stuffing box shall not be so tightly packed as to materially affect the friction of the packing on the spindle.

No air valve shall be stored before erection in the open in sunlight, or upside down to expose the balls and air cavities. Air valves shall be checked before the main is charged to ensure that the balls and faces are not scored or split and that there is no direct or other deleterious materials in the cavities of the body. All air nozzles shall be probed to see that they are clean.

Fire hydrants, frost plugs and similar fittings shall be checked before being incorporated in the line and before the main is charged to ensure that all passageways are clean.

The installation of special types of valve and metering equipment must be strictly in accordance with the manufacturer's instructions.

The direction of opening of the valve shall be indicated on the headstock and on the underside of hydrant covers.

3.2.10 Pressed Steel Plate Storage Tanks

The water capacity of the tanks and the diameter of all pipes and pipe connections therewith will be as detailed on the Drawings and Bills of Quantities. Unless otherwise detailed the proportions of a tank will be such that the height is not less than three quarters of the length and not less than the width. All dimensions must be approved by the Engineer.

Elevated Pressed Steel Plate storage tanks will comply with B.S. 1564 and will be constructed of 4.76mm (top row only) and 6.35mm thick galvanised pressed steel tank plates, 1.22m or 1.00m square nominal size, embossed and with external flanges bolted together. Where detailed in the Sub-Contract the tank will be partitioned centrally, the division wall to be adequately stayed to permit emptying of either half of the tank whilst maintaining full water depth in the other half.

The tank will be complete with a pitched or vaulted cover and gable ends of 3mm thick steel plates, lap jointed and supported on bearers with hinged insect proof cover; 1 No. float operate water level indicator; and will be provided with internal and external ladders as follows. Where the tank is constructed to operate in two halves 2 No. access manholes and internal ladders will be provided.

The external ladder will have 40mm x 6mm mild steel flat stringers with 12mm diameter mild steel rungs and will be cleated to the tank at 1.2m intervals. The stringers will be taken 750mm above the tank cover and bent to return to the cover a distance of 450m from the edge. This ladder will be complete with 40mm x 3mm mild steel flat safety hoops of 600mm diameter, spaced at 1.2m vertical centres, truly bent and welded to the stringers. The safety hoops will be jointed by 3 No. 40mm x 3mm mild steel flat vertical guard strips, evenly spaced and flat fillet welded to the hoops.

The internal ladders will have 65mm x 12mm steel flat stringers with 20mm diameter mild steel rings and will be cleated to the tank at 1.2m intervals.

The tank bottom plates will be provided with a single pipe pad for the washout pipe connections and double pipe pads for all other pipes which pass through the bottom of the tank.

The tank will be provided and erected complete with all bolts, nuts, washers, internal braces and approved non-toxic jointing materials (fibre-glass or bitumen impregnated filler strip or approved equal).

The whole of the tank steelwork and plates will be galvanised as specified before dispatch and after erection, painted with an approved etching primer and two coats of a bitumen based aluminium paint internally and two coats of non-toxic black bitumen paint internally, both as specified.

The tank after final erection on its permanent foundation will be filled with water to overflow level for a period of 24 hours. Any leaks which become apparent will be made good to the satisfaction of the Engineer before acceptance of the work. Both halves of the tank will be tested separately.

3.2.11 Pipework For Pressed Steel Tank

All pipework associated with the tank and stand will be mild steel pipe to B.S. 534 with flanged joints. The pipework will comprise one ball mounted standing inlet pipe at designed top water level, one outlet pipe with ball mounted and approved strainer to take water from the level as detailed on the Drawings. Where not detailed the outlet pipe will take water from not less than 75mm above the tank bottom. One ball mounted standing overflow pipe with its lip 50mm above designed top water level, and one washout pipe which will be capable of completely draining the tank will be provided. Where the tank is constructed to operate in two halves the inlet, outlet, overflow and washout pipes will be duplicated in each half of the tank.

3.3.0 INSTALLATION

3.3.1 General

Installation of all pipework, valves, fittings and equipment shall be carried out under adequate supervision from skilled staff to the relevant codes and standards as specified herein. The Sub-Contractor shall be responsible to the Main Contractor for ensuring that all builders work associated with his piping installation is carried out in a satisfactory manner to the approval of the Engineer.

3.3.2 Above Ground Installation

(a) Water Services

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 which shall be required are achieved without springing the pipe.

Where falls are not shown on the Contract Drawings or stated elsewhere 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 water systems shall be provided with sufficient drain points and automatic air vents to enable them to function correctly. Valves and other user equipment shall be installed with adequate access for operation and maintenance where valves and other operational equipment are unavoidably installed beyond normal reach or in such position as to be difficult to reach from a short step ladder, extension spindles with floor or wall pedestals shall be provided.

Screwed piping shall be installed with a sufficient number of unions to facilitate easy removal of valves and fittings, without the need to cut the pipe.

Full allowance shall be made for the expansion and contraction of pipework precautions being taken to ensure that any force produced by pipe movements are not transmitted to valves, equipment or plant.

All screwed joints to piping and fittings shall be made with P.T.F.E. Tape in accordance with B.S. 4375.

The test pressure shall be maintained by the pump for about one hour and if there is any leakage, it shall be measured by the quantity of water pumped into the main in that time. A general leakage of one gallon per 25mm of diameter, per 1.6 kilometre per 24 hours per 30 metres head, may be considered reasonable but any visible individual leak shall be repaired.

(b) Sanitary Services

Soil, waste and vent pipe systems shall be installed in accordance with the best standards of modern practice as described in B.S. 5572 to the approval of the Engineer.

The Sub-Contractor shall be responsible for ensuring that all ground floor waste fittings are discharged to a gulley trap before passing to the sewer via a manhole.

The Sub-Contractor shall provide all necessary roding and inspection facilities within the draining system in position where easy accessibility is available.

Where a branch requires roding facilities in a position to which normal access is unobtainable, then that branch shall be extended so as to provide a suitable purpose made roding eye in the nearest adjacent wall or floor to which easy access in available.

The vent stacks shall terminate above roof level and where stack passes through roof, a weather skirt shall be provided. The Sub-Contractor shall be responsible for sealing the roof after installation of the stacks.

The open end of each stack shall be fitted with a plastic coated, or galvanised steel, wire guard.
Access for roding and testing shall be provided at the foot of each stack.

(c) Sanitary Appliances

All sanitary appliances associated with the Sub-Contract Works shall be installed in accordance with the best standard of modern practice as described in C.P. 305 to the approval of the Engineer.

3.3.3 Underground Installation

(i) General

All underground water and drainage service installation shall be installed in accordance with the best standard of modern practice as described in C.P. 301 and C.P. 305 respectively and the following clause.

(ii) Bedding

(a) Granular Bedding Material - Type A

Granular bedding Type A shall comprise broken stone or gravel, crushed brick or concrete to pass a 25mm sieve and be retained on 5mm sieve thoroughly mixed with free draining coarse sand in the ratio of one part sand to two parts stone or gravel; or aggregate to B.S. 882 Table 3 or other material which in the opinion of the Engineer has similar characteristics.

Particles shall be rounded or angular but not flaky or elongated and of adequate crushing strength to produce when tested in accordance with B.S. 812 a 10 percent fines value, greater than 5 tonnes.

(b) Selected Fill - Type B

Type B selected fill shall be uniform readily compatible material from tree roots, vegetable matter and building rubbish. All clay lumps retained on a 75mm sieve and all stones retained on a 25mm sieve shall be excluded.

(c) Granular Bedding Material - Type C

Granular bedding Type C shall be as type A bedding material but with all material passing a 10mm sieve. In addition, where used to be flexible not exceeding 0.1. The compaction factor test shall be carried out as follows:-

Equipment

1. An open ended cylinder 225mm long and 150mm internal diameter, (a pitch fibre or PVC pipe is suitable)

2. A metal rammer with a skirting face 40mm diameter weighing 0.9 to 1.1 kg

3. A measuring rule.

Method

A representative sample more than sufficient to fill the cylinder is obtained, (about 12 kg). It is important that the moisture content of the sample should not differ

significantly from that of the material from which the sample was obtained at the time of the use of the trench.

The cylinder is placed on a firm surface and the material sample poured into it loosely and without tamping. The top surface of the material is struck off level with the top of the cylinder and all surplus material removed. The cylinder is then lifted clear of its contents and placed on a clean area of the flat surface. About one quarter of the material is then placed back in the cylinder and tamped thoroughly until no further compaction can be obtained. This procedure is repeated until with the second, third and final quarter tamping each successive surface as level as possible.

The height from the material surface to the top of the cylinder is then measured with the rule and this distance divided by the height of the cylinder, (225mm), is referred to as the Compaction Factor.

For each batch of material three (3) Compaction Factor Tests will be made and if the average value is greater than 0.1 then the batch of material will be deemed to be unsuitable for use as Type C bedding material. Material sufficient for the bed and surround of 200 linear metres of pipe will be considered to comprise a batch.

(d) **Bedding and Surround For Concrete Pipes**

The material to be used for bedding and surround for concrete pipes shall not contain more than 0.3 per cent sulphate expressed as sulphur trioxide nor shall it be obtained from a site where the ground water contains more than 0.1 per cent sulphate.

(iii) **Field or French Drains**

Pipes for french drains shall be either British Standard Surface pipes glazed or unglazed manufactured to B.S. 65 and 540, with Type 2 sockets or plain ended supplied with sleeve couplings or type 1 perforated socketed and sleeve coupled pipes porous concrete pipes to B.S. 1194.

(iv) **Definitions**

For the purpose of underground piped services the following definitions shall apply:-

(a) Top soil shall mean the top layer of soil that can support vegetation.

(b) Suitable material shall mean all material capable of being compacted, forming a stable fill and approved as such by the Engineer.

(c) Unsuitable material shall mean material other than suitable material and shall include material from swamps, marshes or bogs, peat, logs, stumps, or other perishable material, clay of liquid limit exceeding 80 and/or plasticity index exceeding 55, or materials having greater moisture content than approved for use.

(d) Rock in excavation shall mean such material which cannot be excavated by hand methods and individual solid boulders exceeding 0.2 cu.m.

(e) `Rigid pipes' shall mean pipes of cast or spun iron, concrete asbestos cement, clay or similar materials.

(f) `Flexible pipes' shall mean pipes of steel, PVC or other plastic, pitch fibre, ductile iron or similar materials.

(g) `Rigid joints' shall mean joints made of bolting together flanges integral with the barrels of the pipes, by welding together the barrels of the pipes, by caulking sockets with non-deformable material, such as cement mortar, run lead or by similar techniques.

(h) `Flexible joints' shall mean joints made with factory-made jointing materials, loose collars, rubber rings etc., and which allow some degree of flexing, however small, between adjacent pipes.

(v) Types of Pipe

The Contractor shall construct the pipelines using the designs of pipe, bed, haunch and surround detailed on the Drawings.

Where the Contractor wishes to use a type of pipe not manufactured in the minimum internal diameter indicated in the Contract, he may substitute the next larger diameter manufactured, subject to compliance with the design requirements, clearance and cover. The Contractor shall not use pipes and fittings supplied by more than one manufacturer without approval.

(vi) Setting Out

The Contractor shall set out the underground services to the lines shown on the Drawings. Where the service is required laid to falls these shall be set by means of proper sight rails and boning rods.

Sight rails shall be of the following minimum standard. They shall be adjustable sight rails of 150mm x 30mm wrought softwood of length 1m painted black and white as directed secured to strong uprights embedded in the ground at distances not exceeding 60 metres.

Care shall be taken to ensure that these sight rails are not obscured by spoil from the excavation.

(vii) Excavation

The Contractor shall carry out the excavation in accordance with the Drawings and shall comply with the slopes, levels, depths and heights shown thereon.

Unless otherwise directed top soil shall be stripped, laid aside and kept separate from other excavated materials for reuse. Road bottoming and surfacing material which is approved as suitable for re-use shall be laid aside and kept separate from other excavated materials.

Where shown in the Contract or directed top soil shall be stripped over the full width of the working area before any other operation is carried out and soil deposited in dumps. On completion of the other operations the soil shall be evenly spread over the stripped surface.

Excavation shall be carried out the dry and both trenches and general areas shall be kept free from water by pumping, provision of temporary drains, sumps and the like.

Excavations shall be taken out to the least dimensions required to accommodate the service and the working space necessary for its installation subject to the following restrictions. All excavations shall be carried so that the soil beneath receives the maximum amount of disturbance.

Unless otherwise directed the overall width of pipe trench excavation from the trench bottom to a level 300mm above crown of the pipe shall be in accordance with the following table:

Table 40.1 - Pipe Trench Widths

Nominal Internal Diameter (mm)	Minimum Overall Trench Width (mm)	Maximum Overall Trench Width (mm)
100	430	630
150	500	700
200	550	750
225	580	780
300	680	880
375	950	1150
400	1000	1200
450	1330	1230
525	1120	1320
600	1240	1440
675	1330	1530
750	1400	1600
825	1490	1690
900	1920	2120
1050	2100	2300
1200	2290	2490
Above 1200	Outside diameter of pipe plus 800mm	Outside diameter of pipe plus 1000mm

Battering or stepping of the sides of trenches, if approved, will only be permitted from 300mm above the crown of the pipe to the original ground level.

The maximum trench width given above shall be measured to the earth face of any sheeting or trench supports.

Excavation shall be taken to the depth required for the class of bedding shown on the drawings. Any excavation greater than this depth shall be filled with the same material as required for bedding to the Engineer's satisfaction and at the Contractor's expense.

When concrete is directed to be cast directly against existing soil the excavation shall be neatly executed to the shape required.

Excavation shall be timbered, sheet piled or otherwise supported to ensure the stability of the surrounding ground, the Works and adjacent structures and to ensure the safety of all persons. The sides of excavation will be battered only where approved or directed. All over-excavation due to slips, overbreak and the like shall be remedied at the Contractor's expense, by infilling with suitable material as directed by the Engineer.

Should the Engineer regard the Contractor's support of any excavations as inadequate then the Contractor shall comply with any instruction by the Engineer to alter or increase the support. Any instruction so given by the Engineer will in no way relieve the Contractor of his responsibilities under the Contract.

Material from excavations other than unsuitable material shall be set aside clear of the sides of excavation for reuse. Unsuitable material shall be removed to the Contractor's tip.

When the final level of the foundation, as shown on the Drawing or directed by the Engineer, has been reached the Engineer will inspect and approve the foundation prior to the commencement of concreting or other work thereon. The bottoms of all excavations shall be carefully shaped for slop as shown or directed. Any pockets of soft or loose material shall be removed and any cavities or fixtures filled as directed.

The Contractor shall at his own expense make good with mass concrete or as directed exaction greater than required for the complete work. Material which the Contractor has allowed to become unsuitable shall be removed and replaced with mass concrete or as directed, at the Contractor's expense.

The Contractor shall provide whatever additional pipe protection is directed specified maximum width be exceeded due to his method of working.

Where rock or boulders are present in pipe trenches specified to have Class C or FD bedding the sides of the trenches shall be so trimmed that when the pipe is laid to the correct level and alignment no projection of the rock comes within 100mm of the outside of the pipe barrel at any point.

Where rock is found in the bottom of trenches for pipes specified to have Class C or FD bedding, the trenches shall be excavated to the additional depth necessary to allow for Class B or FC bedding respectively.

The Contractor shall avoid unduly disturbing the finished trench formation and shall make good disturbed areas and excavate any wet or puddled material which might result from his failure to do so.

Where directed trenches close to existing structures shall be opened in short lengths and refilled or partly filled with mass concrete or other approved material.

Trenches for pipes carrying water under pressure, except where otherwise required by the Contract, shall be excavated to a sufficient depth to ensure, after consolidation of the refilling, a normal minimum depth of cover of 1800mm from the ground surface to the top of the pipe. Under roads a normal minimum depth of cover of 900mm shall be provided. Where the pipeline is required to be laid to a depth which does not permit this condition to be fulfilled the ground surface shall be made up locally with banking as directed.

(viii) Pipe laying General

On arrival at the Site, pipes shall be carefully inspected for damaged ends, cracks or other defects and any found to be faulty shall be marked and set aside for a decision from the Engineer as to their acceptability.

Pipes with damaged ends may be either completely replaced or have the ends cut off and trimmed as directed by the Engineer.

The Contractor shall ensure that all pipes are properly handled both by his staff and by any cartage Contractor employed by him. During transport, pipes shall not be allowed to rest on narrow cross-members of vehicles or anything else that might give concentrated loads due to the weight of the pipe or bumping of the vehicle but shall be properly supported on soft material. Sufficient labour and equipment shall be on hand before loading and unloading is commenced and under no circumstances shall any pipes be dropped or thrown from a vehicle.

The Engineer will have the right to reject consignments or stocks of piping from which failed pipes have been drawn, or order them to be pressure tested to works pressures outside the pipelines at the Contractor's expense even though no defects are apparent, if there is reason to believe that mishandling has taken place.

Flat braided wire slings shall be used for slinging all pipes except externally coated pipes and plastic pipes for which only special band slings not less than 300mm wide shall be used. Chain or rope slings, hooks, or other devices working on scissor or grab principles shall not be used.

Subject to the requirements of inspection before acceptance, protective bolster, caps or discs on the ends of flanges of pipes, specials or fittings shall not be removed until the pipes, specials, or fittings are about to be lowered into the trench.

Before a pipe is lowered into the trench, it shall be thoroughly examined to ensure that the internal coating or lining and the outer coating or sheathing are undamaged.

Where necessary the interiors of pipes, specials and fittings shall be carefully brushed clean.

Any damaged parts of the coatings or lining shall, before a pipe is used, be made good as directed.

Pipeclaying shall not commence until the bottom of the trench and the pipe bed have been approved. Pipes shall be brought to the correct alignment and inclination concentric with the pipes already laid.

(ix) Bedding and Protecting Pipes Generally

Pipe bedding refers to all bedding haunching and surrounding of pipes and shall be carried out to the types arrangements and dimensions shown on the Drawings.

During the placing of pipe bedding temporary side supports and sheeting shall be removed except where directed to be left in and the full width of the trench shall be infilled with bedding, haunching, surrounding or anchoring materials.

A cavity of adequate size shall be excavated in the sides and bottom of the trench or left in the pipe bed at each joint and at each sling position.

The bottom of the trench or surface of the bed shall be finished to a smooth even surface at the correct levels to permit the barrel of the pipe to be solidly and evenly bedded throughout its whole length between joint and sling holes.

For water pipes the preparation of the trench bottom or surface of the bed shall be completed for at least one full pipe length in advance of the pipe laying, except where in exceptional circumstances another arrangement is approved.

For sewer pipes the trench bottom or surface of the bed shall be completed between adjacent manholes for inspection by the Engineer prior to laying the pipes.

No pipe bedding material shall be placed in trenches containing water.

Where granular bedding is to be used, stones, bricks or similar materials shall not be used below or against the pipe to locate them in position in the trench or to level the pipes.

Where directed, puddle clay dams 500mm thick shall be constructed around the pipe and across the trench as haunching proceeds. The dams shall be at intervals not exceeding 30 metres or as directed and their height shall be determined by the Engineer.

Where directed by the requirements for testing pipelines the method of haunching and surrounding pipes shall be modified to leave pipe joints exposed.

Where there is high ground water table all pipes shall be surrounded in an approved free draining bedding material as specified.

(x) Laying of Pipes

Every pipeline shall be accurately laid to correct line and level perfectly true from joint to joint.

Whenever work is suspended, the open ends of all pipes and junctions shall be adequately plugged to prevent the ingress of any coil or rubbish etc. Care shall be taken at all joints to prevent ingress of any material.

Immediately after laying, the open end of a pipe shall be sealed with a wooden plug or approved stopper of appropriate size to prevent the entry of material which might contaminate the pipeline, damage the linings, obstruct the waterway or affect the working of valves, meters etc. Plugs shall be unperforated and shall be shaped to fit exactly so that water from the trench excavations cannot gain access to the pipeline.

Water pipes and fittings 150mm and under in diameter shall have a brush equal in diameter to the internal bore of the pipe drawn through them as the work proceeds. The brush shall not be removed from the pipeline from commencement until completion.

The plugs in sewers may, with the Engineer's approval, be provided with small holes for drainage purposes, but water from the trench excavation which is heavily charged with silt shall not be allowed to gain access to the pipe.

Where work is interrupted for a period, the plugs left in position shall be regularly inspected for their fixing to ensure that there has been no tampering by unauthorised persons. Whenever any plug is removed, the immediate length of pipe shall be examined for dirt or obstructions and shall be cleaned as required.

Adequate precautions shall be taken by way of backfilling or other means to anchor each pipe securely to prevent floatation of the pipeline in the event of trench being flooded.

No equipment, clothing or apparel shall be left or stored inside pipeline.

If the normal continuity of construction would otherwise be interrupted pending the delivery of valves or specials, the exact extent of the temporary gaps to be left shall be pre-determined after reference to the Engineer. The Contractor shall submit dimensioned sketches, to the Engineer for approval, showing details of the pipes and jointing arrangements to be adopted to effect ultimate closures. Care shall be taken to preserve the accurate alignment of the pipeline across all such temporary gaps.

(xi) Laying to Curves

Where flexibly jointed rigid pipes are to be laid to curve, the outside of spigots in the joints shall not butt hard against the inside of the socket. An angle of pull shall not exceed that laid down by the pipe manufacturer.

Where curves are to be negotiated with straight steel piping with welded joints, no joint shall be flexed more than one degree. Up to two degrees will be permitted with Johnson Couplings.

Where curves are to be negotiated with straight prestressed concrete pipes no joint shall be flexed more than half a degree. For sharper curves purpose made level pipes, level pipes, level adaptors and standard bends shall be provided.

(xii) **Manholes**

(1) **General**

All manholes provided under the Sub-Contract Works shall be constructed of approved materials and in an approved manner.

All manholes shall be water-tight and if constructed of brickwork, solid blockwork or stonework, they shall be rendered internally with a cement mortar of at least 12mm thickness and finished with a smooth surface.
The sides of all channels in every manhole shall be brought up vertically to a height of not less than the diameter of the drain and shall be benched in good concrete from the top of the channels at an angle of 30^0 to the horizontal and floated to a smooth hard surface with a coat of 1:1 cement mortar.

In all other respects, manholes shall be constructed in accordance with B.S. Code of Practice 301.

(2) **Rectangular and Square Manholes**

Rectangular and square straight through manholes shall be constructed from brickwork, solid blockwork, stonework or concrete to comply with the following minimum internal dimensions (millimetres).

Depth Below Ground of Outgoing Invert	Internal Access Shaft Dimensions L X W	Size of Main Channel Diameter	Internal Chamber Dimensions L X W	Height of Chamber above Benching	Wall Thickness
Up to 740	-	100 to 150	610 x 450	-	150
Up to 740	-	230 to 460	760 x 760	-	150
Up to 1200	-	100 to 150	760 x 760	-	150
160 to 1200	-	230 to 460	910 x 910	-	150
1220 to 1800	-	100 to 150	910 x 910	-	150
1220 to 1800	-	230 to 460	1070 x 910	-	150
1830 to 4550	760 x 760	100 to 150	1370 x 910	1370	230
1830 to 4550	760 x 760	230 to 460	1370 x 1070	1370	230
4570 and Over	760 x 760	100 to 150	1370 x 1140	1680	230

4570 and Over	760 x 760	230 to 460	1370 x 1140	1680	230

When branches are connected into the manhole, the length and width dimensions of the chamber shall be increased as follows:-

Length

Branch Diameter

100mm 300mm/branch on the side with most branches.

150mm 380mm/branch on the side with most branches.

230 and 300mm 460mm/branch on the side with most branches.

460mm 610mm/branch on the side with most branches.

Width

Branch Diameter

100mm to 300mm for each side with branches plus 160mm 460mm or the diameter of the main drain which ever is the greater.

3. Precast Concrete Circular Manholes

Where specified straight through precast concrete manholes shall be manufactured and constructed to comply with B.S. 556 and the following dimensional requirements, (Dimensions in millimetres).

Ground Depth of Outgoing Invert	Internal Access Shaft Diameter	Size Main Channel	Height Chamber Diameter	Chamber Above Benching
Up to 740	-	100 to 460	910	-
760 to 2410	-	100 to 460	1070	-
2440 to 4550	760	100 to 460	1200	1370
4570 and Over	760	100 to 460	1370	2680

When branches are connected into manholes the internal diameter of the chamber shall be increased as necessary, up to a maximum chamber diameter 1830mm.

4. Step Irons and Covers

Access shaft to manholes of depths greater than 760mm shall be provided with approved step irons at suitable intervals.

Every manhole or manhole access shaft shall be fitted with a removable air-tight cast iron cover to adequate size and strength, fixed in a manner which prevents surface water gaining access into the drainage system.

Cast manhole covers and frames shall be manufactured in accordance with the requirements of B.S. 497 and shall generally fall into the following categories:-

Heavy Duty	:	1For Carriageways
Medium Duty	:	For Footpaths
Light Duty	:	For domestic premises or other places where they do not have to carry wheeled .traffic.

5. Back Drop Connections

Where the level of the branch drain entering the manhole is higher than can be suitably accommodated by the normal type benching, then the branch drain shall be connected to the manhole by means of a back drop connection.

Back drop connections shall be made in accordance with the details shown on the relevant Sub-Contract Drawings and the requirements of B.S. Code of Practice 301.

6. Channels

Where the branch channel connects to the main channel in the manhole, the invert of the branch channel shall be a minimum of 38mm higher than the main channel.

(xiii) Testing of Pipelines

After pipelines are connected up and joints have been sealed, the pipeline shall be tested before pipes are, if required, haunched or surrounded in concrete.

Methods of testing and inspection shall be in accordance with Clause 4 of the Specification.

xiv) Concrete Bedding, Haunching and Surround

Concrete bedding, haunching and surround shall be provided as necessary or where called for by the Engineer in accordance with the requirements laid down in B.S. Code of Practice 301, Clause 310.

xv) Backfilling

Backfilling of trenches, headings and around manholes shall be carried out in accordance with the methods described in B.S. Code of Practice 301, Clause 508.

xvi) Reinstatement of Surfaces

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

Where excavations have been carried out in public highways or other areas not forming part of the site, the Sub-Contractor shall be deemed to have allowed in his price for all charges associated with the temporary and final reinstatement requirements of the Local of Highway Authority, whether this is carried out by the Sub-Contractor or by the Authority concerned.

No claims for extras in this respect will be accepted.

xvii Sewer Connections

The Sub-Contractor shall pay all charges associated with the connection by the Local Authority of the drainage for the Main sewer, including necessary reinstatement.

3.4.0 Testing and inspection

3.4.1 Site tests - pipework systems

(a) Underground Water Mains

After laying, jointing and anchoring, the main shall be slowly and carefully charged with water, so that all air is expelled and allowed to stand full for three days before testing under pressure.

A long main shall be tested in sections as the work of laying proceeds and all joints shall be exposed for inspection during the testing.

The open end of the main may be temporarily closed for testing under moderate pressure by fitting a water pipe expanding plug, of which several types are available. The end of the main and the plug should be secured by struts or otherwise, the resist the end thrust of the water pressure in the main.

If the section of main terminates with a sluice valve, the wedge of the valve shall not be used to retain the water, instead the valve shall be fitted temporarily with a blank flange, or if a socket valve with a plug and the wedge shall be placed in the open position while testing. The Sub-Contractor shall provide suitable end supports to withstand the end thrust of the water pressure in the main.

(b) Above Ground Internal Water Service Installation

All water service pipe system installed above ground 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.

The Sub-Contractor shall take all necessary precautions to prevent damage occurring to special valves and fittings during the tests. Any item damaged shall be repaired or replaced at the Sub-Contractor's expense.

(c) Underground Drainage System

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

Short branch drains connected to a main drain between manholes shall be tested as one system with the main drain. In long branches a testing junction shall be inserted next to the junction with the main drain and the branch tested separately. After the test has been passed, the testing junction shall be effectively sealed.

All tests on underground drains shall be permitted on cast iron drains at the discretion and to the approval of the Engineer.

Water tests shall be carried out in accordance with the methods described under B.S. Code of Practice 301, Clause 601 (b) and (c) and the test pressure shall not be less than 1,520mm head at the highest point in the pipe section and not more than 10,360mm head at any point in the section.

The test pressure shall be maintained for a period of one hour during which time the pipe and joints shall be inspected for sweating and leakage. Any leak discovered during the tests shall be made good by the Sub-Contractor and the section re-tested.

In addition to pressure tests, drain pipe runs shall also be tested for straightness where applicable. This test shall be carried out in accordance with one of the two methods described in B.S. Code of Practice 301, Clause 601 (e).

Testing of manholes shall be carried out in accordance with the methods described under B.S. Code of Practice 301, Clause 601 (f).

(d) Above Ground Soil Waste and Ventilation Pipe System

All soil, waste and ventilating pipe system forming part of the above ground installation, shall be given a smoke test to a pressure of 38mm of water gauge and this pressure shall remain constant for a period of not less than three minutes.

Water tests on above ground soil, waste and ventilating pipe systems shall not be permitted.

Pressure tests shall be carried out before any work which is to be concealed is finally enclosed.

Any defects revealed by the tests shall be made good by the Sub-Contractor and the test repeated to the approval of the Engineer.

In all other respects, tests shall comply with the requirement for B.S. 5572.

3.4.2 Site test - performance

Following satisfactory pressure tests on the pipework systems, operational tests shall be carried out in accordance with the relevant B.S. Code of Practice on the systems as a whole to establish that special valves, gauges, controls, fittings, equipment and plant are functioning correctly to the satisfaction of the Engineer.

All hot water pipework shall be insulated with performed fibre glass sectional lagging to a thickness of 25mm.

Cold water pipework shall be installed with preformed fibre glass lagging to a thickness of 25mm where the pipe runs above a false ceiling or in areas where the ambient temperature is higher than normal with the result that pipe "sweating", due to condensation will cause nuisance.

All lagged pipes which run in a visible position after erection shall be given a canvas cover and prepared for painting as follows:-

i) Apply a coating of a suitable filler until the canvas weave disappears and allow to dry.

(ii) Apply two undercoats of an approved paint and finish in suitable gloss enamel to colours approved by the Engineer.

All laggings for cold and hot water pipes erected in crawlways, ducts and above false ceiling which, after erection are not visible from the corridors or rooms, shall be covered with a reinforced aluminium foil finish and banded in colours to be approved by the Engineer.

In all respects, unless otherwise stated, the hot and cold water installation shall be carried out in accordance with the best standards of modern practice as described in C.P. 342 and C.P. 310 respectively, to the approval of the Engineer.

The test pressure shall be applied by means of a manually operated test pump or, in the case of long main or mains or larger diameter, by a power driven test pump which shall not be left unattended. In either case precautions shall be taken to ensure that the required pressure is not exceeded. Pressure gauges should be recalibrated before the tests.

The Sub-Contractor shall be deemed to have included in his price for all test pumps, and other equipment required under this Clause of the Specification.

The test pressure shall be one and a half times the maximum working pressure except where a pipe is manufactured from a material for which the relevant B.S. Specification designates a maximum test pressure as in the case of cast or spun iron pipes, where the test pressures should not exceed 120, 180 and 240 metre/head of Clause B, C, or D pipes.

3.4.3 Sterilization of Hot and Cold Water Systems

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

The sterilization procedures shall be carried out by the Sub-Contractor or specialist employed by the Sub-Contractor in accordance with the requirements of B.S. Code of Practice 310, Clause 409, to the approval of the Engineer.

SECTION IV

GENERAL TECHNICAL SPECIFICATION

SECTION IV
GENERAL TECHNICAL SPECIFICATION

4.1 Materials and Workmanship

All materials shall be of adequate quality for the duty specified and the workmanship shall be in accordance with the best accepted modern practice. Unless otherwise stated the Mechanical Contractor shall be obliged to comply with the requirements of the latest edition of the relevant Bureau of Standards Specification where applicable. Failing this, the latest edition of the relevant Britain Standard Specification shall provide the required standard. If the Mechanical Contractor desires to use any other standard specification or code of practice, it shall be referred to the Engineer for approval.

4.2 Structural Steelwork

The structural steel used in the Mechanical Contract shall be mild steel to B.S. 15. Black bolts and nuts shall be in accordance with B.S. 916. Black metal washers shall be in accordance with B.S. 916.

High Strength friction grips, bolts, nuts and washers shall be in accordance with B.S. 3139, Part 1, and their application shall conform to B.S. 3139, Part 1, and their application shall conform to B.S. 3294, Part 1 torque wrenches or impact tools where used be recalibrated before each shift.

All fabrication and erection procedures shall be in accordance with B.S. 449 as amended, Part 5. Before commencing the fixing of the steelwork the erector shall check the seating for line, level and bolt setting, and any errors which cannot be accommodated by the steelwork erector shall be reported to the Engineer.

4.3 Steel Fabrication and Baseplates

The manufacture of all fabricated items of plant shall be generally in accordance with B.S. 449 as amended, Part 5.

The fabrication and manufacture of the plant and equipment shall be completed in the Mechanical Contractor's workshops before delivery to site. No fabrication of complete units shall take place on site, sitework shall be confined to only such minor alterations and adjustments as are found to be necessary during erection. If major alterations are found necessary the items of plant covered shall be returned to the Mechanical Contractor's workshop for modification on replacement and shall be tested and checked before re-delivery to site.

Drive baseplates shall be robustly constructed and adequately stiffened to prevent twisting and distortion. The ration of the base length to its height shall not be more than 10:1.

All surfaces shall be free from recesses and cavities to prevent the accumulation of dirt and/or waste material, and shall be designed to facilitate ease of cleaning and maintenance.

Where driving units are directly coupled to the driven component all mounting surfaces shall be accurately machined to ensure alignment. After final assembly and testing, the individual items of plant shall be accurately dowelled in position on the baseplate to prevent misalignment during installation or during operation.

The Mechanical Contractor shall include in the design for any measures required to counter the effects of vibration which might be caused by operation of equipment.

4.4 Stainless Steel

All items fabricated in stainless steel shall be in the grade specified and detailed designs shall be compatible with fabrication techniques. The designs of articles to be pressed or welded shall be discussed with the fabricator before manufacture. All stainless steel items shall have a 'half-moon' finish to the satisfaction of the Engineer. Edges shall be finished by either welding on 12mm stainless steel round bar in the same grade as the article or by turning down to an acceptable radius.

4.5 WELDING

4.5.1 WELDING

Welding shall be carried out in accordance with the BC Code of Practice for welding No.044 Parts 1, 2, 3, & 4.

4.5.2 Freedom from Surface Defects

All welded fillets or butt joints shall be ground smooth and shall be free from porosity, cavities and entrapped slag. All welds shall conform to the requirements of B.S. 1856.

Welds which are to be hot dip zinc coated shall be neatly formed and the surfaces shall be acceptable and free from cracks in the welds or heat affected zone, from overlap undercuts, porosity, entrapped slag and spatter in or associated with the welds. The welds shall seal completely the edges of all overlapping or contacting surfaces.

4.5.3 Smoothness of joints where Weld is re-commenced or Terminated

The joints in the weld run where welding has been recommenced or terminated shall be smooth and shall show no pronounced hump or crater in the weld surface.

4.5.4 Shape of Profile

The profile of the weld shall be uniform, of appropriately equal leg length and free form overlap at the toes of the weld. Unless otherwise specified the surface shall be either flat or slightly convex in the case of welds and with a reinforcement of not more than 3 mm in the case of butt welds.

4.5.5 Uniformity of Surface

The weld face shall be uniform in appearance through its length.

4.5.6 Electrodes

Electrodes shall be of an approved type for the material being used and shall be kept in a dry condition. All electrodes shall conform to the latest issue of B.S. 693 'Electrodes for Manual Metal Arch Welding of Mild Steel and Medium High Tensiles Steel'.

4.5.7 Qualification of Welders

Welding on or off the site shall be carried out only by welders qualified to the approval of the Engineer. Each welder to be used on the Mechanical Contract Works will be required to carry to test welds to the approval of the Engineer and in the presence of the Engineer's Representative. Only welders whose test welds have been passed by the Engineer shall be employed on the Mechanical Contract Works and then only for the class of welding for which they have been tested. Initial testing of welders and such periodical tests as may be required by the Engineer shall be carried out at the Mechanical Contractor's expense using materials supplied by the Mechanical Contractor.

4.6 HOT DIP (Galvanised Zinc Coatings)

4.6.1 General

All hot dip zinc coatings shall conform to the requirements of the latest issue of specification 'Hot-Dip (Galvanised Zinc coatings' with particular reference to the following.

Tubular constructions shall be provided vent holes in appropriate locations to prevent internal pressure build-up during the hot zinc bath shall be referred to the galvaniser who shall state his requirements for the vent holes desired. Welding flux shall be chipped away, all welds shall be wire brushed, ground or grit or shot blasted if necessary before hot zinc coating.

The surfaces to be hot-dip coated shall be free from paint, oil, grease, and similar impurities. Identification numbers of individual pieces shall be clearly stamped on surfaces of members prior to hot-zinc coating, numbers painted or welded on the surfaces of these members shall be unacceptable.

Exposed surfaces, except welds when necessary, need not be grit or shot blasted, but the engineer shall decide to call for grit or shot-blasting in cases of unsuitable surface finish on material for hot-dip zinc coating. The Engineer shall have the right to inspect all steel components before galvanising, and shall have the right to reject or ask for remedial treatment of any material which is considered unsuitable. This applies particularly to welds, burrs, and surfaces having visible surface defects.

Globular extra heavy deposits for zinc which interfere with the intended use of the material shall not be acceptable. Excessively protuberant lumps and nodules shall be removed by hot wiping or skilful application of mechanical means provided that a sufficient minimum thickness of unbroken zinc coating remains after such treatment. Flows on small parts and working surfaces shall be repaired only by stripping, dressing and re-dipping.

4.6.2 Threads

The galvanising on threads or bolts shall be such as to fit a gauge made by overtapping a nut to the following increased limits of size to 7H tolerances:

Bolt Sizes	M6	M8	M10		M12		M16	M24
Overcut,mm	To be Agreed	To be Agreed	0,33	0,33	0,38	0,38	0,38	

For threaded articles less than 10mm diameter mechanical plating will be acceptable instead of hot dip zinc coating (galvanising).

Nuts shall be capable of being spun over the full length of the thread by hand ungalvanised internal threads shall be coated immediately after cutting, before they are allowed to rust, with preventive compound of type agreed between the supplier and the Engineer.

4.6.3 Bolts

Bolts to be galvanised shall be standard black bolts manufactured according to B.S 916 (and having threads produced to medium class tolerances G8). Any bolt which has been subjected to cold forming (heading) operation during manufacture shall be stree-relieved at a temperature between 600°C for a minimum period of 20 minutes and subsequently cooled in air.

4.6.4 Protection of Coating (Passivation)

Immediately after withdrawal from the bath of molten zinc, galvanised material shall be quenched in water containing approximately 1% of sodium dichromat slightly acidified with sulphuric acid. Other bath compositions may be used provided that they contain recognised passivating agents unless otherwise specified.

Alternatively by agreement between the galvaniser and the Engineer, protection may be applied by other means, such as, for instance, a lacquer containing chromate salts.

4.6.5 White Rust (White Storage Stain)

All galvanised material shall be free from gross deposits of white rust. If material has been affected by white rust, the deposit may be removed, by means of non-metallic brushes and provided that the thickness of zinc coating in the affected area meets the requirements of the specification the material can be accepted.

No galvanised material shall be used for erection unless such material:-

a) has been zinc coated under the KBS certification scheme, and this is indicated by the diamond standardisation mark, which should appear on all labels, delivery notes, and other similar documents relating to such material. Such documents should also indicate the name of the galvaniser concerned.

Structural material should also bear a paint mark applied by the galvaniser to indicate standardisation mark quality. The Engineer may call for certificates from

the galvaniser indicating that each consignment of material complies with the specification and was galvanised under the certification mark scheme: or

b) the galvanised material has been inspected, and each consignment is accompanied by an inspector's certificate indicating that the material is acceptable and complies with the requirements. Structural material should also bear a paint mark applied by the inspector to indicate that the material has been inspected and accepted. Bolts, nuts and other material of small size should be in a bag or container containing a label bearing the inspector's stamp.

4.7 CASTINGS

Because of the corrosion-inducing conditions, and in order to obtain satisfactory mechanical properties of tensile, shear and yield strengths, resistance to impact and transverse loads and hardness properties, all ferrous castings other than those included in the proprietary 'bought out' items of equipment shall comply with the specification hereunder. If the Sub-Contractor wishes to offer alternative materials, he shall submit comprehensive details of such alternatives and obtain the prior written approval of the Engineer before proceeding with manufacture.

Material: Pearlitic Nodular Structure.

Mechanical Properties: Ultimate Tensile Strength - 725 mpa Elongation - 2%
Hardness - 240 to 300 brinell (after normalizing)

Inoculation: All castings shall be inoculated with 3% copper.

Heat Treatment: To provide the optimum physical properties consistent with the pearlitic nodular structure of the material, and to provide a hardness within the range 207 to 235 brinell.

Test Certificates: The sub-contractor shall submit to the Engineer all test certificates of analysis including all relevant details of the micro-structure and mechanical properties. The number of tests to be performed and for which certificates of analysis are required shall depend on the respective casting and shall be a greed in writing with the Engineer.

4.8 VEE-BELT DRIVES

All vee-belt drives shall conform to B.S. 1440: 1962 - "Endless V-belt drives" and shall be as specified below:

a) Application

Unless otherwise specified or agreed to by the Engineer, Vee-Belt drives shall only be used in applications of constant and slightly varying load conditions. Belt speeds

shall not exceed 900 metres per minute, unless otherwise agreed. For reasons of spares interchangeability and maintenance, standard stock vee-belts shall be used.

b) Pulleys

The belt pulleys shall be manufactured from a close-grained cast iron and shall be accurately balanced. The belt grooves shall be properly machined to the correct groove angle and depth.

All sharp corners at the top of the groove shall be removed and the groove sides shall be polished smooth to avoid excessive belt wear. The grooves of mating pulleys shall accurately match each other, particularly regarding width, angle and alignment.

c) Adjustment

Adjustment inward, i.e. towards the driven pulley, shall be provided to ensure sufficient movement of the driving pulley to enable the vee-belts to be fitted by hand, without the use of a lever of any king to force the belts over the pulleys.

The outward adjustment shall provide for correct belt tensioning to ensure that slipping does not occur. All belt tensions shall be re-checked within 24hours and again within a week to start-up to ensure that the initial slack, if any, is taken up.

d) Speed Ratio

Speed ratios greater than 7:1 shall not be acceptable unless otherwise agreed by the Engineer.

4.9.0 BEARINGS

4.9.1 Anti-Friction

Anti-friction bearings shall include all bearings which provide rolling contact between one or more sets of hardened steel balls or rollers located between hardened steel rings or raceways. Anti-friction bearings shall be of approved manufacture.

To facilitate maintenance, spares interchangeability and standardisation, anti-friction bearings of standard designs and manufacture shall be employed. All anti-friction bearings shall be provided with greasing facilities in accordance with the manufacturer's requirements.

4.9.2 Bushed Bearings

Only where specifically stated and in cases of low velocities and light loads in moisture-free conditions will bushed bearings be accepted. All bushed bearing shall be made of an approved friction quality and shall be capable of withstanding severe usage.

All bushed bearings shall be provided with lubrication facilities to ensure adequate lubrication and shall be properly grooved to distribute the lubricant uniformly over the bearing surface. grooves shall not be cut into the journal, but always into the

surrounding bush. The edges of all chamfers and grooves shall be rounded to avoid sharp corners and to facilitate the introduction of the oil or grease.

4.9.3 Self Lubricating or Oil-less Bearings

Self lubricating or oil-less bearings shall only be used on application of light loads and low velocities in moisture-free and low humidity conditions and where bearings are of difficult access and likely to be neglected during servicing. The types of bearing metal composition used shall have frictional and wear resistant properties akin to those of grease lubricated bushed bearings.

4.10 KEYS AND KEY WAYS

All keys and Keyways and taper pins shall conform to B.S. 46: Part 1, 1958.

4.11 LIMITS AND FITS

Limits and tolerances for shafts and hoes shall conform to B.S.3614.

4.12 GENERAL MACHINERY PROTECTION

4.12.1 Coupling and Shaft Guards

All high speed couplings, projecting shaft ends and every dangerous moving part of machinery shall be protected by a guard manufactured from not less than 1.6mm mild steel plate. The guards shall be neatly formed and securely fixed in position.

4.12.2 Belt Guards

All belt or rope drives shall be adequately protected by a belt guard.

The guard shall be manufactured from wire mesh or open type expanded metal, securely braced and stiffened with suitable rolled steel sections and bolted in position. Guard supports shall not short-circuit vibration isolators on form. Provision must be made for test openings to permit RPM reading of fan and motor without the removal of the belt guard.

4.12.3 Painting

All guards shall be finished in a light orange colour to B.S. 381C in accordance with Clause 2.8.4 Class 'C'.

4.12.4 EQUIPMENT BASES

Unless stated elsewhere in this specification, inertia base formers for machinery shall be provided to the Main Contractor for casting, by the Sub-Contractor for casting, by the Sub-Contractor. The bases shall consist of reinforced concrete cast into sheet metal formers at least 150mm deep.

The formers shall comply with the standard set by Mason Industries, for both size and construction. Bases shall be mounted on properly selected spring isolators incorporating noise isolation pads.

Either free-standing stable steel spring or caged spring with snubber may be used. Spring isolators shall be provided with levelling bolts. Noise isolation pads shall be large enough to prevent excessive rocking of equipment during start up and normal operation. Bases and supports shall be arranged to give a clearance of approximately 25mm between the underside of the bases and the floor. Bases shall be large enough to accommodate motors and the equipment they drive.

4.14 IDENTIFICATION AND LABELLING

All plant and equipment items, including items such as dampers, pumps, etc, shall be labelled in a clearly visible position with the item name and, in the case of duplicate items, a number. Plant labels shall correspond with labels on starters, isolators, etc.

Labels shall be of sandwich thermosetting plastic with black lettering on a white background. Lettering shall be at least 6mm high and labels shall be in keeping with the size of equipment and legibility with regard to position.

4.15 PAINTING

4.15.1 Painting Materials

All paint, driers and the like, and other materials shall conform with the requirements of the relevant British Standard Specification. All paints shall be of the best quality and of approved brand and manufacture. All materials shall be used in strict accordance with the manufacturer's instructions and otherwise in strict accordance with the best standard practice. Undercoats of paintwork and primers shall be as supplied by the manufacturer of the paint begin used for the finishing coat. If necessary, paint shall be strained free from skins and similar impurities immediately before application. Priming coats shall be applied over the whole surface and well brushed in order to obtain the maximum penetration. All materials shall be delivered to the job in their original unopened containers with the manufacturer's name and description of contents thereon and no adulteration will be allowed.

4.15.2 Colours

samples of the final colours required shall be submitted for approval before painting the work in hand and the work shall then be finished to the colour or colours as approved. each coat of paint shall be a distinctive colour working up to the finished colour as approved.

4.15.3 External Painting

External painting shall not be undertaken during rainy, damp, frosty or other inclement weather or where such weather is reasonably to be expected within the next 24 hours.

4.15.4 Internal Painting

Before internal painter's work is commenced all floors shall be sept clean, and dirt and rubbish removed, and the rooms left practically free from dust; dust-free conditions being maintained during the progress of the work. No sweeping or dusting shall be done whilst the painting is in progress.

Unless otherwise stated, no paint shall be applied within 50mm of areas which are to be welded. Welds and adjacent parent metal shall be de-slagged, inspected and approved and area shall be abrasive-blasted or ground, and all contaminants shall be removed prior to painting. Wire brushing of the weld shall only be allowed if the paint specification calls for wire-brushing. The weld area shall then be flushed with fresh water and allowed to dry before receiving the full paint system.

Areas where the paint coating has been damaged during transportation erection or by any means whatever, shall be repaired as follows:

Damaged areas or rust spots shall be removed by means of a wire brush or emery paper and the surrounding paint which is still intact shall be feathered for a distance of 20mm beyond the damaged area. Spot priming shall consist of all the coats previously applied and shall overlap the undamaged area by 20mm. Surfaces which are to rest on concrete or other floors or which will be inaccessible after erection shall receive full specified paint system before erection or assembly. Unless otherwise specified, steel embedded with concrete shall not be painted except to within 50mm below the concrete/air interface.

Mating or contact surfaces shall be protected from corrosion by ensuring that the two surfaces brought into contact with each other shall be prepared and primed in accordance with the specification. The primed surfaces shall be brought together while the paint is still wet. Surfaces which are to be friction-bolted shall be prepared in accordance with the specification (i.e. blast-cleaned or wire-brushed) but shall receive no paint coating. All sharp edges shall receive the specified dry film thickness of paint.

Where the shop coat has been allowed to age for a few months before painting, it shall be lightly sanded or rubbed with steel wool and scrubbed with clean water suing a bristle brush. Before painting galvanised iron surfaces, they shall be treated with galvanised Iron Cleaner" or equal and approved cleaner, used in strict accordance with the manufacturer's instructions. Where a temporary protective coating has been applied to prevent wet storage stain, the surface shall be thoroughly scrubbed down by means of a bristle brush and the approved cleaner until all the temporary protection has been removed. The treated surfaces shall then be thoroughly washed down with clean water and the surfaces allowed to dry before painting.

All galvanised sheeting shall be painted on the ground before erection. This will also ensure that overlaps are well protected. Where it is impracticable to apply the coating system before erection,prior consent to paint after erection shall be obtained form the Engineer.

Paint dry-film thickness shall be measured using a non-destructive thickness gauge such as the MIKROTEST or equivalent.

4.15.5 Inspection of Surfaces

All surfaces to be painted shall be carefully inspected by the Sub-Contractor who shall satisfy himself that the surfaces are in a perfect state to take the paintwork specified. No claim will be entertained arising form defective work due to not strictly insisting on receiving from defective work due to not strictly insisting on receiving from other trades, surfaces in a proper condition, fit to receive the type of paint specified. All surfaces shall be perfectly clean, free from dust, dirt, grease, blotches, and other blemishes before painting, staining or application of any coat.

All surfaces shall be properly prepared before painting or staining. Each coat of paint, except the last, shall be rubbed down with a fine glass paper before the next coat is applied.

Unless otherwise directed, the last coat of paint or finishing shall be done when all other work in the Sub-Contract is completed and the premises free from all rubbish and dirt. On completion, all painter's work shall be touched up where necessary and any defects made good. All paint and stain spots shall be removed and all surfaces left in a perfect condition.

4.15.6 Iron and Steel Surfaces

The Sub-contractor shall ensure that primed steelwork which is to be delivered to site is stacked on bearers and is clear of the ground. Wherever possible channels, angles, and other equipment and material shall be stacked so that water cannot collect on the steel.

Iron and steel surfaces shall be scrapped or shot blasted to produce a clean surface before painting. Paint shall not be applied over any surface containing traces of grit, grease, oil and the like, loose rust, loose millscale or corrosion products and foreign matter of any kind.

All air used for blast-cleaning or spraying shall be free from all traces of water and oil. When blast-cleaned, a satisfactory blast profile (i.e anchor pattern) shall be achieved. If the abrasive used for blast-cleaning is sand, it shall be free of clay. All metal surfaces to which paint is to be applied shall be moisture dry. paint surfaces which are to be over-coated shall be hard-dry before over-coating, unless otherwise specified.

4.15.7 Painting of Steel Surfaces with Polyurethane System

This system is based on a polyurethane which is cured with an Aliphatic Di-Isocyanate. No polyurethane products which are cured with Aromatic Di-Isocyanate curing agents will be acceptable. This system shall be used as specified in highly corrosive conditions and where a high quality finish is required.

a) In Fabricator's Premises

i) Surface Preparation. All steel surfaces shall be abrasive blast-cleaned to a near-white finish and shall be free from oil and grease and any corrosive contaminants.

ii) Priming. Within 4 hours of blast-cleaning, one coat of an approved zinc chromate epoxy primer shall be applied to give a minimum dry film thickness of 38 micrometers.

iii) Undercoat. One coat of an approved undercoat compatible with both the primer and the finishing coat to give a minimum dry film thickness of 50 micrometers

b) On Site Painting

After erection the following procedures shall be adopted:-

i) Damaged areas shall be repaired as per clause 15.4 above, and spot priming shall comprise all the shop coats.

ii) Undercoat. Unless the undercoat has already been applied it shall be applied before erection as described in Sub-Clause (a) iii) above.

iii) Finishing. Two finishing coats of approved polyurethane enamel in the specified colour shall be applied to give a minimum dry film thickness of 25 micrometers per coat. The two coats shall be distributable in colour and the second coat shall be applied within 24 hours of the first. The total Minimum dry film thickness for the complete paint system shall be 138 micrometers.

4.15.8 Painting of Steel Surfaces with Alkyd System

This system shall be used as specified on columns, roof trusses, steel window frames and door jambs, pipes, pumps and equipment in areas where corrosion is mild and a decorative appearance is required.

i) Surface.

Where a decorative rather than corrosive resistant finish is required, steel surfaces may be specified to be mechanically or hand wirebrushed to remove loose rust millscale.

Where a more corrosive resistant finish than the above is specified, all steel surfaces shall be abrasive blast-cleaned to a near white finish. The abrasive shall be free form oil and grease and corrosive contaminants such as chlorides and the like.

ii) Etch Priming. (Applicable to abravise-blasted surfaces only).

Within 24 hours of cleaning, apply one coat of an approved single pact within 4 hours of cleaning, apply one coat of an approved single pack zinc chromate etch primer to give a dry film thickness of not less than 20 micrometers.

iii) Priming. (For abrasive - blasted surfaces).

Apply one coat of an approved zinc chromate primer (green) to give a dry film thickness of not less than 38 micrometers.

For wire brushed surfaces to the clean steel apply one coat, by rush or roller, of an approved red lead primer to give a dry film thickness of not less than 38 micrometers.

b) On-Site Painting of Steelwork

i) Damaged Areas

Before and after erection damaged areas shall be repainted as for Clause 15.4 above, and spot priming shall comprise all the shop coats.

ii) Undercoat

Apply one coat of an approved undercoat to give a minimum dry film thickness of 38 micrometers. The undercoat may be tinted to a shade just lighter than the finishing colour using approved stainers.

iii) Finishing

Apply at least one coat of an approved high gloss enamel in the specified colour, to give a minimum dry film thickness of 25 micrometers.

The total dry film thickness for the complete system shall not be less than 100 micrometers for wire-brushed surfaces, and 120 micrometers. The total dry film thickness for the complete system shall not be less than 100 micrometers for wire-brush surfaces and 120 micrometers for abrasive-blasted surfaces.

Note: Where window frames, door jambs and the like have been painted in the fabricator's yard with red oxide primer, this shall be rubbed down and primed in accordance with Clause 15.7 (a) III.

c) Painting of Motors, Gear Boxes and other Equipment

i) Surface Preparation

The surfaces to be painted shall be completely free from oil, grease, rust and foreign matter of any kind.

ii) Priming

One coat of an approved epoxy primer shall be applied to form a uniform coat and to fill all porosities in the castings. After 24 hours the primer shall be wet sanded to produce a uniform smooth surface.

iii) Undercoat

One coat of suitable undercoat tinted to a shade just lighter than the finishing colour with suitable staining agent, which is compatible with the paints, shall be applied.

iv) Finishing

One coat of approved high gloss enamel in the specified colour shall be applied. N.B. Flanged faces shall receive the full specified coating.

d) Painting of Pipes

i) Surface Preparation

The surfaces shall be wire brushed to remove loose rust and loose millscale.

ii) Priming

An approved one coat primer shall be applied.

iii) Undercoat

Undercoat shall be specified in Clause 15.8.

iv) Finishing

The finishing coat shall be as specified in Clause 15.8 (c) (iv). The total dry film thickness for the coating system shall not be less than 90 micrometers. N.B. Flanged faces shall receive the full specified coating.

4.15.9 Painting of Galvanised Surfaces with Alkyd System

This paint system shall be used as specified for painting of side sheeting, ducting and plenum walls, underside of roof sheeting and the outside surfaces of rain water gutters where a decorative effect is required. It shall only be used where the corrosive conditions are mild.

i) Surface Preparation

The surfaces shall be prepared in the manner as described in Clause 15.4 above.

ii) Priming

To the cleaned surfaces apply one coat of an approved Calcium Plumbate primer.

iii) Undercoat

Apply one coat of approved high gloss enamel in the specified colour. The total paint dry film thickness for the system shall not be less than 100 micrometers.

4.15.10 Painting of Equipment and Steelwork with Epoxy System

i) Surface Preparation

a) Equipment

Where the equipment is specified to be painted after installation it shall be delivered to site unpainted. The surfaces to be painted shall be completely free from oil, grease, rust and all other foreign matter. If possible, castings shall be fettled prior to priming.

b) Supports and Steelwork

All surfaces shall be abrasive blast-cleaned. The abrasive shall be free from oil, grease, and corrosive contaminants such as chlorides and the like.

ii) Priming

Apply one coat of approved epoxy primer to form a uniform coat, and to fill all porosities in the casting. After 24 hours the primer shall be wet sanded to produce a uniform, smooth surfaces.

iii) Finishing

Apply two coats of an approved Epoxy Enamel in the specified colour, the second coat to be applied within 24 hours of the fist. N.B. Flanged faces shall receive the full specified coating system.

4.15.11 Painting of Galvanised Surfaces with Epoxy System

This paint system shall be used for painting of galvanised surfaces in highly corrosive conditions.

i) Surface Preparation

These surfaces shall be prepared in the manner as described in Clause 15.4 above.

ii) Priming

To the cleaned surfaces apply one coat of approved Epoxy Zinc Chromate Primer.

iii) Finishing

Apply two coats of an approved epoxy enamel. The second finishing coat shall be applied within 24 hours after the application of the fist finishing coat, and shall be distinguishable in colour from the first. The total minimum dry film thickness for the paint system shall be 88mm.

4.15.12 Painting of Chequer Plate of Egg-Crate Flooring and Supporting

Frames with Epoxy Tar System

This paint system shall be abrasive blasted or acid pickled and passiveated.

i) Surface Preparation

Surfaces shall be abrasive or acid and passivated.

ii) Finishing

Three coats of approved epoxy Tar shall be applied. Consecutive coats shall be in distinguishing colours.

4.15.13 Painting of Galvanised Surfaces with Epoxy Tar System

This paint system shall be used for the painting of internal surfaces of galvanised gutters.

i) Surface Preparation shall be described in Clause 15.4

ii) Finishing

To the cleaned surfaces apply one coat of approved Calcium Plumbate Primer.

iii) Undercoat

Apply one coat of suitable undercoat tinted to a shade just lighter than the finishing colour with a suitable tinting agent which shall be compatible with the paint.

iv) Finishing

The Contractor shall apply two coats of approved Epoxy Tar. The second coat shall be applied within 24 hours of the first coat. The total paint dry film thickness shall be not less than 200 micrometers.

4.15.14 Painting of Steelwork with Chlorinated Rubber System

This system shall be used in areas where the steelwork is exposed to occasional corrosive conditions.

a) In Fabricator's Yard

i) Surface Preparation

Abrasive blast-clean all steel surfaces. The abrasive shall be free form oil, grease and any corrosive contaminants.

ii) Priming

One coat of approved chlorinated rubber undercoat shall be applied to give minimum dry film thickness of 75 micrometers.

iii) Undercoat

One coat of approved chlorinated Rubber Undercoat shall be applied to give a minimum dry film thickness of 75 micrometers.

b) On-Site Painting

After erection, the following procedure shall be adopted:-

i) Damaged areas shall be repaired as described in clause 15,4 above and spot priming shall comprise all the shop coats.

ii) Finishing

One coat of approved chlorinated rubber enamel shall be applied in the specified colour, to give a dry film thickness of not less than 25mm.

4.15.15 Painting of Galvanised Surfaces with Micaceous Iron Oxide Pigmented Alkyd System

Unless the Engineer has given his written consent, the galvanised sheets shall be primed on the ground before erection.

i) Surface Preparation. The surfaces shall be prepared in the manner as described in Clause 15.4.

ii) Priming To the clean surfaces apply one coat of an approved calcium plumbate primer.

iii) Undercoat. Apply one coat of an approved Alkyd micaceous Iron Oxide structural paint.

iv) Finishing. Apply one coat of an approved Alkyd micaceous Iron Oxide structural paint in colour as specified.

(v) Damaged Areas These shall be repaired in a manner as described in clause 15.4

The total paint dry film thickness shall not be less than 114 micrometers.

4.15.16 Specialised Painter

All painting shall be carried out by a painting specialist employed by the Sub-contractor.

4.16. PROTECTION OF UNPAINTED SURFACES

Bright Machined Parts

All bright machined parts shall have a protective treatment applied by the manufacturer before despatch and this treatment shall be kept intact up to the time of handover unless it has been removed for installation. If the surface is exposed after installation a further protective coating shall be applied in accordance with the manufacturer's requirements.

4.17. PIPING AND FITTINGS

4.17.1 Materials

Pipework shall be run as shown on the sub-contract drawings. All piping used in the construction of the works shall be straight, cleanly finished, round in cross-section, free from cracks, surface flows, laminations and other defects and free from scale.

4.17.2 Neatness

All pipe runs shall be arranged to present a neat appearance with where practicable shall be parallel both with one another and with the building structure, paying due regard however to the grading and venting requirements. All vertical pipes shall be plumb.

Pipes shall be bent round piers and all other projections and recesses and all offsets due to varying thicknesses of plaster, walls, floors and ceilings and other structural works were such changes in direction of piping are indicated on the drawings or not. Details of the skirting heights, sill heights and floor finishes shall be determined before any work is commenced. No pipework offsets shall be allowed on piping.

4.17.3 Prevention of Dirt Entering Pipes, valves etc

All pipes, fittings, valves, etc shall be guaranteed to be free from corrosion and internal obstruction. Pipes and fittings showing signs of corrosion shall not be fitted.

The open ends of all pipework and valves shall be protected. Wrought-iron screwed caps or plugs or plastic covers only shall be used to cover open ends. Wood, rag or paper plugs shall be used. Pipework delivered for use on the Sub-Contract Works shall be stored clear off the ground on suitable racks or stands and with the ends protected as described above.

4.17.4 Pipe Cutting and Cleaning

All cuts from Standard lengths of pipe shall have all burrs and swarf removed, the ends shall be trimmed square and the pipe shall be thoroughly cleaned both internally and externally before erection.

4.17.5 Accessibility

All valves, drains and supports shall be positioned so as to facilitate maintenance. Grouping of valves, drains unions flanges etc shall be preferred to scatted siting. Joints shall not be formed in the thickness of walls, floors or ceilings. All pipework, valves fittings and equipment forming the piping installation shall be erected so that it can be dismantled and be readily accessible for repair and replacement.

Readily accessible means that the flange, union, etc, can be reached and worked upon either in the open or else by removal of a purpose made duct cover, manhole or similar cover. The fitting is not accessible if as fixed it cannot be manipulated.

Where pipework is to be installed in an inaccessible position it shall be welded or brazed. Unions or flanges shall be provided as equipment to facilitate dismantling. Care shall be taken to ensure that pipe flanges, valves etc are staggered relative to similar projections or adjacent pipes and obstructions such as bemas columns and pipe supports, where necessary.

4.17.6 Grading of Pipework

All pipework shall be installed with continuous gradients to allow for drainage and for venting air. The rise or fall of piping in the direction of flow shall be as laid out in the schedule below (unless noted otherwise on the drawings or instructed by the Engineer.

Service	Rise or Fall	Minimum Gradient mm per meter
Water	Rise (preferred)	2
Steam	fall	4
Condensate	fall	4
Compressed Air	fall	8

4.17.7 Pipes laid in Ground

Pipes laid in the ground shall be assembled with care and shall be well bedded in to ensure that pipework and fittings shall not be damaged by movement of the ground. (Steel pipes shall either be supplied with factory applied bitumen/fibreglass wrapping and joints site-wrapped with bitumen tape, or the entire pipeline shall be primed with Densopaste, protected with Denso tape applied with a 55% overlay and protected with PVC wrapping securely fixed).

Excavation in ground and backfilling of trenches with sealed backfill shall be by others unless specified otherwise.

4.17.8 Pipes Joints

a) Types of Joints

Joints shall be screwed, welded or flanged as specified for each particular service elsewhere in this specification. Joints shall comply with relevant KBS or BS specification. All flanges shall be at 90^0 to the centre line of the pipe and the holes shall straddle the centre line.

b) Screwed Joints

Pipes for screwed joints shall be provided with taper threads to B.S. 21 Part 1. Steel pipes shall be carefully reamed out before the plain end is threaded. Threads shall be right, clean and free of burrs prior to installation. Before making a joint, the male screw thread shall be wrapped with PTFE tape. Alternative jointing compounds shall not be used without the express approval of the Engineer.

Should a screwed joint prove defective under test or in operation, the joint shall be broken and remade, caulking will be permitted.

c) Flanged Joints - Steel Pipes

All flanges, bolts, nuts and washers shall be manufactured from mild or stainless steel to B.S. 4504 Part 2 "Table of Piped Flanges (for land use)" to the table appropriate to the pressure specified. Bolt holes in flanges shall be drilled, not punched, and spot faced for nuts.

Pipes not galvanised shall be provided with flanges crewed or welded for nominal bores of 80mm and below and with welded flanges for larger sizes. Galvanised pipes shall be provided with galvanised screwed flanges for nominal bores 80mm and below and with welded flanges for larger sizes. For galvanised piping all welding shall be carried out before galvanising.

Welded flanges shall be of the machine-faced, slip-on pattern with neck secured by welding both at the neck and bore of the flange to pipe, with the pipe finishing 3mm inside the bore. Care shall be taken not to distort the machined face. The use of alternative flanging to the ASA standards throughout the installation will be considered upon application.

d) Flanged joints - Polypropylene Pipe

Flanges on polyprolene pipes shall be of the full face type up to and including 100mm NB, and the stub flange type with mild steel backing ring for sizes 125mm NB and above, these shall also be used on sizes below 100 mm NB upon the Engineer's request.

All drilling in flanges and backing rings shall be to B.S. 4504 Part 2 "Table of Pipe Flanges" (for land use) and the holes shall be drilled, not punched, and spot faced.

Thickness of flanges and backing rings shall be as specified for each service and the material for the flanges and stub flanges shall be identical to that of the pipe. The use of the alternative flanging to ASA standards throughout the installation will be considered upon application.

e) Gaskets and Bolts

The joint between flanges shall be made up with a joint ring graphite faced on both sides. Joint strings shall be suitable for the pipeline pressure and temperature duty and shall be identified for duty for which they are suitable. Joint rings shall be cut from sheets on site.

Bolts heads and nuts shall be hexagonal in form and washers shall be fitted beneath bolt heads and nuts. The lengths of bolts shall be such that not less than one thread nor more than 5mm of bolt protrudes through each nut when the joint is pulled up. All bolts and nuts shall be corrosion resistant.

f) Welded Joints - General

Welding technique, edge prepatin and welding rods or electrodes shall be selected to be suitable in all respects for the materials and duty of the pipeline, and comply with the applicable British Standards.

Each approved welder will be assigned a reference number which shall be stamped on each weld carried out by him. During the progress of the site work ultrasonic or radiographic examination or welds may be carried out by an independent authority at the expense of the Employer Welds found to be defective shall be cut out and the pipe made good, all the sub-contractor at his own expense, and the new welds retested at the sub-contractor's expense.

The Sub-Contractor shall cut out and prepare for mechanical testing in the presence of the Engineer, welded joints selected by the Engineer. Cutting out and preparing of test pieces and the making good of pipelines shall be at the Sub-contractor's expenses. The total number of such tests will not exceed one per cent of welded joints except that welds found to be defective shall not form part of this total.

Should a significant proportion of the tested welds of a particular welder prove to be defective due to faulty workmanship, all welds carried out by the particular welder shall be cut out and the pipeline made good by another welder whose work has proved satisfactory.

When the general hydraulic test of the completed systems is carried out, each weld shall be lightly hammered during the time pressure is maintained. If any leaks occur at welds, the portion of weld near the leak shall be removed by cutting or grinding and welded. Repairs shall not be attempted by caulking or fusion of surrounding metal.

g) Welded Joints - Steel Pipes

Oxy-acetylene welding shall generally be carried out in accordance with the "Recommended practise of oxy-acetylene welds in mild steel pipelines" publishing by the Heating and Ventilation Contractors Association. Metal arc welding shall be in accordance with Technical Memorandum T.3 issued by the British Welding Research Association.

The Sub-contractor shall obtain from the manufacturers tests certificates representative of welding rods and electrodes used and in accordance with B.S. 1453 or B.S. 639 respectively.

All welded joints, whether produced by oxy-acetylene flame or metal are processes shall be of prime quality. The butts shall be slightly convex with regular ripples and no undercutting, washing away or surface cavities shall be present. Notches at the root into the pipe bore in excess of 1.5mm will be accepted and the external reinforcement shall run out smoothly to the pipe surface on either side. All slag shall be removed after each run. Undercut edges, slag pockets, unsound metal and blowholes shall be chipped out as the work proceeds.

h) Welding - Polypropylene

The use of radial welding equipment for pipework joints shall be preferred. The butt machine used for the welding of polypropylene pipes shall be of a design approved by the Engineer. The machine is to carry out the butt welding of pipes from 100 mm NB up to and including 300 mm NB, must be capable of welding flanges and fittings onto the pipe, and be able to do angular butt welds for development of special bends.

The machine shall be capable of maintaining a welding force of 3500 N. The welding force to be maintained at each weld shall be 10N for each square centimetre of annular pipe surface, at a temperature of 250 plus of minus 10°C, and therefore provision shall be made for the heating of both mating surfaces to a temperature of, and maintaining, 250 plus of minus 10°C. All heating surfaces in contact with the piping material shall be Teflon coated.

i) Pipe Fittings

a) General

Fittings shall be to the standards specified elsewhere in this specification and shall be compatible in all respects with the materials and class of piping being installed. Where standard fittings are not available for the duty required, reductions on the run and to the branch shall be in all cases be made with reducing sockets. reducing bushes and long screw connectors with backnuts shall not be used.

Bends shall preferably be of the long radius type except for the compressed air system and where space is restricted. In these cases short radius elbows may be used subject to the approval of the Engineer.

In general standard tees shall be used for all connections to pipes and headers. The welding on of sockets or branch pipes will be permitted only with the authority of the Engineer. Reducers shall be of the eccentric type, except on vertical pipelines where concentric reducers may be used. Transitions shall be swept and not abrupt. All connections to plant items shall be so arrange that the plat can be easily disconnected. All steam, compressed air and water connections shall be made to the top of the line unless noted otherwise on the drawings.

4.17.10 Pipe Supports and Guides

a) General

All supports, brackets, hangers clips and other fixing accessories necessary to support all piping system from the building structure or concrete bearers shall be provided and fixed under this sub-Contract. As far as practicable standard bought-ut dip galvanised components shall be used. Samples of these components shall be submitted for approval prior to the placing of order.

Steam and other pipes for high temperature duties be supported on rollers and guided with rollers at changes of direction or other points where necessary to prevent pipes leaving the supports, or on hangers with spherical washers or suitably articulated to take up movement.

Brackets and supporting frames of rolled steel sections shall be fabricated in accordance with the best accepted practice to form true, rigid, neat structures. Makeshift, untidy or unstable supports will be acceptable. Woodscrews, pop-rivets, self-tapping screws, or other fastenings subject to loosening by vibration shall not be used in the fabrication or attachment of pipe supports or fixings. Spring washers, lock nuts or other locking devices shall be used on nuts. Contact between dissimilar metals shall be avoided. A pipe shall not be supported from another pipe unless approved by the Engineer or specifically called for the drawings. Where a common hanger is used for more than one pipe, provision shall be made to accommodate unequal expansion.

b) Fixing to Structure

Fixing to the building structure shall not be carried out in any manner other than that specifically approved by the Engineer for the particular area of the building and type of finish. Care shall be taken to avoid unnecessary damage to finishing.

Competent labour shall be employed to ensure that supports are correctly sized, spaced and set out prior to fixing. All work shall be made good to the Engineer's approval.

For fixing to brick and concrete, holes of correct size shall be neatly drilled using special purpose twist drills, and fixings made by rowl-bolts or equal or bolts of the grouted type approved by the Engineer. Shot fixings shall not be used nor shall fixings be made into mortar between bricks. Fixing to lightweight or hollow structures shall be by means of suitable screw anchors, toggle bolts or approved alternative.

c) Spacing of Supports

Spacing of supports for steel and copper pipes shall not exceed the centres given in the following table:

MAXIMUM SPACING OF SUPPORTS (M)

Nominal Bore of pipe (mm)	Steel Pipes		Copper Pipes	
	Horizontal	Vertical	Horizontal	Vertical
15	2.0	2.4	1.4	1.9
20	2.4	3.0	1.4	1.9
25	2.7	3.0	1.7	2.2
32	2.7	3.0	1.7	2.7
35	3.0	3.6	2.0	3.0
40	3.4	4.0	2.0	3.0
50	3.7	4.5	2.0	3.4
65	3.7	5.0	2.4	4.0
80	4.1	5.0	3.0	4.0
100	4.4	5.0	3.0	4.0
125	4.4	5.5	3.0	4.0

150	4.8	6.0	-	-
200	5.1	6.3	-	-
250	5.8	6.5	-	-
300 and over	6.1		-	-

Special supports shall be provided for all heavy items of pipeline equipment such as stainers, valves, etc.

d) Positions of Supports

Supports shall be positioned to reduce, as afar as possible, stress on joints, valves and items of equipment. Due to regard shall be given to the maintenance of accessibility and to the requirements of access to their services to be fixed in the area.
Vertical pipes shall be supported at the bottom of the riser, or at an intermediate anchor point, to allow for expansion and to carry the entire weight of the riser. Intermediate supports will act as guides. Branches from risers shall not act as supports for the riser.

e) Guides

Guides shall be provided and fixed to prevent pipes leaving their supports due to expansion compensating devices.

f) Anchor Points

Anchor points shall be provided to resist the axial stress transmitted by the flexure of expansion loops or bellows. Anchors shall be provided complete for attachment to the structure and where applicable shall be bolted or welded to the structure or positioned accurately for grouting in by others.

On steel pipelines anchors shall consist of heavy mild steel saddles welded all round to the pipe surface and provided with exterior lugs for bolting to the building structure or thrust block. Saddles shall be not less than the thickness of the pipe to which they are welded and of width equal to its nominal bore. On polypropylene pipelines shall const of 3mm thick polypylene pads completely surrounding the pipe and then attached to the supporting steelwork with U Bolts. Alternatively, anchors may consist of slip on flanges welded to the pipe and not bolted or welded in the approved manner to rolled steel members attached to the structure.

In the case of copper pipes, anchors shall generally consist of two flanges-to-copper adaptors interposed int he pipe run at the anchor point. Mild steel sections shall be bolted to either side of the flanged joint and attached to the building structure.

4.17.11 Provision for Expansion in Piping

Piping shall be installed in such a manner as to allow for thermal expansion. Where sufficient flexibility is not provided by changes of direction in the run, expansion loops or expansion compensators shall be provided. In general, fabricated expansion loops shall be used to allow 'nesting' of loops in adjacent pipes but purpose made expansion loops may be used if they are suitable for the pressure and expansion duty.

Expansion compensators shall be used only on Engineer's approval and then must be suitable for the working conditions and installed in full compliance with the manufacturer's recommendations regarding guiding, alignment and all other respects of erection and commissioning.

Care shall be taken that the compensators are not overstressed during pressure testing of pipelines, and if necessary, made-up spool-pieces of pipe shall be substituted during these tests.

All supports shall provide for the expansion movement in pipes. Hangers shall be free to 'swing' and rigid supports shall be of the roller type or pipes shall have 'slides' of rolled steel sections welded to them to permit free movement on supports without damage to the pipe or insulation.

4.17.12 Pipe Sleeves

a) General

Pipes shall not be build rigidly into walls, floors, ceilings, footings or under roads. Sleeves shall be provided under this sub-contract, unless noted otherwise on the drawings, for building-in by others at all such locations.

The Sub-Contractor shall provide all sleeves in advance of building requirements and shall be responsible for ensuring that sleeves are properly positioned, aligned and built-in. Rectangular or circular openings will be provided by the builder in structural concrete slabs and it shall be the Sub-Contractor's responsibility to supply, position, align and secure sleeves, ready for casting in by the builder. Puddle flanges shall be provided for building-in where pipes pass through bound walls or below ground.

b) Sizes

Sleeves shall not be used as pipe supports and a free annular space of at least 6mm shall be allowed between a pipe and its covering, if any and its sleeve. In lad bearing walls or footings the annular space shall be of a minimum of 25mm. Where pipes change direction, sleeves shall be oversized to accommodate expansion movement of the pipe.

Sleeves shall extend through walls to within 5mm of the finished surface on both sides to allow for flush caulking over the sleeve with water proofing compound. Vertical sleeves shall be project 50mm above the finished floor level and end 5mm above the underside of the slab. Polystyrene or similar material spacer discs shall be provided to locate the sleeve during casting of concrete, so that when the discs are removed the caulking clearance is left.

c) Materials

Sleeves in load-bearing walls and under roads shall be of cast-iron. Other sleeves shall be of standard galvanised pipe cut to length. Sleeves shall properly cut, reamed and trimmed square. Sleeves for casting in the concrete shall be securely fixed to form work by the sub-contractor before concrete is poured. The annular space between each pipe and sleeve shall be firmly caulked at each end with polysulphide or equal waterproof compound which does not set hard.

4.17.13 Ventilation and Draining of Pipework

a) General

Sufficient provision shall be made at high points of piping and equipment for ventilation and at low points for draining. Drains shall be provided on all major sections of pipework so that they can be drained without draining the entire system. vents shall be adequate to ensure that airlocks cannot form in the system.

b) Manual Vents

Manually operated air release points shall be provided on all water piping to permit the initial charging of the system. Each point shall comprise an air bottle fitted on tope of the pipe and with a welded cap and 15mm discharge pipe run to a fullway air-release valve at hand level and then to discharge at an agreed point. Pipes up to 40mm shall have air bottles of the same diameter as the pipe, air bottles for larger pipes shall be 40mm diameter. All air bottles shall be 300mm long.

c) Automatic Vents

Automatic vents shall be provided with lockshield isolating valves and 15mm discharge pipes run to approved positions. Automatic vents shall be as manufactured by Spirax Sarco or equal and approved. Steam mains shall be provided with thermostatically operated air vents at all high points in the system to allow for quick warming up of the system after a shutdown.

d) Drain Points

Steam lines shall be provided with steam trapped condensate drain points at all low points at least every 40 meters on long lines. Drain pockets of diameter equal to that of the steam pipe shall be provided on lines up to 100mm diameter and of diameter 50mm less than the pipe diameter for pipes above 100mm. The condensate line from the trap shall enter the top of the condensate in the header or main.

Water lines and equipment shall be drainable through 15mm lockshield isolating valves and discharge pipes run to approved positions. Compressed air lines shall have trapped automatic condensate drains at all low points in the system.

4.17.14 Valves and Strainers

a) General

Valves and strainers shall be of the types specified elsewhere in this specification,of best quality and suitable in all respects for the duties for which they are intended.

b) Valves

Except where loose key or lever operation is specified, all manual valves shall be provided with handweels. Closing shall be by clockwise rotation of the handwheel. All valves shall conform to the following design and materials specification:

Bronze	B.S. 1400 LG-2C or A.S.T.M.B. 62-63
Cast Iron	B.S. 1452 GR14C or A.S.T.M.A. 445-63T
Ductile Iron	B.S. 1504-161A or A.S.T.M.A. 216 Grade WCB.

Mixing, thermostatic and other automatic valves shall be of 'fail-safe' design and where practicable self-acting.

4.17.5 Pressure Reducing Valve Sets

Pressure reducing valves shall be as manufactured by Spirax or equal and approved. They shall be installed complete with separator, isolating valves, strainer, pressure gauges, by-pass and contr valves, etc and a pressure relief valve mounted on the low pressure side, sized in accordance with accepted practice, to fully protect any equipment in the event of failure of the pressure reducing valve. The relief valve shall be set, and all gauges shall be in place before steam is allowed to pass through any P.R.V. set. The discharge pipe from the pressure relief valve shall be run to the nearest drain point approved by the Engineer.

4.17.16 Instruments and Gauges - Pipework

Where shown on the drawings pressure gauges and thermometers shall be provided. Pressure gauges shall be of the dial type with minimum 100mm dials and scaled to 50% in excess of maximum anticipated pressure.

They shall be fitted with isolating valves, gauge cocks and syphon bends and installed on extension pipes extended to a convenient position and properly supported. Gauges shall be tested against a deadweight tester in the presence of the Engineer and shall be accurate to within 2% over the working range. Pressure gauges shall be calibrated in kpa. Blow off holes in gauges shall be aimed in a safe direction, away from the operator. Thermometers shall be of brass mercury-in-glass type at least 150mm long and installed in thermometer pockets so that they may be removed without draining the pipeline. Angle or staring pattern thermometers as appropriate shall be used. Calibration shall be in ^{0}C.

4.17.17 Identification and Labelling

a) Pipework

All pipework, both insulated and uninsulated shall have coloured identification band and direction arrows marked on in clearly visible positions at maximum spacings of 6 meters on all runs. This spacing shall be reduced if necessary to ensure that each pipe and branch-passing through any form of space is coded, each branch has at least one coding band and there shall be a coding band within one meter of each valve, plant connections and flange or union.

The colours to be used for banding and arrows shall be agreed with the Engineer but shall comply as far as is possible with B.S. Bands and arrows shall be neatly stencilled using paint system compatible with the surfaces to which they are to be applied. Bands will consist of a base colour band and identification bands of contrasting colours and each 50mm wide.

All insulated pipework other than stainless steel, copper galvanised and polypropylene, shall be painted over the entire length prior to insulating with an approved anti-corrosive inert

bituminous based paint, suitable for use on steam pipework. All other pipework shall be pained and code banded, as indicated elsewhere in this specification. On bare polypropylene, identification and direction of flow arrows shall be made by the sue of coloured adhesive tape (of a type approved by the Engineer) banded around the pipe in accordance with the foregoing positions.

b) Equipment Items

All plant and equipment items shall be labelled in a clearly visible position with the items name and, in the case of duplicate items, a number. Plant labels shall correspond with designations on the drawings. Labels shall be of rear engraved and filled 'trefoiled" of sandwich thermosetting plastic with black lettering on white background. Lettering size shall be at least 6mm.

c) Valves

Section isolating valves and valves in service areas shall be labelled to identify the zones they serve and with an abbreviated code to identify the service. A schedule of labels required will be provided by the Engineer.

Valve labels shall be sandwich thermosetting plastic with black lettering on a white background secured to the valve stem with a light chain. Sample labels shall be submitted for approval.

4.18 Pipework System Materials

4.18.1 General

All materials shall be suitable for the temperature rating of the system in which they are installed. These ratings are given in the detailed specification.

4.18.2 Steam Reticulation and Condensate Return

a) Piping

150 mm and below	B.S. 1387, heavy class seamless, plain ends prepared for welding.
above 150 mm	B.S. 3601/22 or API 5.L Sch 20 with wall thickness 6,35mm min.

b) Fittings

Steel but-weld fittings to B.S. 1640 or equal,wall thickness not less than pipe thickness.

c) Flanges

B.S. 4504

d) Gaskets

Compressed asbestos.

e) Valves

Steam Isolating Valves

Upto to 40mm	globe valves with cast bronze or ductile iron bodies, replaceable seat, bronze or stainless steel trim, union bonnet pattern and screwed by B.S. 21.
50mm to 150mm	globe valves with cast bronze or ductile iron bodies, replaceable seat, bronze or stainless steel trim, union bonnet pattern and flanged to B.S. 4504.
200mm and above	globe valves with cast bronze or ductile iron bodies valves with cast iron or ductile iron bodies replaceable seat, bronze or stainless trim, rising spindle pattern and flanged to B.S. 4504.

Steam Regulating Valves

These valves shall be needle valves of materials specification similar to isolating globe valves.

Condensate Valves

Upto to 40mm	Cast bronze of ductile iron bodies, replaceable seat, bronze or stainless steel trim, union bonnet pattern and screwed by B.S. 21.
50mm to 150mm	Cast iron or ductile iron bodies, replaceable seat, bronze or stainless steel trim, union bonnet pattern and flanged to B.S. 4504.

Gate Valves

Upto to 40mm	ductile iron bodies, replaceable seat, bronze or stainless steel trim, union bonnet pattern and screwed by B.S. 21.

Non return valves

Upto to 40mm	bronze swing check screwed to B.S. 21.
50mm to 150mm	ductile iron bodies, replaceable seat, bronze or stainless steel trim, union bonnet pattern and flanged to B.S. 4504.

Sight Glasses

Bronze/Gunmetal bodies, single window (Spirax-Hills or equal) combined sight-check valves may be used only where installed safe from Mechanical damage.

Steam Traps

For line draining	Spirax Sarco inverted bucket steam trap fig HN.00/6 or equal unless otherwise specified on the drawing. (stainless steel trim).
For equipment	Spirax ball float steam trap. Fig FT.10 to correct pressure range or equal, unless otherwise specified on the drawings. (Stainless steel trim)

Air vents

Spirax thermostatic vent fig AV10 or 20 depending on pressure, or equal.

Pressure Reducing Valves

Spirax type 25p diaphragm pilot operated reducing valve. Stainless steel trim, phosphor bronze diaphragm, correctly sized for flor rate and with high turn-down accuracy and tight shut-off.

Strainers

up to 50mm	Malleable or cast iron body, stainless steel screen and screwed connections to B.S. 21 (spirax fig 12 of equal)
65mm and above	Cast Iron or S.G. iron body, stainless steel screen and fanged connections (Spirax fig. 33 or equal)

4.18.3 Cold and warm 45°C Water Reticulation

a) Piping

Piping - Steel

up to 150mm	Galvanised steel piping to B.S. 1387, medium class, screwed and socketed.
above 150mm	B.S. 3601/22 or API equivalent, 4.5mm wall thickness with plain ends for welding. To be hot dip galvanised after fabricating.

Piping - Polypylene

up to 25 mm	1 500 kpa rated. Extruded from polypropylene - ethylene grade 'Hacksawed Plastics PPH 2222- X.U.V. or approved equivalent and shall be heat and U.V. stabilised to B.S. 4991 or ISOR 160.
32mm and above	600 kpa rated for cold water and 900 kpa for warm water. Extruded from propylene acetylene grade 'Hacksawed Plastics PPH 2222- X.U.V. or approved equivalent and shall be heat and U.V. stabilised to B.S. 4991 or ISOR 160.

b) Fittings

Fittings -Steel

up to 100mm	Fusion welded and of exactly the same material as the polypropylene piping.
above 125mm	butt welded or fusion welded and of exactly the same material as the polypropylene piping.

Fittings -Polyprolene

up to 150mm	Galvanised malleable iron fitting to SABS 509.
above 125mm	flanged to B.S. 4504. Fabricated or forged steel.

c) Flanges

Flanges - Steel

50mm to 150mm B.S, 4504 screwed and galvanised.

above 125 mm Butt welded or fusion welded and of exactly the same material as the polyprolene piping.

Flanges - Polypropylene

Full face polypropylene or polypropylene stub flanges with mild steel backing rings drilled to B.S. 4504.

d) Gaskets

6mm rubber insertion.

e) Valves

Globe

Upto to 40mm bronze body, bronze or stainless steel trim, replaceable seating, and screwed to B.S. 21.

65 and above cast iron body, bronze or stainless steel trim, replaceable seating flanged to B.S. 4504.

Gate

Upto to 40mm bronze body, bronze or stainless steel trim, replaceable seating, and screwed to B.S. 21.

65mm and above cast iron body, bronze or stainless steel trim, replaceable seating flanged to B.S. 4504.

Check-valves

Upto to 40mm bronze body, bronze or stainless steel trim, replaceable seating, and screwed to B.S. 21.

65 and above cast iron body, bronze or stainless steel trim, replaceable seating flanged to B.S. 4504.

Ball valves

Upto to 50mm chrome plated brass, teflon seat rings screwed to B.S. 21, with fixed operating handle.

Restrictor Valves

Ball stop with c=screw driver operation as supplied by castle Brass or equal.

f) Strainers

Upto to 50mm	Malleable iron bodies, stainless steel screen and screwed connections to B.S. 21 (Spirax fig.12 or approved equal).
65 and above	cast iron or S.C. iron bodies, stainless steel screen and flanged connections (Spirax fig.33 or approved equal)

4.18.4 Hot water (85°C)

a) Piping

Piping - Steel

Stainless steel type 304 L to A.S.T.M specification A312. Wall thickness 2mm minimum longitudinally welded. NOTE All welds made in the pipe during manufacture shall be suitably cold worked to relive stresses and normalize crystal structure in order to prevent stress corrosion occurring while the pipe is in service at 85°C. All joints in run and to fittings to be welded, using a suitable inert gas technique.

Piping - Polypropylene

Upto to 25mm	1,500 kpa rated. Extruded from polypropylene - ethylene grade "Hoeschst Plastics PHH 222 X.U.V. or approved equal and shall be hear and U.V. stabilised, to B.S. 4991 or ISOR 160.
32mm and above	1,500 kpa rated. Extruded from polypropylene -ethylene grade "Hoeschst Plastics PHH 222 X.U.V. or approved equal and shall be hear and U.V. stabilised, to B.S. 4991 or ISOR 160.

Piping - Copper

Type CU DHP complying with B.S. 2051

b) Fittings

Fittings - Steel

Stainless steel type 304L welded.

Fittings - Polypropylene

Upto to 100mm	Fusion welded of exactly the same material and pressure rating as the polypropylene piping.
125mm and above	Flanged and of exactly the same pressure rating and material as the polypropylene piping.

Fittings - copper

Upto to 50mm	Capillary to B.S. 864 or screwed to B.S. 21. Above 50mm flanged, brazed or bronze welded.

c) Flanges

Flanges - Steel

Stainless steel type 304L flat face - slip-on, to B.S. 4504.

Flanges - Polypropylene

Full face polypropylene or polypropylene stub flanges with mild steel backing rings drilling to B.S. 4504.

Flanges - copper

Bronze or gunmetal brazed or welded to pipe, B.S. 4504. Brass bolts, nuts and washers to be used.

d) Gaskets

6mm Rubber insertion.

e) Valves

Globe (throttling valve only)

Up to 40mm bronze body, bronze or stainless steel trim, replaceable seating and screwed to B.S. 21.

50mm and above Cast iron body, bronze or stainless steel trim, replaceable seating and screwed to B.S. 4505.

Gate

Up to 40mm bronze body, bronze or stainless steel trim, replaceable seating and screwed to B.S. 21.

50mm and above Cast iron body, bronze or stainless steel trim, replaceable seating and screwed to B.S. 4505.

Valves

Up to 40mm bronze body, bronze or stainless steel trim, replaceable seating and screwed to B.S. 21.

50mm and above Cast iron body, bronze or stainless steel trim, replaceable seating and screwed to B.S. 4505.

Check Valves

Up to 40mm bronze body, bronze or stainless steel trim, replaceable seating and screwed to B.S. 21.

50mm and above Cast iron body, bronze or stainless steel trim, replaceable seating and screwed to B.S. 4505.

Ball Valves

Up to 40mm chrome plated brass, teflon seat rings, screwed to B.S. 21 with fixed operating handle.

Restrictor Valves

Ballstop with screwdriver option as supplied by Castle Brass or equal.

Finish - Machined brass unless specified otherwise.

f) Strainers

Up to 50mm Malleable iron body, stainless steel screen and screwed connections to B.S. 21 (Spirax fig.12 or approved equal) 65mm and above malleable iron body, stainless steel screen and flanged connections (Spirax fig.33 or approved equal).

4.18.5 Hot water (85°C)

a) Piping

Piping - Steel

upto 150mm Steel piping (Black) to B.S. 1387 medium class plain ends for welding.

above 150mm Steel piping to B.S. 3601/22 or API Equivalent 4,5 mm wall thickness plain ends for welding.

Piping - Polypropylene

Upto to 100mm 1,500 kpa rated. Extruded from polypropylene - ethylene grade "Hoeschst Plastics PHH 222 X.U.V. or approved equal and shall be hear and U.V. stabilised, to B.S. 4991 or ISOR 160.

b) Fittings

Fittings - Steel

Butt-weld fittings to B.S. 1640.

Fittings - Polypropylene

Upto to 100mm Fusion welded of exactly the same material and pressure rating as the polypropylene piping.

125mm and above Butt welded or fusion welded and of exactly the same pressure rating and material as the polypropylene piping.

c) Flanges

Flanges - Steel

B.S. 4504 wrought steel, flat faced, slip on.

Flanges - Polypropylene

Full face polypropylene or polypropylene stub flanges with mild steel backing rings drilling to B.S. 4504.

d) Gaskets

Compressed asbestos 6mm full-face.

e) Valves

Up to 50mm ball valves with bronze body, hard chromed bronze ball, teflon seats, screwed, to B.S. 21. Alternatively forged steel body, stainless steel ball.

65mm and above globe valves with cast iron body, bronze seating rising spindle, flanged to B.S. 4504.

Check Valves

Non-slam double swing check valves with cast iron body, bronze flaps and neoprene seat, fitted between flanges.

Traps

15mm Spirax Sarco 'Driline' type automatic trap with internal strainer, or approved equal.

20mm Spirax Sarco C.A 10 with spirax sarco fig.6 angle strainer fitted before trap or approved equal. All traps to have balance pipe.

Filter, Regulator, Lubricator Sets

8 mm Spirax type MFRL or approved equal complete with pressure gauge and manual operated drains on filter unit.

10,15, & 25mm Spirax type SFRL or approved equal complete with pressure gauge and manual operated drains on filter unit.

Filter and Regulator

As for filter, regulator and lubricator sets but without lubricator.

h) Moisture separators

Up to 40mm Spirax vertical type S! (for approval equal) screwed inlet and outlet to B.S. 21 complete with drain trap type CA 10.

32mm and above Spirax Sarco horizontal type S4 (or approved equal) flanged connections, complete with drain trap CA.10

4.18.6 Chilled Water Pipework

a) Piping

upto 80 mm B.S. 1307 medium class, screwed and socketed.

100mm to 150mm B.S. 1387 medium class. plain ends prepared for welding.

Above 150 mm B.S. 3601/22 or API equivalent with wall thickness 5 mm minimum. plain ends prepared for welding.

b) Fittings

Steel butt-weld fittings to B.S. 1640 or equal, wall thickness not less than pipe thickness or screwed malleable iron fittings as applicable.

c) Flanges B.S. 4504

d) Gaskets Rubber insertion

e) Valves
Cocks - Balancing Valves

Upto to 50mm bronze body, bronze or stainless steel trim, replaceable seating and screwed to B.S. 21.

65mm and above Cast iron body, outside screw and yoke, bolted bonnet, replaceable seating, rising stem incorporation back seal, bronze or stainless steel trim, and flanged to B.S. 4504.

Gate

Upto to 50mm bronze body, bronze or stainless steel trim, replaceable seating and screwed to B.S. 21.

65mm and above Cast iron body, outside screw and yoke, bolted bonnet, replaceable seating, rising stem incorporation back seal, bronze or stainless steel trim, and flanged to B.S. 4504.

Check Valves

Upto to 50mm bronze body, bronze or stainless steel trim, replaceable seating and screwed to B.S. 21.

65mm and above Cast iron body, bronze seating, swing-check,

flanged to B.S. 4504

f) Strainers

All strainers to be installed as follows:

Upto 50mm diameter screwed to B.S. 21. 50mm and over flanged to B.S. 4504.

Screwed ends Bronze body, stainless steel screen.

Flanged ends Cast Iron body, stainless steel screen.

4.18.7 Condenser Water Pipework

a) Piping

upto 80 mm	B.S. 1307 medium class, screwed and socketed.- galvanised.
100mm to 150mm	B.S. 1387 medium class. flanged ends - galvanised after manufacture.
Above 150 mm	B.S. 3601/22 or API equivalent with wall thickness 5 mm minimum, flagged ends - galvanised after manufacture.

b) Fittings

upto 80 mm Galvanised malleable iron fittings to B.S. 143 screwed to B.S. 21.

above 80 mm Flanged to suit.

c) Flanges

upto 80 mm B.S. 4504 screwed and galvanised.

above 80 mm B.S. 4504 slip on. Pipe and Flange galvanised after manufacture.

d) Gaskets Rubber insertion

e) Valves

Valves shall be all as specified for chilled water, 17.18.6 e.

f) Strainers

Strainers shall be all as specified for chilled water 17.18.6 e.

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SECTION V

PARTICULAR SPECIFICATION FOR PLASTICS SYSTEMS

5.0 Soil and Waste Systems

5.1 UPVC Soil System

5.1.1 The pipes and fittings shall comply in all respects with the requirements of British Standard 4514:1969, and shall, where appropriate, bear the British Standard Kitemark.

5.1.2 Pipes shall be supplied in plain ended lengths.

5.1.3 The minimum acceptable wall thickness of pipe fittings and shall be:-

Nominal ins	Size mm	Pipe mm	Fittings mm
3	82	3.20	3.2
4	110	3.20	3.2
6	160	3.30	3.5

5.1.4 The method of jointing to be employed shall be that of solvent welding using the manufacturer's approved cement. Seal ring fittings shall be used where necessary to accommodate thermal movement, or the sockets of standard fittings shall be converted to seal ring joints by the addition of a seal ring adaptor.

5.1.5 The grade UPVC used for the pipe shall have a minimum softening point of 82°C when tested by the vicat method as described in British Standard 2782:1976, Method 102A.

5.1.6 The grade of UPVC used for the fittings shall have a minimum softening point of 79°C when tested by the Vicat method described in British Standard 2782:1976, Method 102A.

5.1.7 The pipe and fittings shall be colour grey, to British Standard 5252:1976 10.A.07, black, or for water closet connections, white.

5.1.8 The rubber seals for seal ring joints shall be of a section that gives more than one point of contact with the pipe and shall be to the material requirements of British Standard 2494:1976. Water closet connections shall be to the same British standard.

5.1.9 Waste boss connections when fitted to pipes shall consist of two parts with inner and outer flanges, solvent welded as a complete unit with inbuilt gradients for the waste pipes of 1 1/4°. Where it is not possible to gain access to the bore of the soil pipe, self locking bosses with integral clamping action may be used provided that the mating surfaces are suitable for and used with solvent weld cement.

5.1.10 Alternative waste boss connections may be made using unequal junctions conforming to British Standard 4514:1969 with solvent weld joints conforming to British Standard 4514:1969.

5.1.11 When used internally holderbats shall be made of mild steel protected from corrosion by galvanised or plastic coating. They shall have two-position fixing suitable for either acting as a pipe support but allowing thermal movement or as a clamp fit on a fitting creating a fixed point. For optimum fit to pipe supports PVC packing pieces may be used. PVC holderbats may be used for external use.

5.1.12 Access shall be provided where necessary either by means of an integrally moulded door in an access fitting with an externally fitted rubber seal and secured with two galvanised bolts and nuts or alternatively by a two-piece clamp type door fitted into the pipe run.

5.2.0 <u>MUPVC WASTE SYSTEM</u>

5.2.1 The pipe and fittings shall comply in all respects with the requirements of British Standard 5255:1976, and shall, where appropriate, bear the British Standard Kitemark.

5.2.2 Pipes shall be supplied in plain ended lengths.

5.2.3 The minimum acceptable wall thickness of pipe and fittings shall be:-

Nominal Size ins	Size mm	Pipe and Fittings Wall Thickness mm
1 1/4	32	1.8
1 1/2	38	1.9
2	50	2.0

5.2.4 The method of jointing to be employed shall be that of solvent welding using the manufacturer's approved cement. Seal ring joints shall be introduced where it is necessary to accommodate expansion.

5.2.5 The grade UPVC used for the pipe shall have a minimum softening point of 94° when tested by the Vicat method as described in British Standard 2782:1976, Method 102A.

5.2.6 The grade of UPVC used for the fittings shall have a minimum softening point of 80°C when tested by the Vicat method as described in British Standard 2782:1976, Method 102A.

5.2.7 The pipe and fittings shall be colour grey, to British Standard 5252: 1976 10.A.07, black or white.

5.2.8 The rubber seal rings shall be of a section that gives more than one point of contact with the pipe and shall be to the material requirement of British Standard 2494:1976.

5.2.9 Traps shall be moulded from white polypropylene and shall have a universal compression outlet. The fittings shall comply in all respects to British Standard 3943:1979 where applicable, and shall bear the British Standard Kitemark.

Traps of configurations not covered by the British Standard shall comply with the performance specification of the standard.

5.3.0 SOIL AND WASTE SYSTEMS - WORKMANSHIP

5.3.1 The installation, method of jointing and fixing shall comply in all respects to the manufacturer's sitework instructions.

5.3.2 Maximum intervals between pipe supports shall be:-

Nominal ins	Size mm	Horizontal m	Vertical m
1 1/4	32	0.5	1.2
1 1/2	38	0.5	1.2
2	50	0.9	1.2
3	82	0.9	1.8
4	110	0.9	1.8
6	160	1.0	1.8

5.3.3 Pipes shall be fixed in straight runs and all horizontal runs shall be laid to gradients in accordance with British Standard 5572:1978 Code of Practice for Sanitary Pipework, and in any event not less than 18mm/m unless otherwise instructed.

5.3.4 Expansion joints shall be provided at a maximum of 4 metre centres for soil, 2 metre centres for waste and between fixed points over 1 metre centres.

5.3.5 The work shall be inspected and tested during installation at agreed stages.
All work which will be concealed shall be tested before it is finally enclosed.

A final test shall be made upon completion of soundness and performance in accordance with British Standard 5572:1978 Code of Practice for Sanitary Pipework.

5.4 Rainwater Systems:

5.4.0 UPVC Half Round Rainwater System Pipe and Gutter

5.4.1 Gutters shall be true half round section 110mm outside diameter complying in all respects with the requirements of British Standard 4576 Part 1:1970 and shall, where appropriate, bear the British Standard Kitemark.

5.4.2 Gutters shall be supplied in plain ended lengths.

5.4.3 The minimum acceptable wall thickness of gutter shall be 2.20mm

5.4.4 Rainwater pipes shall be circular in section, 65mm nominal diameter complying in all respects to British Standard 4576 Part 1:1970 and shall bear the British Standard Kitemark.

5.4.5 Rainwater pipes shall be supplied in plain ended lengths.

5.4.6 The minimum acceptable wall thickness of rainwater pipe shall be 1.80mm.

5.4.7 Pipe support brackets must be adequate to screen expansion gaps.

5.4.8 The grade of UPVC used for gutter and pipe shall have a minimum softening point of 75°C when tested by the Vicat method as described in British Standard 2782:1976, Method 102A.

5.4.9 The pipe and gutter shall be colour grey, to British Standard 5252: 10.A.07, black or white.

5.5.0 UPVC Square Rain Water System Pipe and Gutter

5.5.1 Gutters shall be rectilinear section 116mm wide maximum.

5.5.2 Gutters shall be supplied in plain ended lengths.

5.5.3 The minimum acceptable wall thickness of gutters shall be 2.20mm.

5.5.4 Rainwater pipes shall be square in section, 58mm internal dimension.

5.5.5 Rainwater pipes shall be supplied in plain ended lengths.

5.5.6 The minimum acceptable wall thickness of rainwater pipes shall be 1.80mm.

5.5.7 Pipe Support brackets must be adequate to screen expansion gaps.

5.5.8 The grade of UPVC used for gutter and pipe shall have a minimum softening point of 75° when tested by the Vicat method as described in British Standard 2782:1976, Method 102A.

5.4.9 The pipe and gutter shall be colour grey, to British Standard 5252: 10.A.07, black or white.

5.5.0 UPVC Square Rainwater System Pipe and Gutter

5.5.1 Gutters shall be rectilinear section 116mm wide maximum.

5.5.2 Gutters shall be supplied in plain ended lengths.

5.5.3 The minimum acceptable wall thickness of gutters shall be 2.20mm

5.5.4 Rainwater pipes shall be square in section, 58mm internal dimension.

5.5.5 Rainwater pipes shall be supplied in plain ended lengths.

5.5.6 The minimum acceptable wall thickness of rainwater pipes shall be 1.80mm.

5.5.7 Pipe support brackets must be adequate to screen expansion gaps.

5.5.8 The grade of UPVC used for gutter and pipe shall have a minimum softening point of 75°C when tested by the vicat method as described in British Standard 2782:1976, Method 102A.

5.5.9 The pipe and gutter shall be colour grey, to British Standard 5252: 1976 10.A.07, black or white.

5.6.0 UPVC Rainwater Fittings

5.6.1 All fittings shall comply with the relevant requirements of British Standard 4576 Part 1: 1970 and shall, where appropriate bear the British Standard Kitemark.

5.6.2 All gutters, pipe and fittings shall be colour grey to British Standard 5252:1976 10.A.07, black or white.

5.6.3 Gutter connecting fittings shall have integrally moulded seal retaining cavities housing a rubber seal or hallow section.

5.6.4 Gutter connecting fittings shall incorporate provision for fixing to fascia boards, rafters or brickwork such that the fixing screws shall not be in contact with the inner surface of the gutter and shall have provision for expansion of the gutter clearly marked in the fitting.

5.6.5 The grade of UPVC used for fittings shall have a minimum softening point of 75°C when tested by the Vicat method 102A as described in British Standard 2782:1976, Method 102A.

5.7.0 Workmanship

5.7.1 All rainwater systems shall be installed in accordance with the manufacturer's sitework instructions.

5.7.2 Gutters shall be supported on support brackets at one metre centres. In areas of heavy snow load, brackets shall be provided at 800mm centres.

5.7.3 Gutters shall be installed to accommodate the thermal movement.

5.7.4 Expansion joints shall be provided at maximum 4 metre centres.

5.7.5 Screws for fixing shall be roundheaded No.10 and long enough to make full use of the thickness of a traditional 25mm nominal softwood fascia. They shall have a rust-proofed finish. When fixing to other fascia, fastenings of equivalent holdings power shall be used.

5.8 Buried Drain System:

5.8.0 UPVC Buried Drain System

5.8.1 The pipes and fittings shall comply in all respects with the requirements of British Standard 4660:1973 and shall, where appropriate, bear the British Kitemark.

5.8.2 Pipes shall be supplied in plain ended lengths.

5.8.3 The minimum acceptable wall thickness of pipe and fittings shall be:-

Nominal	Size	Pipe	Branch Junction Only		All Other Fittings	
			Socket	Body	Socket	Body
ins	mm	mm	mm	mm	mm	mm

4	110	3.2	3.5	3.8	3.2	3.4
6	160	4.1	4.3	4.7	4.3	4.7

5/5

5.8.4 The method of jointing to be employed shall be lip-seal socketed fittings jointing to other materials shall be made in the manner specified by the manufacturer.

5.8.5 The grade of UPVC used for the pipe shall have a minimum softening point of 82°C when tested by the Vicar method as described in British Standard 2782:1976, Method 102A.

5.8.6 The grade of UPVC used for the fittings shall have a minimum softening point of 79°C when tested by the vicat method as described in British Standard 2782:1976, Method 102A.

5.8.7 The pipe and fittings shall be colour golden brown approximating to British Standard 381C:1971 No.414. The seal retaining caps shall be black polypropylene.

5.8.8. The rubber of lip seal joints shall be to the material requirement of British Standard 2494:1976.

5.8.9 Holderbats shall be made of mild steel protected from corrosion by galvanising or plastic coating. They shall have a two position fixing suitable for either acting as pipe support but allowing thermal movement or as clamp fit on a fitting creating a fixed point. For optimum fit to pipe supports PVC packing pieces may be used.

5.8.10 The base of soil and bent stack connection to the buried drain shall be made with a bend of minimum centre line radius of 250mm.

5.8.11 Minor changes of direction where permitted shall be made with a variable bend that has a constant effective length.

5.9.0 <u>BURIED DRAIN SYSTEM - WORKMANSHIP</u>

5.9.1 The installation, method of jointing and fixing shall comply in all respects to the manufacturer's site work instructions.

5.9.2 <u>Excavation of Trenches</u>

Trenches shall be excavated to a sufficient depth to allow a 100mm minimum bed below the underside of the pipe. Trench width shall be not less than the outer diameter of the pipe plus 300mm and not wider than necessary.

5.9.3 <u>Trench Invert</u>

The base of the trench shall be such that even support is given to the pipe for its full length. Soft spots shall be removed and replaced with compacted or granular material - see clause 5.9.7. High spots and rock shall be removed to allow a full 100mm bed depth.

5.9.4 <u>Pipe Bed</u>

The bed shall be composed of granular material to the specification called for in clause 5.9.7 and shall cover the full trench width and length and be boned to gradient.

5.9.5 Laying and Jointing

Pipes and fittings shall be laid true to gradient in straight lines and jointed in accordance with manufacturer's instructions. All pegs used for alignment and other purposes must be

removed after use and before sidefilling. All joints shall be watertight.

Pipes barrels shall be in continuous contact with the trench when laid.

5.9.6 Side Filling

The side filling of pipes shall be composed of hard granular material which shall be to the requirements of clause 5.9.7

Side filling must be placed equally on both sides of the pipes and compacted, so as to buttress the pipes against the trench walls. Side filling shall continue up to pipe crown level as a minimum and above this level if required by the Engineer.

5.9.7 Back Filling

The first 300mm of backfill above crown level shall be taken from selected trench spoil all passing 25mm sieve. It shall be placed in two 150mm layers each firmly, tamped. Above the 300mm level mechanical filling and compacting may be used.

Where cover is less than 450mm the pipe shall be covered with 75mm of selected material laid to support a concrete tile or slab indicating the presence of a service.

5.9.8 Granular Material for Bed and Sidefill

All material for bed and sidefill shall be hard and granular passing 20mm sieve and shall contain not more than 5 per cent fines passing 3mm sieve.

The material may be composed of crushed stone, clinker, quarry scalping, ballast, gravel, shingle or all-in aggregate to British Standard 882:1965.

The material shall have a compaction factor of 0.3 or less.

5.10 COLD WATER SYSTEMS:

5.10.0 UPVC Cold Water System

5.10.1 Pipe shall comply in all respects with the requirements of British Standard 3505:1968 and shall bear the British Standard Kitemark.

Fittings shall comply in all respects with the requirements of British Standard 4346 Part 1:1969 and shall bear the British Standard Kitemark.

5.10.2 Pipes shall be supplied in plain ended lengths.

5.10.3 The minimum acceptable wall thickness of pipe and fittings shall be:-

Nominal Size ins	Pipe and Fittings mm
3/8	1.5
1/2	1.7
3/4	1.9
1	2.2
1 1/4	2.7
1 1/2	3.1
2	3.9
3	5.7
4	7.3

5.10.4 The method of jointing to be employed shall be that of solvent welding using the manufacturer's approved cement, which shall comply with the requirements of British Standard 4346 Part 3, and shall bear the British Standard Kitemark.

5.10.5 The grade UPVC used for pipes shall have a minimum softening point of 75°C and for the fittings a minimum softening point of 72°C when tested by the Vicat method as described in British Standard 2782:1976, Method 102A.

5.10.6 The pipe and fittings shall be coloured dark grey.

5.11.0 Workmanship

5.11.1 The installation method of jointing and fixing shall comply in all respects to the manufacturer's sitework instructions.

5.11.2 At 20°C the maximum intervals between pipe supports shall be:-

Nominal Size ins	Horizontal m	Vertical m
3/8	0.75	Up to twice the permitted horizontal spacing of support centres shall be accepted provided the pipe is well protected within a structure.
1/2	0.84	
3/4	0.94	
1	1.07	
1 1/4	1.14	
1 1/2	1.28	
2	1.44	
3	1.72	
4	1.90	

5.11.3 Pipes passing through walls or floors shall be sleeved to allow unrestricted movement.

5.11.4 The work shall be inspected and tested during installation at agreed stages.

All work which will be concealed shall be tested before it is finally enclosed.

A final test shall be made upon completion for soundness and performance to the satisfaction of the Local Water Authority.

SECTION VI

PARTICULAR SPECIFICATION FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF THE HOSEREEL AND HYDRANT FIRE FIGHTING SYSTEM

SECTION VI

PARTICULAR SPECIFICATION FOR THE SUPPLY, INSTALLATION AND COMMISSIONING OF THE HOSEREEL AND FIRE FIGHTING SYSTEM

6.1.1 General

The particular specification details the requirements for the supply, installation and commissioning of the hosereel installation. The hosereel installation shall comply in all respects to the requirements set out in C.O.P. 5306 Part 1: 1976, B.S. 6041 and B.S. 5274. The system shall comprise of a pumped system for hosereels on all floors.

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 completion and satisfactory functioning of the works.

No claims for extra payment shall be accepted from the Sub-Contractor because of his non-compliance with the above requirements.

If in the opinion of the Sub-Contractor there is a difference between the requirements of the specification and the contract drawings, he shall clarify these differences with the Engineer before tendering.

6.1.2 Climatic Conditions

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

b) Where not otherwise stated, all ratings of plant, equipment and apparatus shall be interpreted as site ratings and NOT sea level or other ratings.

Maximum temperature	30.6^0C
Minimum temperature	13.8^0C
Average Diurnal Range	14.9^0C
Relative humidity range	41-75%
Altitude	1214m above sea level
Latitude	00 02'S
Longitude	34^0 49'E
Rainfall	Extremely heavy at certain periods Of the year.

6.1.3 Scope of Works

The Sub-Contractor shall supply/deliver, erect, test and commission all the automatic fire fighting hosereel installation which is called for in this Specification and shown on the Contract Drawings listed in the Drawing Schedule.

6.1.4 Pipework

The pipework for the hosereel installation shall be galvanised wrought steel tubing `Medium' Grade Class `B' to B.S. 1387: 1967 malleable iron fittings to B.S. 21.

6.1.5 Pipe Fittings

The pipe fittings shall be wrought steel pipe fittings welded or seamless fittings conforming to B.S. 1740 Part 1971 or malleable iron fittings to B.S. 143.

All changes in direction will be with standard bends or long radius fittings. No elbows permitted.

6.1.6 Flanges

The flanges shall comply with B.S. 4504: 1969. All flanges shall comply to a nominal pressure rating of 16 bar (PN 16) and shall be of either cast iron or steel.

6.1.7 Gaskets

The gaskets for use with flanges to B.S. 4305: 1969 shall comply with B.S. 4865 Part 1: 1972 for pressure up to and not exceeding 64 bar.

6.1.8 Non-Return Valves

The non-return valves up to and including 80mm diameter shall be as Glenfield No. 5003 to B.S. 5153: 1974 with flanges to B.S. 4504 (PN 16).

The valves shall be of cast iron construction with gunmetal seat and bronze hinge pin.

6.1.9 Gate Valves

The gate valves up to and including 80mm diameter shall be as Crane No. D 151 non-rising stem and wedge disc to B.S. 1952: 1864 (B.S. 5154: 1974) with screwed threads to B.S. 21 taper thread or flanged to B.S. 4504.

6.1.10 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 to be packed with mineral wool, to the Engineer's approval.

6.1.11 Floor and Ceiling Plates

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

6.1.12 Hosereel

The hosereels to the installation shall consist of recessed and non-recessed automatic hosereels as Angus Fire Armour Model III swinging hosereels (recess) and Model 1 swinging hosereel respectively.

All the above hosereels shall comply with B.S. 5274: 1976 and B.S. 3169: 1970 and are to be installed to the requirements of C.P. 3505 Part 1: 1976.

The hosereels shall be supplied and installed complete with first-aid non-kinking hose 30 metres long, with nylon spray/jet/shut-off nozzle inlet to the reel are to be supplied.

The orifice to the nozzle shall not be less than 4.8mm to maintain a minimum flow of 0.4 L/S to the jet.

The hosereels shall be installed at 1.5mm centre above the finished floor level in locations shown on Contract Drawings.

6.1.13 Earthing

Earthing installation shall be electrically earthed by a direct earth connection. The installation of the earthing to be carried out by the Electrical Sub-Contractor.

6.1.14 Hosereel Pump Set

On line pump as "Hobby" complete with pressure vessel and controls.

The Hosereel set to incorporate a pressure monitoring device having two independently adjustable contacts arranged to close on falling pressure. Contact No.1 is set to close on fall in pressure due to opening of Hosereel valve or similar. Operation of this switch initiates the full automatic sequence set, including remote alarm and indication.

BasePlate

Fabricated steel with support for control panel and pipework, together with four lifting eye bolts for ease of installation.

Valves/Pipework

Each set consists of identical pumps with isolating valves on each pump suction and isolating and non-return valves on each pump discharge. The delivery line from the pump is fitted with a pressure switch, test cock/vent, delivery pressure gauge, and a further isolating valve for routine testing.

Suction and discharge manifolds terminate in flanges drilled to BS4504 PN16.

The pipework is fabricated steel.

All valves fitted are Metropolitan Water Board (M.W.B.) stamped as standard.

Membrane Pressure Vessel

A membrane pressure vessel has been integrated into the system to provide a positive charge, thus preventing pump operation as a result of any minor system leakage.

Control Panel

As described.

Electrics
The set, being pre-wired eliminates the need for wiring on site, except for the connection of an electrical power source (3 phase, 3 wire supply) to the control panel.

Testing
The complete unit to be manufactured, tested and delivered as a packaged unit, finished in hard gloss red paint.

6.1.15 Finish Painting

Upon completion of testing and commissioning of the hosereel installation the pipework shall be primed and finish painted with 2 No. coats of paint to the Architect's requirements.

6.1.16 Testing and Commissioning

The hosereel installation is to 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 a half times the working pressure of the installation to the approval of the Engineer. Simulated fault condition of the pumping equipment, is to be carried out before acceptance of the system by the Engineer and Architect.

6.1.17 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 instructions 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 seven days in which time the Client's staff shall be instructed in the operation and maintenance of the equipment.

6.2.0 PARTICULAR SPECIFICATION FOR THE SUPPLY AND INSTALLATION OF PORTABLE FIRE EXTINGUISHERS

6.2.1 General

The particular specification details the requirements for the supply and installation and commissioning of the Portable Fire Extinguishers which shall conform to B.S. 5423: 1980. 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 completion and satisfactory functioning of the works.

If in the opinion of the Sub-Contractor there is a difference between the requirements of the specification and the Contract Drawings, he shall clarify these differences with the Engineer before tendering.

6.2.2 Water/Co_2 Extinguishers

The portable 9-litre water filled CO_2 cartridge operated portable fire extinguishers shall comply with the requirements of B.S. 5423: 1980. Unless manufactured with stainless steel, bodies shall have all internal surfaces completely coated with either a lead tin, lead alloy or zinc applied by hot dipping. There shall be no visibly uncoated areas.

The extinguishers shall be clearly marked with the following:-

a) Method of operation

b) The works "WATER TYPE" (GAS PRESSURE) in prominent letters

c) Name and address of the manufacturer or responsible vendor

d) The nominal charge of the liquid in letters

e) The liquid level to which the extinguisher is to be charged

f) The year of manufacture

g) A declaration to the effect that the extinguisher has been tested to a pressure of 24.1 bar

h) The number of the British Standard B.S. 5423: 1977.

6.2.3 Portable Carbon Dioxide Fire Extinguishers

The portable carbon dioxide fire extinguishers shall comply with B.S. 5423: 1980

The body of the extinguishers shall be a seamless steel cylinder manufactured to one of the following British Standards, B.S. 401, B.S. 1288.

The filling ratio shall comply with B.S. 5355 with valves fittings for compressed gas cylinders to B.S. 341. Where a hose is fitted it shall be flexible and have a minimum working pressure of 206.85 bar, the hose is not to be under internal pressure until the extinguisher is operated.

The nozzle shall be manufactured of 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 born shall be so as to direct the discharge and limit the entrainment of air. It shall be construed of electrically non-conductive material.
The following and markings shall be applied to the extinguishers:

a) The words 6 Kg. carbon dioxide fire extinguishers and to include the appropriate nominal gas content.

b) Method of operation.

c) The words "Re-charge immediately after use".

d) Instructions for periodical checking.

e) The number of the British Standard B.S. 5423: 1980.

f) The manufacturers name or identification markings.

6.2.4 <u>Dry Powder Portable Fire Extinguishers</u>

The portable dry powder fire extinguishers shall comply with B.S. 5423: 1980. The body shall be constructed of steel not less than the requirements of B.S. 1449 or aluminium to B.S. 1470: 1972 and shall be suitably protected against corrosion.

The dry powder charge shall be non-toxic and retain its free flowing properties under the 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 material. Where a hose is provided it shall not exceed 1,060M and shall be acid and alkali resistant. Provision shall be made for securing the nozzle when not in use.

The extinguisher shall be clearly marked with the following information;

a) The words "Dry Powder Fire Extinguisher".

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 this British Standard to B.S. 5423: 1980.

j) When appropriate complete instructions for charging the extinguisher shall be clearly marked on the extinguisher or otherwise be supplied with the refill.

Foam Fire Extinguisher

The portable foam extinguisher shall comply with the requirements of B.S. 5423: 1980. The body shall be constructed from 16 s.w.g. steel to B.S. 1449, polythene lined to give protection against internal corrosion while the neck ring shall be in steel to B.S. 980 and welded internally to the body.

The gas cartridge shall be a standard fitting 75 gam capacity CO_2 gas cartridge, plastic coated and also complying with B.S. 5423. The discharge hose shall be made from polyester reinforced flexible P.V.C. and nozzle in moulded A.B.S. Provision shall be made for securing the nozzle when not in use.

The extinguisher shall be clearly marked with the following information:-

a) The words "FOAM FIRE EXTINGUISHER".

b) Method of operation in prominent letters.

c) The working pressure and the quantity of charge in litres.

d) Manufacturer's name or identification.

e) The words "RECHARGE AFTER USE" if rechargeable type.

f) Instructions for periodical checking.

g) The number of this British Standard B.S. 5423: 1980

6.2.5 Fire Blanket

The fire blanket shall be made from cloth with pre-asbestos yarn to measure 2000 x 2000mm and shall be fitted with special tapes folded so as to offer instantaneous single action release blanket from storing jacket.

6.2.6 **Painting & Finishing**

The sub-contractor shall paint or cause to be painted all the service pipework in the respective colour coding as specified to B.S. 1710 and elsewhere in this specifications.

SECTION VII

GENERAL TECHNICAL SPECIFICATION - COMMISSIONING

GENERAL TECHNICAL SPECIFICATION - COMMISSIONING

7.1 General

Before any commissioning work takes place, the sub-contractor shall submit a set of schematic commissioning drawings showing duct runs, and other equipment, air flows, water flows and controls. These drawings to be accompanied by the method proposed for commissioning of the plant, as by the method proposed for commissioning of the plant, as well as the number of people involved, their names and experience. The Engineer;s approval on the above item is essential before any commissioning takes place.

7.2 Maintenance Manuals

The Sub-contractor shall provide, before any commissioning works starts, three copies of the maintenance and operating manuals for the plant supplied. These manuals shall be sewn and bound in book form with hard plastic covers to withstand constant use, and shall be properly indexed to facilitate quick references. Prior to the submission of the three copies mentioned above the Sub-Contractor shall submit one draft copy of the maintenance and operating manuals for approval. The works shall not be considered to be completed for the purposes of taking over until such manuals have been supplied to the Engineer, and subsequent equipment test results have been included in them.

The manuals shall include:-

a) A list of recommended servicing tools and specialist plant.
b) A list of recommended spares necessary for a period of 2 years operation.
c) Exploded drawings or spares lists from which every item of every place of plant can be positively identified of each item of plant.
d) A list of giving the name and address of the manufacturer of each item of plant.
f) A copy of all test certificates obtained with the plant.
g) A list of recommended lubricants.
h) a preventive maintenance programme for all plant.
i) Operating instructions for each item of plant.
j) Performance data, equipment tests and characteristic curves.

7.3.0 Initial Testing and Plant Commissioning

7.3.1 Initial Testing

a) Pressure Testing - Piping

All pipework system shall be pressure tested by filling with water and raising the pressure to 1.5 times working pressure. They shall then be left for a period of at least one hour during which all joints must remain water-tight. Any fault found during the pressure test shall be remedied and the test reapplied until the same is dealt with completely.

The pipework shall be tested in sections to suit the construction programme and all services in concealed locations shall be tested before they are finally concealed. No insulation shall be applied before tests have been carried out.

The Sub-Contractor shall provide all test equipment and all additional items such as toes, valves, drain fittings, etc, which are necessary to enable the systems to be treated in sections. Each test shall be witnessed by the Engineer or his nominated agent and also a signed certificate of approval shall be obtained.

b) Drawing and Cleaning

On completion of the pressure test on a section of pipework the water used for testing shall be drained away as quickly as possible to remove as much dirt and dross as possible. After completion for a pipework circuit the circuit shall be flushed through to remove all pipe scale, dress and similar material.

c) Pressure Testing - Ducting

See section on ducting

d) Insulation Tests

All electrical wiring and controls integral with the plant supplied shall be subjected to insulation tests. All instrument and other equipment required for the tests shall be provided by the sub-contractor.

e) Drives

All drives shall be run and tested for direction rotation and correspondence of alignment.

7.3.2 Plant

The Sub-Contractor shall check over and test and satisfy himself that all items of plant are correctly assembled and aligned before start-up. This work is to be carried out by skilled commissioning Engineers who are completely familiar with the plant involved.

The Engineer shall witness plant commissioning as required by him and the contractor must advise the Engineer prior to any commissioning work taking place.

On completion of the plant commissioning the Contractor shall provide written confirmation to the Engineer that he has completed all commissioning work to the Engineer that he has completed all commissioning work and is satisfied that the time items of plant are operating satisfactorily.

7.3.3 Test of Completion

On completion of the Sub-Contractor's initial testing and commissioning as specified above, the plant shall be put into normal operation and the final adjustment os the plant shall be made. Thereafter the Tests on completion shall be carried out to ensure that the plant will fulfil the function for which it has been designed. These tents shall extent for a period of at least four weeks and shall include the following:

a) Simulated tests for all alarm and safely cut out equipment.
b) Simulated tests on automatic controls.
c) Capacity tests to ensure that the plant supplied will handle the quantities specified.

The Sub-Contractor shall utilise the Engineer's manual Equipment performance and capacity.

The Sub-Contractor shall at his own cost render all assistance and supply all labour, appliances and any other materials, as may be required to carry out these tests. All instruments shall be accurately calibrated before the tests begin.

On completion of the whole of the tests and when the sub-contractor is satisfied that the entire plant is operating satisfactorily and will fulfil the function for which it has been designed, he shall submit to the engineer triplicate copies of all tests records and charts together with reports on all the tests called for in this specification. The Engineer shall reserve the right to ask for previous tests in order to prove that the operation of the plant is satisfactory and in accordance with the specification and drawings,

The Sub-Contractor shall be responsible for the proper operation and running maintenance of the plant throughout the period of the tests. The Sub-Contractor shall provide full time experienced commissioning Engineers and artisan staff during the entire testing period.

At the commencement of and during the whole of the testing period the sub-contractor shall be required to have stored on site all essential spares and tools considered necessary to enable repair work of defective parts to be carried out immediately in the event of a breakdown.

The operation and Maintenance manual shall be completed and handed over to the Engineer before the start of any commissioning work and in any case, prior to the issuing by the engineer of the taking-over certificates. The period of maintenance shall be deemed to have started upon the date of issuing of the taking-over certificate.

7.4 Operator Training Period

The Operator Training Period on the whole of the works or on any part thereof shall commence at the date to be fixed after the issue of the taking over certificate and mutually agreed with the Engineer. This period shall continue for a period sufficient to ensure that the operations are full conversant with the functions they are to perform, but shall not exceed a period of 5 days.

The Contractor shall provide full-time instructions during the entire operator training period, who shall be fully experienced in the class of work and shall be capable of training the operating and maintenance staff in the duties they are to perform.

7.5 Period of Maintenance (Defect Liability)

The expression period of maintenance shall mean a period of 12 months from the date of taking over in accordance with Clause 3.3. hereof.

GENERAL CONDITIONS FOR KITCHEN EQUIPMENT

1.0 QUALITY OF MATERAILS AND WORKMANSHIP

1.1 Materials and Workmanship Generally

All materials, equipment and accessories are to be new and in accordance with the requirements of the current rules and regulations where such exist, or in their absence with the relevant B.S.

Uniformity of type and manufacture of equipment or accessories is to be preserved as far as practicable throughout the whole work.

If in this specification the practice is adopted of specifying a particular item as 'similar'to that of a particular firm's product, 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 name or products is quoted.

Where particular manufacturers re specified herein, no alternative makes will be considered, and the Engineer shall be allowed to reject any other makes.

The sub-contractor will be entirely responsible for all materials, apparatus, equipment etc. furnished by him in connection with his work taken down or changed which is executed in an unsatisfactory manner.

The work shall be carried out by competent workmen under skilled supervision. The Engineer shall have the authority too have any of the work taken down or changed, which is executed in an unsatisfactory manner.

The works shall be carried our strictly in accordance with:-

a) British Standard BS 2512, Gas heated catering equipment.
b) British Standard BS 4167 (parts 1& 2) electrically heated catering equipment.
c) British Standard BS 3456.

d) All other relevant British Standard Specifications and codes of practice (herein after referred to as B.S. and C.P. respectively.
e) By-laws of local Authority.
f) The specification and the particular specification.
g) The working drawings.
h) The Engineer's or Architect's instruction.

The drawings and specifications are to be read as whole and are to explain each other. Work shown on the drawings and not described in the specifications or vice versa shall be duly executed under the contract.

1.2 Kitchen Equipment.

The standard of quality, safety, and performance of catering equipment shall be as specified in the section 6, schedule of prices and shall also be recommend by:-

- British Standards Institute,
  Park lane.
  London WIA 2EJ, in B.S. Specifications.

- American National Standarads Institute (A.N.S.I)
  1430 Broadway
  New York, NY 10018 U.S.A.

- American Society for Testing Materials (A.S.T.M.)
  1916 Race Street
  Philadelphis 3, PA. U.S.A

The supply power up to and including local isolators will be provided and installed by the Electrical Sub-Contractor. All other wiring shall be as described in the Particular Specification.

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

The starting current of all electric motors and equipment shall not exceed the maximum permissible starting currents described in the Kenya Power and Lighting Company Ltd.'s By-Laws.

All electrical plant and equipment supplied by the Sub-Contractor shall be rated for the supply voltage and frequency obtained in Kenya, that is 415 volts, 50Hz, 3-phase or 240 volts, 50Hz, 1-phase as specified in the particular specification.

Any equipment that is not rated for the above voltage and frequencies may be rejected by the Engineer.

2.5 Transport and Storage

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

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

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

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

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

SECTION VI:

DRAWINGS

Note 1. A list of drawings should be inserted here.

2. The actual Contract drawings including site plans should be annexed in a separate booklet.

SECTION VII:

BILLS OF QUANTITIES

Notes for preparing Bills of Quantities

1.0 **Preamble To Bill of Quantities**

a) The Bill of Quantities shall form part of the Contract Documents and is to be read in conjunction with the Instructions to Tenderers, Conditions of Contract Parts I and II, Specifications and Drawings.

b) The brief description of the items in the Bill of Quantities is purely for the purpose of identification, and in no way modifies or supersedes the detailed descriptions given in the conditions of Contract and Specifications for the full direction and description of work and materials.

c) The Quantities set forth in the Bill of Quantities are estimated and provisional, representing substantially the work to be carried out, and are given to provide a common basis for tendering and comparing of Tenders. There is no guarantee to the Contractor that he will be required to carry out all the quantities of work indicated under any one particular item or group of items in the Bill of Quantities. The basis of payment shall be the Contractor's rates and the quantities of work actually done in fulfilment of his obligation under the Contract.

d) The prices and rates inserted in the Bills of Quantities will be used for valuing work executed, and the Engineer will measure the whole of the works executed in accordance with this Contract.

e) A price or rate shall be entered in ink against every item in the Bill of Quantities with the exception of items, which already have provisional sums, affixed thereto. The Tenderers are reminded that no "nil" or "included" rates or "lump-sum" discounts will be accepted. The rates for various items should include discounts if any. Tenderers who fail to comply will be disqualified.

f) Provisional sums (including Dayworks) in the Bill of Quantities shall be expended in whole or in part at the discretion of the Engineer in accordance with Sub-clause 52.4 and Clause 58 of part of the Conditions of Contract.

g) The price and rates entered in the Bill of Quantities shall, except insofar as it is otherwise provided under the Contract, include all Constructional plant to be used, labour, insurance, supervision, compliance, testing, materials, erection, maintenance or works, overheads and profits, taxes and duties together with all general risks, liabilities and obligations set out or implied in the Contract, transport,
electricity and telephones, water, use and replenishment of all consumables, including those required under the Contract by the Engineer and his staff.

h) Errors will not be corrected by the Employer for any arithmetic errors in computation or summation

i) The Bills of Quantities, unless otherwise expressly stated therein, shall be deemed to have been prepared in accordance with the principles of the latest edition of the Civil Engineering Standard Method of Measurement (CESMM).

j) "Authorised" "Directed" or "Approved" shall mean the authority, direction or approval of the Engineer.

k) Unless otherwise stated, all measurements shall be net taken on the finished work carried out in accordance with the details shown on the drawings or instructed, with no allowance for extra cuts or fills, waste or additional thickness necessary to obtain the minimum finished thickness or dimensions required in this Contract. Any work performed in excess or the requirements of the plans and specifications will not be paid for, unless ordered in writing by the Engineer.

l) (a) Hard material, in this Contract, shall be defined as the material which, in the opinion of the Engineer, require blasting, or the use of metal wedges and sledgehammers, or the use of compressed air drilling for their removal, and which cannot be extracted by ripping with a dozer tractor of at least 150 brake horse power (112 kilowatt) with a single, rear-mounted, hydraulic ripper. Boulders of more than $0.2m^3$ occuring in soft material shall be classified as hard material

(b) Soft material shall be all material other than hard material.

2.0 The objectives of the Bills of Quantities are;

(a) to provide sufficient information on the quantities of Works to be performed to enable tenders to be prepared efficiently and accurately;and

(b) when a Contract has been entered into, to provide a priced Bills of Quantities for use in the periodic valuation of Works executed.

In order to attain these objectives, Works should be itemized in the Bills of Quantities in sufficient detail to distinguish between the different classes of Works, or between Works of the same nature carried out in different locations or in other circumstances which may give rise to different considerations of cost. Consistent with these requirements, the layout and content of the Bills of Quantities should be as simple and brief as possible.

3.0 The Bills of Quantities should be divided generally into the following sections:

(a) Preliminaries.

The preliminaries should indicate the inclusiveness of the unit prices, and should state the methods of measurement which have been adopted in the preparation of the Bills of Quantities and which are to be used for the measurement of any part of the Works.

The number of preliminary items to be priced by the tenderer should be limited to tangible items such as site office and other temporary works,

otherwise items such as security for the Works which are primarily part of the Contractor's obligations should be included in the Contractor's rates.

(b) Work Items

(i) The items in the Bills of Quantities should be grouped into sections to distinguish between those parts of the Works which by nature, location, access, timing or any other special characteristics may give rise to different methods of construction or phasing of the Works or considerations of cost. General items common to all parts of the Works may be grouped as a separate section in the Bills of Quantities.

(ii) The brief description of the items in the Bill of Quantities should in no way modify or supersede the detailed descriptions given in the Contract drawings, Conditions of Contract and Specifications.

(iii) Quantities should be computed net from the Drawings, unless directed otherwise in the Contract, and no allowance should be made for bulking, shrinkage or waste. Quantities should be rounded up or down where appropriate.

(iv) The following units of measurement and abbreviations are recommended for use.

Unit	*Abbreviation*	*Unit*	*Abbreviation*
cubic meter	M^3 or cu m	millimeter	mm
hectare	ha	month	mon
hour	h	number	nr
kilogram	kg	square meter	m^2 or sq m
lump sum	sum	square millimeter	mm^2 or sq mm
meter	m	week	wk
metric ton (1,000 kg)	t		

(v) The commencing surface should be identified in the description of each item for Work involving excavation, boring or drilling, for which the commencing surface is not also the original surface. The excavated surface should be identified in the description of each item for Work involving excavation for which the excavated surface is not also the final surface. The depths of Work should be measured from the commencing surface to the excavated surface, as defined.

(c) Daywork Schedule

A Daywork Schedule should be included if the probability of unforeseen work, outside the items included in the Bills of Quantities is relatively high. To facilitate checking by the Employer of the realism of rates quoted by the tenderers, the Daywork Schedule should normally comprise:

(i) a list of the various classes of labour, and materials for which basic Daywork rates or prices are to be inserted by the tenderer, together with a statement of the conditions under which the Contractor will be paid for Work executed on a Daywork basis; and

(ii) a percentage to be entered by the tenderer against each basic Daywork Subtotal amount for labour, materials and plant representing the Contractor's profit, overheads, supervision and other charges.

(d) Provisional Quantities and Provisional Sums

(i) Provision for quantity contingencies in any particular tem or class of Work with a high expectation of quantity overrun should be made by entering specific "Provisional Quantities" or "Provisional Items" in the Bills of Quantities, and *not* by increasing the quantities for that item or class of Work beyond those of the Work normally expected to be required. To the extent not covered above, a general provision for physical contingencies (quantity overruns) should be made by including a "Provisional Sum" in the Summary of the Bills of Quantities. Similarly, a contingency allowance for possible price increases should be provided as a "Provisional Sum" in the Summary of the Bills of Quantities. The inclusion of such provisional sums often facilitates budgetary approval by avoiding the need to request periodic supplementary approvals as the future need arises.

(ii) Provisional Sums to cover specialized works normally carried out by Nominated Sub Contractors should be avoided and instead Bills of Quantities of the specialised Works should be included as a section of the main Bill of Quantities to be priced by the Main Contractor. The Main Contractor should be required to indicate the name (s) of the specialised firms he proposes to engage to carry out the specialized Works as his approved domestic sub-contractors. Only Provisional Sums to cover specialized Works by statutory authorities should be included in the Bills of Quantities.

(iii) Unless otherwise provided in the Contract, the Provisional Sums included in the Bills of Quantities should always be expended in whole or in part at the discretion of the Engineer after full consultation with the Employer.

(e) Summary

The Summary should contain a tabulation of the separate parts of the Bills of Quantities carried forward, with Provisional Sums for Dayworks, physical (quantity) contingencies, and price contingencies (upward price adjustment) where applicable.

SECTION 1 TITLE: HOSTELS

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	HOSTELS **Allow for supply, installation, testing and commissioning of the following:-**					
	WC SUITE					
1.01	Dual flush closed coupled WC suite in white vitreous China as DURAVIT comprising of Wc bowl Model 0176090000, 6 l cistern and fittings assembly, horizontal outlet complete with soft close seat & cover, and chrome plated push button.	No	60			
1.02	WC suite in white vitreous china as DURAVIT comprising:- WC bowl Model 0176090000 P/S trap exposed sloans Lever operated flush valve or equal or approved. The valve to have a 25mm dia w outlet.	No	4			
	WASH HAND BASINS					
1.03	Counter top mounted white vitreous china wash basin as DURAVIT Model 0461570000 with one tap hole, complete with Chrome plated radius monoblock mixer with pop-up waste, plastic bottle trap.	No	64			
1.04	Wall mounted white vitreous China wash basin with one tap hole as DURAVIT Model 079150000 complete with chrome plated Aztec pillartap handles and plastic bottle trap.	No	9			
	STAINLESS STEEL SINK					
1.05	Stainless steel kitchen sink double bowl size 1000 x 500 mm complete with mono block sink mixer with swivel spout, 40mm dia. Chrome plated chain waste and plug and plastic bottle P trap	No	36			
	MIRRORS					
1.06	600 X 450 X 6mm thick plate glass mirrors with chromium plated dome screws.	No	64			
	TOILET ROLL HOLDER					
1.07	Wall mounted chrome plated toilet roll holder	No	64			
	TOWEL RAILS					
1.08	650mm long – 20mm dia chrome plated towel rail	No	52			
Carried forward to collection page						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	WALL MOUNTED CONCEALED SHOWER					
1.09	The shower to comprise of:- Wall mounted concealed 4-way bath shower mixer with spout and fixed shower head.	No	52			
	WATER STORAGE TANKS					
1.10	Pressed steel plated water tanks capacity 5410 L Size 3000x2000x1000 mm high	No	2			
1.11	Pressed steel plated water tanks capacity 3490 L Size 4000x1000x1000 mm high	No	1			
1.12	Pressed steel plated water tanks capacity 2600 L Size 3000x1000x1000 mm high	No	1			
	SOAP TRAY					
1.13	Wall mounted chrome plated soap dish holder	No	52			
	Carried forward to collection page					

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
2.00	**PLUMBING** Supply and install the following pipework in PPR Grade PN 20.					
2.01	25mm diameter PPR tubing	Lm	1024			
2.02	32mm ditto	Lm	382			
2.03	40mm ditto	Lm	239			
2.04	25mm dia. PPR bend	No	250			
2.05	50mmditto	No	37			
2.06	63mm ditto	No	18			
2.07	25mm x ½ Ditto	No	177			
2.08	32mm dia. Bend	No	52			
2.09	40 mm ditto	No	40			
2.10	63mm dia. Ditto	No	4			
2.11	32 x 25 x 32mm dia unequal Tee	No	113			
2.12	40 x 25 x 40mm dia ditto	No	32			
2.13	50 x 25 x 50mm dia ditto	No	2			
2.14	50 x 32x 50 dia ditto	No	2			
2.15	50 x40x 50 dia ditto	No	1			
2.16	63 x 40 x63mm dia ditto	No	6			
2.17	25mm dia equal tee	No	42			
2.18	32 mm dia ditto	No	6			
2.17	40mm dia ditto	No	9			
2.19	63 dia ditto	No	2			
2.20	25 X ½ mm dia. Tee	No	147			
2.21	32 X 25mm dia. reducer	No	66			
Carried forward to collection page						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
2.00	**PLUMBING**					
2.22	40 x 32 mm dia Ditto	No	20			
2.23	50 x 40 mm dia Ditto	No	4			
2.24	63 x 50 mm dia ditto	No	4			
	GATE VALVES					
2.25	32mm dia. Heavy duty Peglar gate valve.	No	10			
2.26	40mm dia. Ditto	No	2			
2.27	63 dia ditto	No	2			
	Copper Tubing					
2.28	20mm dia. Tubing about 300mm long, bend as required and including brass backnuts and jointing.	No	154			
2.29	40 mm peglar valve	No	2			
2.30	20mm dia chrome plated ample valves	No	154			
	Carried forward to collection page					

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
2.32	**Pipe Insulation** All pipework listed below shall be insulated with 25m Thick industrial grade flexible "Strypol" insulation as Manufactured by Armstrong Cork International. or eq and approved All Insulated to Manufacture's instructions Allow for insulation for bends etc as necessary in your Pipe work prices. Note that some pipework will be Installed by others and it will be your responsibility to Insulate them.					
2.33	25mm diameter pipework	Lm	146			
2.34	32mm ditto	Lm	101			
2.35	40mm ditto	Lm	72			
2.36	50mm ditto	Lm	14			
2.37	63mm ditto	Lm	4			
	INSULATION CLADDING					
2.38	All exposed insulation shall be fully cladded with 24 Gauge galvanised mild steel sheet to engineers approv Allow for cladding over bends in your pipe work price	Item				
2.39	Ups grundfos 200 series circulator pump model 40-120 duty and standby	Set				
	Wiring					
2.40	Allow for all wiring to immersion heaters, pumps etc f Local isolator. **Note:** Electrical supply shall be brought to within one Of equipment item	Item				
	Control Panels/Isolator					
2.41	The control and indication gear necessary for solar hea Installation shall be housed in a purpose made control Each item of control and indication gear shall be clear Identified on the front of cover.	No				
	Testing and Commissioning					
2.42	Allow for setting to work, testing and commissioning	Item				
SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	FOUL WATER DRAINAGE					
3.0	MUPVC waste pipe system confirming to BS 5255.					
3.01	200.125.40 waste pipe	Lm	114			
3.02	200.15.40 ditto	Lm	108			
3.03	200.2.4 ditto	Lm	195			
	Extra over MuPVC Waste pipework for the following:-					
3.04	201.125.91 Sweep Bend	No	108			
3.05	201.15.91 ditto	No	72			
3.06	206.2.91 ditto	No	69			
3.07	206.1.91 Tee	No	38			
3.08	100.4.40 Soil Pipe	No	349			
3.09	250.2 cowl	No	20			
3.10	101.4 92 Sweep Bend	No	116			
3.11	104.4.92 Single branch	No	38			
3.12	104.4.92 double branch	No	4			
3.13	128.4.90 WC connector	No	20			
3.14	uPVC Buried Drain System conforming to BS 4660	No	51			
3.15	1800.4.60 Burried Drain Pipe	No	106			
3.16	1844.4.25 Gully Piece	No	22			
3.17	1849.4 P Trap	No	22			
3.18	281.3 Trapped Floor Gully	No	132			
3.19	282.6 Floor Gully Inlet	No	132			
	Carried forward to collection page					

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	Inspection Chambers					
3.20	Allow excavation, concreting to class 1:3:6, Walling 150mm thick solid concrete block walls with 1:3 mortar and plastering to 1:2, medium duty rectangular cover and frame to BS 497 Ref. No. A2-19 ½ for manholes not exceeding 1000mm depth.	No	22			
3.21	Allow for a masonary gully trap of size 300 X 300 X 450 mm deep with the necessary seal, drain pipe & cover	No	26			
	Excavation					
3.22	Excavate trench from ground level for buried drain pipes not exceeding 1000mm and average 450 mm deep, part return, **fill in ram and remainder cart away.**	No	124			
	Carried forward to collection page					

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
4.0	**INCOMING WATER MAINS** Supply and install the following pipework in PPR Grade PN 20.					
4.01	50mm diameter PPR tubing	Lm	250			
4.02	50x25mm dia. PPR Tee Bend	No	48			
4.03	50mm dia Equal PPR Tee	No	1			
4.04	T25 x ½	No	6			
	Excavation					
4.05	Excavation trench from ground level for buried water pipes not exceeding 1000mm and average 450mm deep, part return, fill in ram and remainder cart away.	Lm	250			
4.06	Stand pipes	No	6			
	Water Booster Pumps system.					
4.07	2No. pumps duty and standby As Grundfos Model" CM3-4, capable of pumping $3m^3/Hr$ and a head of 25m and shall be complete with the following:- - Mounting base flat - Control panel - 4No. isolating valves (50mm dia) - 2No. non- return valves dia 50mm - Control switches in the water tanks - 60L pressure vessel					
	Pumps system to be " As Model" SGM3/25	Item	1			
	GROUND TANK					
4.08	Rationally moulded plastic tank as Roto/Kentainer model CCV2400 Capacity 24000L	No	1			
	Carried forward to collection page					

SECTION 5.0 **TITLE: RAIN WATER DRAINAGE**

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
5.0	**RAIN WATER DRAINAGE** Supply, deliver and installation the following for rain wate disposal from roof					
	FULBORA OUTLETS					
5.1	100mm diameter Fullbora outlet of uPVC, as Terrain Ref 2171.4 or other approved material to take.	No	16			
	Supply, deliver and install uPVC buried drain system to BS 4660 and BS 4660 and 4514 and rain water pipes to BS4576, Solvent welded joints shall be as per the systems Manufacturer's written instructions. Tenderers must allow In their pipework prices for all the couplings, connectors, Joints, support brackets etc as required in the running legth Of pipework and also where necessary. The installation Must comply with BS 5572					
	uPVC Rain water system conforming to BS4476					
5.2	75dia. mm uPVC Piping including adaptor	Lm	313			
	Extra over pipework for the following:-					
5.3	75mm Spigot/Socket Bend	No	22			
	uPVC Buried Drain System conforming to BS 4660					
5.4	1800.4.60 Buried Drain Pipe	Lm	92			
5.5	1800.6.60 Buried Drain Pipe	Lm	150			
5.6	1800.8.60 Buried Drain Pipe	Lm	43			
	Sand Trap Drain Chambers					
5.7	Allow escavation, concreting to class 1:3:6, walling 150mm Thick solid concrete block walls with 1:3 mortar and Plastering to 1:2 heavy duty openable rectangular cover Grating and frame to BS 497 Ref No. A2-19 ½ for Manholes(sand trap) not exceeding 1000mm depth.	No	23			
5.8	Allow for Testing and commissioning	Item				
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Item	Description	Unit	Qty	Rate	Kshs.	Cts.
4.00	**FIRE FIGHTING EQUIPMENT**					
	Supply and install the following Fire Fighting equipment:-					
	Portable Fire Extinguishers					
4.01	9 litres water Co2 fire extinguisher complete with refill Cartridges and wall fixing brackets complying with B.S. 5423.	No	9			
4.02	4.5 kg carbon dioxide gas extinguisher complete with discharge horns and wall fixing brackets complying with B.S.5423.	No	9			
	Fire Fighting Hose Reels					
4.03	Standard manual swing type recessed fire hose reel comprising of:- 35m length of non-kinking 20mm dia rubber hose, nozzle. The hose shall conform to BS 3169.	No	9			
	Fire Hose Reel Pump Set.					
4.04	The hose reel booster pump to be as Dayliff fire hose reel set model DFS5 comprising of:- 2No. pumps one duty and other standby, capable of a flow rate 6 M^3 per hour against a pressure of 4 bar complete with a flow control switch of sensitivity of 0.1 L/s, control panel, pressure vessel, electrical wiring etc as necessary for automatic operation.	Set	3			
	Galvanised steel Pipework and fittings					
4.05	25mm dia GI piping	Lm	12			
4.06	32mm ditto	Lm	12			
4.07	40mm ditto	Lm	70			
4.08	50mm ditto	Lm	10			
SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
4.07	25mm dia GI bend	No	12			
4.08	40mm ditto	No	17			
4.09	50mm ditto	No	10			
4.10	32 x 25 Unequal Tee	No	3			
4.11	40 x25mm ditto	No	3			
4.12	50 x 40 ditto	No	1			
	Gate Valves.					
4.13	25mm dia Heavy duty peglar gate valve	No	9			
4.14	40mm ditto	No	5			
4.15	50 mm dia ditto	No	5			
	Unions					
4.16	25mm dia union	No	9			
4.17	40 mm dia ditto	No	2			
4.18	50mm dia ditto	No	2			
	Non-return Valves					
4.19	40mm dia non return valve	No	2			
4.20	50mm dia ditto	No	2			
	TEE					
4.21	40 mm dia equal Tee	No	2			
4.22	50mm dia ditto	No	2			
4.23	32 x 25 mm dia Unequal Tee	No	3			
4.24	40 x 25 mm dia ditto	No	3			
4.25	50 x 25 mm dia ditto	No	1			
SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE						

SECTION 4.00 **TITLE: FIRE FIGHTING EQUIPMENT**

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
4.00	**Reducers**					
4.26	32 x 25 mm dia. reducer	No	3			
4.27	40 x 32 mm dia. ditto	No	3			
4.28	50 x 40 mm dia. ditto	No	1			
SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE						

PROPOSED RESEARCH CENTRE AND HOSTELS FOR JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

COLLECTION PAGE - HOSTELS

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SECTION 1 TITLE: RESEARCH CENTRE

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	RESEARCH CENTRE **Allow for supply, installation, testing and commissioning of the following:-**					
	WC SUITE					
1.01	WC suite in white vitreous china as DURAVIT comprising:- WC bowl Model 0176090000, P/S trap and exposed sloans Lever operated flush valve and seat and cover with stain steel hinges or equal and approved. The valve to have a 25mm dia water outlet.	No	15			
1.02	**WASH HAND BASINS** Counter top mounted white vitreous china wash basin with one tap hole as DURAVIT Model 0461570000, complete with non- concussive Pillar tap, pop-up waste, plastic bottle trap.	No	13			
1.03	Wall mounted white vitreous china wash basin with one tap hole as DURAVIT Model 0791500000, complete with Chrome plated radius monoblock mixer, with pop-up waste, plastic bottle trap.	No	2			
1.04	Wall mounted white vitreous china wash basin with one tap hole as DURAVIT Model 0791500000 complete with non- concussive Pillar tap, pop-up waste, plastic bottle trap.	No	3			
	CLEANERS STAINLESS STEEL SINK					
1.05	Vitreous China Cleaners sink 480x425 mm complete with grating, Cobra bib tap, legs and support grind waste1 ½ and fixing brackets. The sink to be DURAVIT Model 0313480000	No	2			
	MIRRORS					
1.06	600 X 450 X 6mm thick plate glass mirrors with chromium plated dome screws.	No	20			
	TOILET ROLL HOLDER					
1.07	Wall mounted chrome plated toilet roll holder	No	15			
	LABORATORY WASH HAND BASIN					
1.08	Wall mounted white vitreous china wash basin with one tap hole as DURAVIT Model 0791500000complete with automatic sensor-operated chrome plated bib tap, with pop-up waste, chrome plated bottle trap plus 2No. no-touch detergent dispensers and no-touch hand dryer	Set	5			
	WALL MOUNTED CONCEALED SHOWER					
1.09	The shower to comprise of:- Wall mounted concealed 4-way bath shower mixer with spout and fixed shower head. The shower to be as Twyford radius Cat No. 5745	No	2			
Carried forward to collection page						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	URINAL BOWLS					
1.09	Urinal bowl in white vitreous china as DURAVIT for two person comprising:- Urinal bowl size 450x350 mm Model 0824440000, pair of bowl supports 40mm grating, 40mm dia. plastic P-trap wit 75mm seal, exposed Cobra push operated flush valve equal, chromium plated flush pipes and spreaders, and partition Model 8500000000 ,	Set	3			
	SOAP DISPENSER					
1.10	Soap dispenser to be as 'Starmix' push type or equal approved.	No	11			
	HAND DRIERS					
1.11	No-touch automatic electrical hand drier for electric supply compatible with single Ph.240V 50Hz and to complete with a mounting plate, centrifugal fan and motor of 1.7hp operating at 4600rpm, thermal overlo element and auto-resetting thermal cut-out. The drie to be as starmix.	No	11			
	EYE WASH / SHOWER					
1.12	To be as lab fitting pedaled floor type shower and eye wash made of Stainless Steel AS 304 suitable for installing on the floor. Operation is through the handle/pusher/pedaled switch.	No	5			
	LABORATORY SHOWER					
1.13	The shower to be as Heatrae Sadia, Sure Flow instantaneous electric shower, power rating 8.7kw	No	1			
	LABORATORY SINKS					
1.14	Chemical resistant polypropylene sink as brownall CAT No. CL 762 size 457 x 305 x 203mm deep complete with fixed swanneck labtap as brownall CL.1214C, CL.745 anti-siphon bottle trap	No	9			
	WATER TREATMENT PLANT					
1.15	The equipment to be as DAYLIFF Reverse Osmosis Plant model DRO4/1	Item	1			
	Carried forward to collection page					

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
2.00	**PLUMBING** Supply and install the following pipework in PPR Grade PN 20.					
2.01	25mm diameter PPR tubing	Lm	105			
2.02	32mm ditto	Lm	65			
2.03	40mm ditto	Lm	39			
2.04	50mmdia. Ditto	Lm	68			
2.05	63mm dia ditto	No	2			
2.06	20mm dia. PPR bend	No	16			
2.07	25mm x ½ Ditto	No	31			
2.07	32mm dia. Bend	No	15			
2.08	40 mm dia. ditto	No	11			
2.09	32x 1" ditto	No	11			
2.10	50 mm dia ditto	No	5			
2.11	40mm dia. Equal PPR Tee	No	7			
2.12	32mm dia ditto	No	5			
2.13	50 mm dia ditto	No	6			
2.14	25mm x ½" dia Unequal Tee	No	9			
2.15	40 x 25 x 40 mm dia ditto	No	8			
2.16	40 x 32 x 40 mm dia ditto	No	6			
2.17	50 x25x 50 mm dia ditto	No	1			
2.18	50 x 32 x 50 mm dia ditto	No	3			
2.19	32x ½mm dia ditto	No	2			
2.20	30 x 25mm dia reducer	No	7			
2.21	40 x 25 mm dia ditto	No	1			
2.22	40 x 32 mm dia ditto	No	3			
	Carried forward to collection page					

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	GATE VALVES					
2.19	25mm dia. Heavy duty Peglar gate valve.	No	1			
2.20	32mm dia ditto	No	2			
2.21	40mm ditto	No	1			
2.22	50mm dia. Ditto	No	3			
	Copper Tubing					
2.23	20mm dia. Tubing about 300mm long, bend as required and including brass backnuts and jointing.	No	25			
	ROOF TANKS					
2.24	Pressed steel plated water tanks capacity 8230L Size: 3000x3000x1000 high	No	1			
2.25	Pressed steel plated water tanks capacity 1710L Size: 2000x1000x1000 high	No	1			
2.26	. 20mm dia chrome plated angle valves	No	28			
	ADAPTERS					
2.27	63 X 2" dia ditto	No	2			
2.28	50 x 1½" ditto	No	2			
2.29	**Pipe Insulation** All pipework listed below shall be insulated with 25r Thick industrial grade flexible "Strypol" insulation a: Manufactured by Armstrong Cork International. All Insulated to Manufacture's instructions Allow for insulation for bends etc as necessary in yo Pipe work prices. Note that some pipe work will be Installed by others and it will be your responsibility t Insulate them.					
2.30	25mm diameter pipework	Lm	25			
	32mm ditto	Lm	8			
	INSULATION CLADDING					
2.31	All exposed insulation shall be fully cladded with 24 Gauge galvanised mild steel sheet to engineers Approval. Allow for cladding over bends in your pipe work prices.	Item				
TOTAL CARRIED FORWARD TO FORM OF TENDER						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
2.32	**PLUMBING FOR LABORATORIES**					
	Stainless steel 304 Schedule 40 pipes to B.S 3601 and fittings welded joints as described					
2.33	15mm diameter Stainless steel 304 pipes	Lm	63			
2.34	20mm ditto	Lm	20			
2.35	25mm ditto	Lm	26			
2.37	32mm ditto	Lm	14			
	Bends/Elbows					
2.38	15mm Weldon bend	No	23			
2.39	20mm ditto	No	1			
2.40	25mm ditto	No	5			
2.41	32mm ditto	No	4			
	Tees					
2.42	25mm dia equal Weldon Tee	No	2			
2.43	32mm dia ditto	No	1			
2.44	20x15x20mm unequal Weldon tee	No	4			
2.45	25x15x25mm dia ditto	No	2			
2.46	32x20x32mm dia ditto	No	1			
2.47	32x25x32mm dia ditto	No	2			
	Valves					
2.48	25mm diameter stainless steel Globe valve	No	1			
	Reducers					
2.49	20x15mm stainless steel reducer	No	4			
2.50	25x15mm ditto	No	1			
2.51	25x20mm ditto	No	2			
2.52	32x25mm ditto	No	1			
TOTAL CARRIED TO THE COLLECTION PAGE						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	FOUL WATER DRAINAGE					
3.01	MUPVC waste pipe system confirming to BS 5255.	Lm	26			
3.02	200.125.40 waste pipe	Lm	17			
3.03	200.2.40 ditto	Lm	69			
	Extra over MuPVC Waste pipework for the following:-					
3.04	201.125.91 Sweep Bend	No	16			
3.05	201.15.91 ditto	No	16			
3.06	201.2.91 ditto	No	4			
3.07	100.4.40 Soil Pipe	No	116			
3.08	101.4 92 Sweep Bend	No	12			
3.09	104.4.92 Single branch	No	14			
3.10	131.4weathering Apron	No	2			
3.11	128.4.90 WC connector	No	15			
3.12	150.4 vent cowl	No	2			
3.13	150.2 vent cowl	No	2			
3.14	204.2.91 Sweep Tee	No	5			
3.15	224.2.15 Reducer	No	5			
3.16	128.4.90 WC connector	No	15			
3.17	237.2 Access Trap	No	2			
Carried forward to collection page						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	FOUL WATER DRAINAGE					
	Extra over MuPVC Waste pipework for the following:-					
	uPVC Buried Drain System conforming to BS 4660					
3.18	1800.4.60 Burried Drain Pipe	No	154			
3.19	1844.4.25 Gully Piece	No	5			
3.20	1849.4 P Trap	No	5			
3.21	281.3 Trapped Floor Gully	No	8			
3.22	282.6 Floor Gully Inlet	No	8			
3.23	Waste water holding and disinfection treatment Tanks. The tanks to be as kentainer model LR 100 BL, size: 750 x 1750 x 1050 mm high, capacity : 1000 litres.	No	2			
	Inspection Chambers					
3.24	Allow excavation, concreting to class 1:3:6, Walling 150mm thick solid concrete block walls with 1:3 mortar and plastering to 1:2, medium duty rectangular cover and frame to BS 497 Ref. No. A2-19 ½ for manholes not exceeding 1000mm depth.	No	7			
3.25	400 X 200mm stainless steel floor trap with grating	No	5			
3.26	Allow for a masonary gully trap of size 300 X 300 X 450 mm deep with the necessary seal, drain pipe & cover	No	5			
3.27	**Excavation**					
	Excavate trench from ground level for buried drain pipes not exceeding 1000mm and average 450 mm deep, part return, **fill in ram and remainder cart away.**	Lm	132			
TOTAL CARRIED FORWARD TO FORM OF TENDER						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	Grease Trap					
3.28	Allow excavation, concreting to class 1:3:6, Walling 150mm thick solid concrete block walls with 1:3 mortar and plastering to 1:2, heavy duty rectangular cover and frame to BS 497 Ref. No. A2-19 ½ for a standard grease trap complete with grease removal baskets	No	1			
	Testing and commissioning					
3.29	Allow for setting to work, testing and commissioning	Item				
	Carried forward to collection page					

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	FOUL WATER DRAINAGE-LABORATORIES					
3.01	ALL waste pipe system to be of polypropylene make	Lm	8			
3.02	200.125.40 waste pipe	Lm	22			
3.03	200.2.40 ditto	Lm	43			
	Extra over MuPVC Waste pipework for the following:-					
3.04	201.125.91 Sweep Bend	No	10			
3.05	201.15.91 ditto	No	16			
3.06	201.2.91 ditto	No	4			
3.07	100.4.40 Soil Pipe	No	55			
3.08	101.4 92 Sweep Bend	No	6			
3.09	104.4.92 Single branch	No	5			
3.10	150.4 vent cowl	No	1			
3.11	204.2.91 Sweep Tee	No	5			
3.12	1849.4 P Trap	No	4			
	Carried forward to collection page					

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
4.0	**INCOMING WATER MAINS** Supply and install the following pipework in PPR Grade PN 20.					
4.01	40mm tubing	Lm	30			
	40mm dia bend	No	3			
	Gate valves					
4.03	40mm dia Havy duty Peglar Gate Valve	No	1			
4.04	40mm dia Tee	No	2			
4.05	40mm dia bend	No	7			
	Water Booster Pumps system.					
4.06	2No. pumps duty and standby As Grundfos Model" CM10-2, capable of pumping $3m^3/Hr$ and a head of 25m and shall be complete with the following:- - Mounting base flat - Control panel - 4No. isolating valves (50mm dia) - 2No. non- return valves dia 50mm - Control switches in the water tanks - 60L pressure vessel					
	Pumps system to be " As Model" SGM10/25	Item	1			
	GROUND TANK					
4.07	Rationally moulded plastic tank as Roto/Kentainer model CCV2400 Capacity 24000L	No	2			
4.08	Stand pipe	No	1			
	Carried forward to collection page					

SECTION 5.0 **TITLE: RAIN WATER DRAINAGE**

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
5.0	**RAIN WATER DRAINAGE** Supply, deliver and installation the following for rain water disp from roof					
	FULBORA OUTLETS					
5.1	100mm diameter Fullbora outlet of uPVC, as Terrain Ref 2171.4 or other approved material to take.	No	9			
	Supply, deliver and install uPVC buried drain system to BS 4660 and BS 4660 and 4514 and rain water pipes to BS4576, Solvent welded joints shall be as per the systems Manufacturer's written instructions. Tenderers must allow In their pipework prices for all the couplings, connectors, Joints, support brackets etc as required in the running legths Of pipework and also where necessary. The installation Must comply with BS 5572					
	uPVC Rain water system conforming to BS4476					
5.2	100 mm uPVC Piping including adaptor	Lm	110			
	Extra over pipework for the following:-					
5.3	100mm Spigot/Socket Bend	No	27			
	uPVC Buried Drain System conforming to BS 4660					
5.4	1800.4.60 Buried Drain Pipe	Lm	87			
	Storm Drain Chambers					
5.5	Allow escavation, concreting to class 1:3:6, walling 150mm Thick solid concrete block walls with 1:3 mortar and Plastering to 1:2 heavy duty openable rectangular cover Grating and frame to BS 497 Ref No. A2-19 ½ for Manholes(sand trap) not exceeding 1000mm depth	No	9			
5.6	Allow for Testing and commissioning	Item				
	SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE					

SECTION 6.00 TITLE: FIRE FIGHTING EQUIPMENT

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
4.00	**FIRE FIGHTING EQUIPMENT** Supply and install the following Fire Fighting equipment:- **Portable Fire Extinguishers**					
6.01	9 litres water Co2 fire extinguisher complete with refill Cartridges and wall fixing brackets complying with B.S. 5423.	No	6			
6.02	4.5 kg carbon dioxide gas extinguisher complete with discharge horns and wall fixing brackets complying with B.S.5423.	No	6			
6.03	5 kg automatic DPC gas extinguisher complete with wall fixing brackets complying with B.S.5423.	No	1			
	Fire Fighting Hose Reels					
6.04	Standard manual swing type recessed fire hose reel comprising of:- 35m length of non-kinking 20mm dia rubber hose, nozzle. The hose shall conform to BS 3169.	No	3			
	Fire Hose Reel Pump Set.					
6.05	The hose reel booster pump to be as Dayliff fire hose reel set model DFS5 comprising of:- 2No. pumps one duty and other standby, capable of a flow rate 6 M^3 per hour against a pressure of 4 bar complete with a flow control switch of sensitivity of 0.1 L/s, control panel, pressure vessel, electrical wiring etc as necessary for automatic operation.	Set	1			
	Galvanised steel Pipework and fittings					
6.06	40mm dia GI pipe	Lm	15			
6.07	35mm ditto	Lm	8			
6.08	32mm dia ditto	No	4			
6.09	25mm dia PPR bend	No	6			
6.10	40mm dia ditto	No	12			
6.11	32 x 25 x 32 Unequal Tee	No	1			
6.12	40 x 25 40mm ditto	No	1			
SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
6.13	40mm dia Equal Tee	No	2			
	Gate Valves.					
6.14	25mm dia Heavy duty peglar gate valve	No	3			
6.15	40 mm dia ditto	No	5			
	Unions					
6.16	25mm dia ditto	No	3			
6.17	40 mm dia ditto	No	2			
	Non-return Valves					
6.18	40mm dia ditto	No	2			
SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE						

COLLECTION PAGE – RESEARCH CENTRE

	KSHS.	CTS
Brought forward from collection page 14 ……		
Brought forward from collection page 15 ……		
Brought forward from collection page16……		
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	Allowed Main Bq	
Allow a PC sum of Ksh. 10,000,000.00 for Kitchen Equipment.		
Allow a PC sum of Ksh. 850,000.00 for Kitchen gas installation	Allowed Main in Bq	
Allow a PC sum of Ksh. 650,000.00 for Kitchen mechanical ventilation installation	Allowed Main in Bq	
Allow a PC sum of Ksh. 850,000.00 for Kitchen fire suppression installation	Allowed in Main Bq	
Sub-total carried to main summary page		

JOOUST- RESEARCH CENTRE
AND HOSTELS
PLUMBING AND DRAINAGE

MAIN SUMMARY PAGE.

	KSHS.	CTS
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Add contingency sum of Kshs. **100,000.00**	100,000	00
TOTAL PLUMBING AND DRAINAGE		

SOLAR WATER HEATING SERVICES

HOSTELS SOLAR WATER HEATING
SECTION 1

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	SOLAR WATER HEATING INSTALLATIONS HOSTELS					
1.01	1200Ltrs hot water storage cylinder complete with 6 x 3kw booster heaters	No	1			
1.02	600Ltrs hot water storage cylinder complete with 3 x 3kw booster heaters	No	2			
1.03	$2m^2$ solar collectors(Amch-Israel) or equivalent to Engineers approval	No	20			
1.04	Automatic air vent	No	3			
1.05	Temperature differential control unit and accessories	No	3			
1.06	Ups grundfos 200 series circulator pump model 40-120 duty and standby	Set	3			
	Wiring					
1.07	Allow for all wiring to immersion heaters, pumps etc from Local isolator. **Note:** Electrical supply shall be brought to within one metre Of equipment item	Item				
	Control Panels/Isolator					
1.08	The control and indication gear necessary for solar heating Installation shall be housed in a purpose made control panel. Each item of control and indication gear shall be clearly Identified on the front of cover.	No	3			
	Supporting Framework (if any)					
1.09	Allow supports for the above Solar Tanks to Engineer's approval	Item				
	Supporting Framework					
1.10	Allow supports 40 x 40 x 6mm mild steel angle iron fixed On roof for the above Solar Panels heating units to Engineer's approval	Item				
SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	PIPEWORK **Supply and fix Galvanised Mild Steel Pipes to BS 1387 "Class B" with screwed and socketed joints to BS 21 and fittings to BS 143 and 1256 of approved Manufacture with galvanising to BS 727** **Tenderer must allow in their pricing of pipework for all the couplings, nipples, sockets, connectors, unions, Joints etc as required in the running lengths of pipe Work and also where necessary, for pipe fixing clips Holderbats plugged and screwed.**					
1.1.10	40mm diameter GMS Tubing	Lm	72			
1.1.11	32mm diameter GMS Tubing	Lm	7			
	Extra Over GMS Tubing for the following					
1.1.12	40mm diameter GCI Bends	No	40			
1.1.13	32 mm ditto	No	4			
1.1.14	40mm dia equal tee	No	2			
1.1.15	32 mm ditto	No	2			
1.1.16	40mm ditto	No	2			
1.1.17	40x25x40mm dia equal tee	No	1			
1.1.18	40x25mm dia reducer					
SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
1.1.19	**GATE VALVES** 40mm diameter screwed-in bonnet, full way non-rising stem, solid wedge disk, bronze gate valve to BS 5154 P 20 for series B rating with wheel head and jointing to GMS Tubing. As "Crane" Model No.D151 or equal And approved	No	5			
1.1.20	Ø63mm dia ditto	No	10			
1.1.21	Ø 40mm union	No	4			
1.1.22	Ø 40mm dia non return valve	No	4			
	Sterilization and Flusing					
1.1.23	Allow for the sterilization and flushing out the solar Heating system.	Item				
	Connections					
1.1.24	Allow for connection to hot water pipe work supplied b Others	Item				
	Hot water Circulator Pumps					
1.1.25	Allow for the supply and installation of 1No. Sets of Duty and standby pumps as Grundpos Model UPS 25-60	Set	3			
	Testing and Commissioning					
1.1.26	Allow for setting to work, testing and commissioning	Item				
SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE						

JOOUST- HOSTELS
SOLAR WATER HEATING INSTALLATION
SERVICES

SUMMARY PAGE.	KSHS.	CTS.
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Brought forward from page 30……		
Brought forward from page 31……		
	100,000	00
Add contingency sum of Kshs 100,000.00		
TOTAL FOR HOSTELS SOLAR WATER HEATIN(		

RESEARCH CENTRE SOLAR WATER HEATING
SECTION 2

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	SOLAR WATER HEATING INSTALLATIONS RESEARCH CENTRE					
2.01	700Ltrs hot water storage cylinder complete with 6 x 3kw booster heaters	No	1			
2.02	$2m^2$ solar collectors(Amch-Israel) or equivalent to Engineers approval	No	6			
2.03	Automatic air vent	No	1			
2.04	Temperature differential control unit and accessories	No	1			
2.05	Allow for the suplly, installation, testing and commissioning of one set of duty and standby ,Ups grundfos series 200 circulator pumps model 50-120	Set	1			
2.06	**Wiring** Allow for all wiring to immersion heater, pumps etc from Local isolator. **Note:** Electrical supply shall be brought to within one metre Of equipment item	Item				
	Control Panels/Isolator					
2.07	The control and indication gear necessary for solar heating Installation shall be housed in a purpose made control panel. Each item of control and indication gear shall be clearly Identified on the front of cover.	No	1			
	Supporting Framework (if any)					
2.08	Allow supports for the above Solar Tanks to Engineer's approval	Item				
	Supporting Framework (If any)					
2.09	Allow supports 40 x 40 x 6mm mild steel angle iron fixed On roof for the above Solar Panels heating units to Engineer's approval	Item				
SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE						

Item	Description	Unit	Qty	Rate	Kshs.	Cts.
	PIPEWORK **Supply and fix Galvanised Mild Steel Pipes to BS 1387 "Class B" with screwed and socketed joints to BS 21 and fittings to BS 143 and 1256 of approved Manufacture with galvanising to BS 727** **Tenderer must allow in their pricing of pipework for all the couplings, nipples, sockets, connectors, unions, Joints etc as required in the running lengths of pipe Work and also where necessary, for pipe fixing clips Holderbats plugged and screwed.**					
2.1.10	25mm diameter GMS Tubing	Lm	24			
	Extra Over GMS Tubing for the following					
2.1.11	32 mm diameter GCI Bends	No	13			
2.1.12	25 mm dia equal Tee	No	2			
	GATE VALVES					
2.1.17	25mm diameter screwed-in bonnet, full way non-rising stem, solid wedge disk, bronze gate valve to BS 5154 PN 20 for series B rating with wheel head and jointing to GMS Tubing. As "Crane" Model No.D151 or equal And approved	No	4			
2.1.18	Ø 25mm union	No	2			
2.1.19	Ø 25mm dia non teturn valve	No	2			
	Sterilization and Flusing					
2.1.20	Allow for the sterilization and flushing out the solar Heating system.	Item				
	Connections					
2.1.21	Allow for connection to hot water pipe work supply by Others	Item				
	water Circulator Pumps					
2.1.22	Allow for the supply and installation of 1No. Sets of duty And standby pumps as Grundfos Model UPS 40-120	Set	1			
	Testing and Commissioning					
2.1.23	Allow for setting to work, testing and commissioning	Item				
SUB-TOTAL CARRIED FORWARD TO COLLECTION PAGE						

JOOUST- RESEARCH CENTRE
SOLAR WATER HEATING INSTALLATION
SERVICES

SUMMARY PAGE.

	KSHS.	CTS
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Brought forward from 34……..		
	100,000	00

Add contingency sum of Kshs. **100,000.00**

TOTAL FOR RESEARCH SOLAR WATER HEATI

JOOUST SOLAR WATER HEATING INSTALLATION SERVICES

MAIN SUMMARY PAGE.

	KSHS.	**CTS.**
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TOTAL CARRIED TO FORM OF TENDER		

SWIMMING POOL INSTALLATION SERVICES

JOOUST - SWIMMING POOL

Item	Description	Unit	Qty	Rate	KShs.	Cts.
1.0	**SWIMMING POOL INSTALLATIONS** Supply, deliver and install the following equipment as described:-					
1.01	**SWIMMING POOL PUMPS** Self priming swimming pool pumps capable of handling 3.9l/s against a static head of 10 metres. Pumps to be complete with the following:- - Cast iron end shield - Draining plug - Multi directional barrel unions on discharge and suction - Integral strainer - Thermal and overload motor protection Pumps to be as "DAVEY" Pool Pump Model QP4 with a power Consumption of 0.75KW 240V 50 HZ or equal and approved	No	3			
1.02	**SWIMMING POOL FILTERS** High Grade Silica sand Media filters with a minimum filter area of 0.64m^2 and a maximum volume flow rate of 65 m^3/hr complete with:- - Multi port valve - 100MM diameter dial pressure gauge - Automatic air bleeding system - Quick release perspex lid for inspection - Boss connections for inlets and outlets Filters shall be as "DAYLIFF" Model Dx 600 or equal and approved	No	3			
	Total Carried forward to collection					

Item	Description	Unit	Qty	Rate	KShs.	Cts.
1.03	**VACUUM POINT AND PLUG** Heavy duty chrome plated vacuum point and plug on brass body with 40mm diameter vacuum hose connection. AS "CERTIKIN" Model CK20 or equal and approved	No	2			
	INLET SPREADERS					
1.04	50mm diameter brass chrome plated inlet spreaders with adjustable stainless steel petal plates as "CERTIKIN" Model HD 5015 or equal and approved	No	10			
	SUMP OUTLETS					
1.05	Stainless steel frame and 450 X 450 mm grilles sump outlets as "CERTIKIN" Model HD33D" or equal and approved	No	2			
1.06	Stainless steel frame and 200 X 200 mm grilles sump outlets as "CERTIKIN" Model HD33D" or equal and approved	No	nil			
	POOL LADDERS					
1.07	38 mm diameter mirror polished stainless steel ladder complete with:- - 3No. slip resistant stainless steel treads - Pinchanchors - Escutcheons - Cycolac ends As "CERTIKIN" Model CKL or equal and approved	No	2			
	Total carried forward to Collection					

Item	Description	Unit	Qty	Rate	KShs.	Cts.
1.08	**VACUUM SWEEPER** 12" Flexivac vacuum sweeper complete with:- - Supple polymer plastic head - Free running wheels - Extra long hose nozzle - Vent Hole As "CERTIKIN" Model HD 70 or equal and approved.	No	1			
1.09	**Floating Hose** 40mm diameter floating hose of 15 metres long to suit the vacuum sweeper. AS "CERTIKIN" Model CX or equal and approved	No	1			
1.10	**TELESCOPIC HANDLE** Light weight anodised aluminium telescopic handle 2400 mm extending to 4800 mm complete with standard fixings for vacuum sweeper heads and cleaning equipment with easy lock twist action. AS "CERTIKIN" Model CK 816 or equal and approved	No	1			
1.11	**STAINLESS STEEL HANDRAILS** 32 mm dia. Stainless handrails complete with support brackets	LM	58			
		LM	72			
1.12	DECK LEVEL GRILLES 250mm wide					
	Total Carried Forward to Collection Page					

Item	Description	Unit	Qty	Rate	KShs.	Cts.
	uPVC PIPEWORK					
	Supply, deliver and install uPVC Class "D" high pressure pipework conforming to BS 3505 and fittings to BS 4346.					
	Tenderers MUST ALLOW in their pipework prices for all couplings, connectors, joints, unions, thrust blocks, pipe flanges, paddle flanges were pipework crosses structural walls, adaptors for uPVC to cast iron fittings, fixing clips, plugged and screwed holderbats, etc as required in running lengths of pipework and for satisfactory installation.					
1.13	50mm diameter uPVC pipes	LM	45			
1.14	50mm diameter uPVC pipes	LM	nil			
1.15	65mm ditto	LM	38			
1.16	80mm ditto	LM	50			
1.17	100mm ditto	LM	41			
	Extra over uPVC pipework for the following fittings:-					
1.18	50mm diameter uPVC bends	No	12			
1.19	50mm diameter uPVC bends	No	1			
1.20	65mm ditto	No	9			
1.21	80mm ditto	No	15			
1.22	100mm ditto	No	13			
1.23	65 mm diameter uPVC equal Tee	No	8			
1.24	50 mm ditto	No	1			
1.25	65 mm ditto	No	1			
1.26	100mm ditto	No	1			
1.27	65 x 50 mm diameter uPVC Reducers	No	9			
2.28	80 X 65 mm ditto	No	2			
2.29	150mm dia pipe header of length 2metres with 3No. Tees of 150 x 40 and 2No. Plugs	ITEM				
2.30	150mm dia pipe header of length 2metres with 2No. Tees of 150 x 100 and 3No. Tees of 150 x 50 and 2 No Plugs	ITEM				
	Total Carried Forward to Collection Page					

Item	Description	Unit	Qty	Rate	KShs.	Cts.
	Gate (Sluice) Valves					
1.28	40mm diameter screwed-in bonnet, full way non rising stem, solid wedge disk, bronze gate valve to BS 5154 PN 20 for series "B" rating with wheel head and allow for jointing to uPVC tubing. AS "CRANE" Model No. 152 or equal and approved.	No	1			
1.29	50 mm diameter ditto	No	3			
1.30	80 mm ditto	No	1			
1.31	100mm ditto	No	2			
	Non-Return (Check) Valves					
1.32	100mm diameter screwed-in cap, lift type metal disc bronze non-return valve to BS 5154 PN 32 for series "B" ratings. AS "CRANE" Model No. D105 or equal and approved	No	2			
1.33	Ø75 Ditto	No	1			
	Unions					
1.34	100mm diameter union valve to BS 5154 PN 32 for series "B" ratings. AS "CRANE" Model or equal and approved	No	2			
1.35	80mm Dia. Ditto 50mm Dia. ditto	No No	1 1			
1.36						
	Electrical Works					
1.37	Allow for all electrical works including control panel, wiring from the pumps to control panel, and local isolators etc. Control panel to be complete with:- - Isolators - Contactors - Push button switches for "ON" and "OFF" for pumps - "RED" pilot light for indicating control panel "LIVE" - "GREEN" pilot lights for indicating pumps "ON"					
	Total Carried Forward to Collection Page					

Item	Description	Unit	Qty	Rate	KShs.	Cts.
	- "RED" pilot lights for indicating pumps "TRIP or FAIL" - Labelling for each pilot light - Under voltage protection	Item				
	All interconnecting wiring					
1.38	Allow for a testing Kit for:- - Residual chlorine and PH - Alkalinity Control - Free Chlorine - Any other for satisfactory performance	Item				
	Pool Chemicals					
1.39	Allow for the following pool chemicals to last for 6 months:- - Pool acid - Pool Soda - Algaecide - Pool Sanitizer - Pool Conditioner - Pool Chlorine - Any other item for satisfactory performance	Item				
	Testing and Commissioning					
1.40	Allow for setting to work, Testing and Commissioning	Item				
	Instruction Period					
1.41	Allow for instruction of the Client Staff on the operation and maintenance of the swimming pool equipment and initial maintenance during the liability defects period of 6 months	I				
	Total Carried Forward to Collection Page					

Item	Description	KShs.	Cts.
	COLLECTION PAGE **SWIMMING POOL INSTALLATION** Brought Forward From Page No 37 Brought Forward From Page No 38 Brought Forward From Page No 39 Brought Forward From Page No 40 Brought Forward From Page No 41 Brought Forward From Page No 42 **Allow a provisional sum of Ksh. 7,500,000.00 for construction and related civil works** **SUB-TOTAL** **ADD CONTINGENCY SUM**	**7,500,000** **80,000.**	**00** **00**
	TOTAL CARRIED FORWARD TO FORM OF TENDER		

KITCHEN AND LAUNDRY EQUIPMENT,

KITCHEN MECHANICAL VENTILATION

AND FIRE SUPPRESSION SYSTEM

JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE NAD TECHNOLOGY
KITCHEN AND LAUNDRY EQUIPMENT INSTALLATIONS

Item	Description	Unit	Qty	Rate	Shs	Cts
.	**KITCHEN EQUIPMENT INSTALLATIONS** Supply and fix the following including all materials, jointing and connections to water, gas, electrical power supplies and drainage pipes as necessary.					
1	**GAS OVEN COOKING RANGE.** Six burner gas heated open boiling top unit complete with the following:- - External casing made out of satin finished 18/10 stainless steel. - Double skinned insulated oven door in stainless steel. - Vitreous enameled steel individual spillage trays. - Open burners in cast-iron with chromium plated burner crowns. - Cast-iron pan supports. - Cast-iron oven base plate. - The burners shall be pipe shaped with self-stabilising flame and the gas supply line shall have gas regulating taps with individual pilot control. - Secondary drip tray below burners. - The oven shall have removable side hangers with three-position shelf supports and shall be insulated with glass wool packed in aluminium foil, shall have a stainless steel self-stabilising burners with piezo-electric ignition to pilot burner with push button shut down. - The oven shall also have a multifunctional safety valve incorporating flame failure device and thermostat of 110^0c range. - Adjustable legs. The unit shall have a total rating of 140,000 BTU/hr 25,500 BTU/hr and shall be as Zanussi Model HCF/G 1210 or equal and approved.	No	1			
SUB – TOTAL CARRIED FORWARD TO MAIN SUMMARY PAGE						

Item	Description	Unit	Qty	Rate	Kshs.	Cts
2	**ELECTRIC DEEP FAT FRYERS.** Double pan electrically heated free standing deep fat fryer, 700mm wide X 705 mm deep X 850 mm high capable of frying 100 Lb of raw potatoes per hour. The fryer shall have the following features:- - External surfaces of 18/10 stainless steel. - The fryer wells of 18/10 stainless steel with a sanded surface to facilitate cleaning. - The pan shall be curved such that it can facilitate oil drainage by a drainage tap and also the elements shall be sited so as to increase efficiency. - The temperature shall be thermostatically controlled at 60 – 200^{0}C and the safety thermostat shall be included to cut-out if the adjustable thermostat fails. - The frying baskets shall be of zinc chromed steel and the basket rests shall be easily removable for cleaning. - The bottom grids. - All accessories including 2No. double baskets and chromed steel front rails. - Easily dismountable stainless steel encased elements. - Adjustable feet. - The unit shall be operational on 3 phase 50HZ power supply with 18Kw consumption and it shall be as Zanussi Model RFR/E700 UK or equal and approved.	No	1			
TOTAL CARRIED FORWARD TO MAIN SUMMARY PAGE						

Item	Description	Unit	Qty	Rate	Shs	Cts
3	**BAKERY OVEN** Gas heated forced air bakery oven with a minimum oven size of 540 mm length X 750 mm width X 700 mm height (0.284 cubic metres) free standing complete with the following:- - Outer casing, door, sides and top made out of 18/10 stainless steel. - The oven chamber, shelf supports, tray supports, rear shield of chamber made out of stainless steel. - The door incorporated with a large window insulated by an air gap between two tempered glass panes and a safety switch to cut-off heating when the door is opened. - All gaskets to be of silicon rubber. - Facilitates to collect dripping fats at the bottom. - Flexible hose for water supply - Flue guard. - Oven shelf support with 80mm pitch between shelves. - Accessories for converting the fixed shelf supports in a roll-in rack to enable whole loads to be moved in and out as one. - Chromed-steel trolley for carrying the roll-in racks with a locking device to lock the racks to the trolley. - Pair of zinc-chromed steel grids (Size 530 X 375mm) - Gastronorm trays and pans as necessary. - Draught diverter. - Fitted with elements and automatic temperature control. - A safety thermostat that turns off the main supply if the heater is not functioning properly. - - The unit shall have Gas rating of 103,000Btu/hr and a total electric power rating of 0.5 kw , 240v, 50HZ and shall be as Zanussi model FCF/G 20	No	1			
Sub Total Carried Forward to Main Summary Page						

Item	Description	Unit	Qty	Rate	Shs	Cts
	..					
4	**STAINLES STEEL SINK UNIT.** Double bowl double drainer stainless steel sink unit with overall dimensions 2000 X 600 X 850mm with minimum bowls of size 700 X 500 X 320 mm deep. The unit shall stand on 40 X 40 X 5mm thick RHS stainless steel legs and shall have a 75mm down stand at the front, sides and 50mm upstand at the rear, with a 20mm lip for fixing on to the wall.	No	2			
5	Double bowl double drainer stainless steel sink unit with overall dimensions 1600 X 600 X 850mm with minimum bowls of size 700 X 500 X 320 mm deep. The unit shall stand on 40 X 40 X 5mm thick RHS stainless steel legs and shall have a 75mm down stand at the front, sides and 50mm upstand at the rear, with a 20mm lip for fixing on to the wall.	No	1			
	Double bowl double drainer stainless steel sink unit with overall dimensions 1200 X 600 X 850mm with minimum bowls of size 700 X 500 X 320 mm deep. The unit shall stand on 40 X 40 X 5mm thick RHS stainless steel legs and shall have a 75mm down stand at the front, sides and 50mm upstand at the rear, with a 20mm lip for fixing on to the wall.	No	1			
	STAINLESS STEEL POT RACK The unit to measure 2000 X 700 X 1800mm high complete with 3No. shelves. The unit to be made out of stainless steel with 40 X 40 X 5mm RHS stainless steel legs. The bottom shelf to be 170mm from finished floor level.	No	1			
	Sub – Total Carried to Main Summary Page					

Item	Description	Unit	Qty	Rate	Shs	cts
6.	**MANUAL POTATO CHIPPER** A heavy duty manual potato chipper to be as Metcalf or equal and approved.	No	1			
7.	**CHOPPING WOOD BLOCK.** Chopping wood block of 610 X 610 X 200mm depth made out of hard wood on 50 X 50 X 3mm thick RHS galvanized mild steel support stand mounted such that the top is at about 900mm from finished floor level.	No	1			
8.	**VEGETABLE PREPARATION MACHINE.** Table top vegetable preparation machine capable of cutting 10 X 10mm 300kg of chips amongst other types of cutting like dicing, julienne, grating, crisping etc of fruit and vegetables. The unit shall have the following features:- - Construction from non-corrosive materials and polished aluminium surfaces in food zones. - Plates to have stainless steel bushes and fitted with easily removable stainless steel blades. - Dicing and chipping grids to be fitted with stainless steel grids with adjustable tension on the chipping grid. - Motor shall incorporate built in brake controlled by push buttons including emergency stop and no-volt release. The unit shall also be supplied with the following features:- - 2No. slicing plates. - 1No. crisps plate. - 1No. dicing grids. - 1No. scallops plate. - 1No. grating plate. The unit shall be as Crypto peerless TRS chefs pack or equal and approved. Power rating | HP; 240v, 50HZ	No	1			

Sub-Total Carried To Main Summary Page

Item	Description	Unit	Qty	Rate	Shs	Cts
9.	**DOUGH MIXER** 40 litres variable speed mixer of welded steel construction for strength and smooth lines for ease of cleaning complete with :- - 0.75 kw motor capable of handling up to 10kg of light roll dough. - A two-way timer for continuos and timed operations. - A push button for emergency stop. - Anti-surge device, motor overload protection, built in quick blow fuse, dynamic baking with no-volt release. - 30 litres stainless steel bowl beater. - Whisk. - Spiral dough hook. The unit shall be as Crypto peerless model EG30 or equal and approved.	No	1			
10.	**STAINLES STEEL PLATE RACK.** The unit to measure 1800 X 600 X 18000mm high complete with 4No. shelves. The unit to be made out of stainless steel with 40 X 40 X 5mm RHS stainless steel legs. The bottom shelf to be 170mm from finished floor level.	No	1			
	Sub-Total Carried to Main Summary Page					

Item	Description	Unit	Qty	Rate	Shs	Cts
	POTATO PEELER					
11.	Potato peeling machine capable of peeling 6.3kg per charge (150 kg of potatoes per hour) with a grit of close mesh with fine grade. The unit shall also have the following:- - A cast metal peeling plate and drum coated with abrasive bedded in epoxy resin. - Waste dilution unit. - Adaptor nipple for direct connection to drain. - Outlet hose and clips. - Peel sieve. - Air break unit. The unit shall be as Crypto peerless cc14 or equal and approved power rating ⏐hp, 240v, 50Hz.	No	1			
	BAIN MARIE/HOT CUPBOARD					
12	Electric heated Bain Marie with a hot cupboard underneath complete as follows:- - Exterior finish in 18/10 stainless steel. - 18/10 stainless steel well with rounded corners. - Temperature controlled from 65 to 90^0C. - Water drain at the front. - Perforated false bottom. - Adjustable feet +/- 21mm. - Hot cupboard with 3-position shelf support removable for cleaning. - Double skinned insulated stainless steel counter balanced door with insulated handle. - Hot cupboard thermostat control adjustable from 65 to 90^0C. - 5No.Gastronorm containers. - —” diameter water connection and tap. - —” diameter drainage. - —” diameter inlet. The unit shall have a power supply of 2.3kw for bain marie and 1.8 kw for hot cupboard and overall size of 1545 X 700 X 900mm high.	No	1			

Sub –Total Carried to Main Summary Page

Item	Description	Unit	Qty	Rate	Shs	Cts
13.	**COFFEE/TEA URNS** Table mounted 10litres (3 gallons) capacity coffee/tea urns in polished heavy gauge stainless steel, complete with reliable immersion type element incorporating automatic cut-out units, lift-off cover, suitable gauge glass and 'Tomlinson' non0drip tap. The heater element shall be thermostatically controlled and shall be adjustable by exterior control switch for temperature selections. It shall be operational on 50 Hz single phase with 3kw power consumption.	No	2			
14.	**GENERAL PURPOSE TROLLEY** 900 X 600 X 900mm high on 5" diameter heavy duty flexcelo castors and provided with 4No. stainless steel shelves mounted on stainless steel RHS framework.	No	4			
15.	**INSECTORCUTOR** Insectorcutor of stainless steel housing emitting ultra-violet light for irresistible attraction to insects complete with:- - Powder coated safety grill - Easily removable plastic tray. - Fully protected high tension grid operating at variable voltage of 8000 to 16000 volts. - Brackets to attach to the wall. The unit shall be operational on 240v 50Hz with 20w power consumption and shall be as Crypto peerless model No. 1K 20 or equal approved.	No	2			
16.	**CLEARING TROLLEY.** 900 X 600 X 900mm high on 5" diameter heavy duty flexcelo castors and provided with 2No. stainless steel shelves mounted on stainless steel RHS framework.	No	2			
	Sub-Total Carried to Main Summary Page					

Item	Description	Unit	Qty	Rate	Shs	Cts
17.	**GAS STOCKPOT STOVE.** 2 burner free standing gas stock pot stove to be complete with the following: - Open burners in cast iron with chromium plated burner crowns. - Cast iron pan supports - Self stabilising flame. - Adjustable legs. - 5 position control switch. - Overall dimensions 1372 X 460 X 850mm high.	No	1			
18.	**MOBILE REFUSE BINS.** 480mm diameter x 840 depth mounted on a frame work of 3no. 4" diameter flexcelo castor wheels. The bin to be fabricated out of heavy gauge galvanised mild steel sheets.	No	2			
19.	**TRAY SLIDING RAIL** Grated type stainless steel sliding rail, 300mm wide, 3100mm long installed at back of Bain Marie.	Item				
20.	**EXPRESSO COFFEE MAKING MACHINE** The body to be of satin finished stainless steel (silver) and to be complete with the following:- i) Automatic water level ii) Automatic anti-saction valve iii) Hot water economiser iv) Electric (cup warmer to be as manufactured by La Cimbalie model M30 Classic 2-group boiler capacity 10l power rating 4.2kw, 240v, 60Hz.	No	1			
	Sub – Total Carried to Main Summary Page					

Item	Description	Unit	Qty	Rate	Shs	Cts
22	**CHEST FREEZER.** The chest freezer to be of a reputable and shall have minimum capacity of 15 ft^3	No	1			
	REFRIGERATOR					
23	The fridge to be of a reputable make minimum capacity 600L	No	1			
	STAINLESS STEEL TABLES					
	Heavy duty stainless steel table with backsplash and undershelf. Table size size to be 2000 x 600×850 mm high.	No.	1			
	Heavy duty stainless steel table with backsplash and undershelf. Table size size to be 1000 x 600×850 mm high.	No.	1			
	Heavy duty stainless steel table with backsplash and undershelf. Table size size to be 1285 x 600×850 mm high.	No	2			
	DISH WASHING MACHINE					
24	1No. Crypto peerless , U.K dishwashing machine model washtech 1000, capacity 1000 plates	No	1			
	GAS GRIDDLE					
25.	Free standing gas griddle 1/2grooved 1/2flat size 700mm ×700×850mm	No	1			
	Sub – Total Carried to Main Summary Page					

LAUNDRY EQUIPMENT

Item	Description	Unit	Qty	Rate	Shs	Cts
	LAUNDRY EQUIPMENT					
1.	**22KG WASHER EXTRACTOR** To be as Primus Model R22 or equal and approved. Electrical rating 18kw 3phase ,50Hz.	No	1			
2	**25KG TUMBLER DRYER** To be as Primus Model D25 or equal and approved. Electrical rating 30kw 3phase ,50Hz.	No	1			
3	**2M LONG ELECTRIC ROTAR IRONER** To be as Primus Model 1-25-140 or equal and approved. Electrical rating 7.18kw 3phase ,50Hz.	No	1			
4.	Stainless steel 4 tier rack size 1300mm500mm×1800mm with :- - stainless steel solid shelves - sheet channel leg - adjustable PVC grommet/stainless plugs fitted in 38dia tube	No	1			
5.	Stainless steel hand wash trough size 1500mm×490mm×250mm complete with :- - rear upstand - ss bracket for fixing on the walls - hole for the solid waste	No	1			
6.	Stainless steel hanger trolley size 500mm×800mm×1200mm	No	1			
	Sub – Total Carried to Main Summary Page					

FIRE SUPPRESSION SYSTEM

Item	Description	Unit	Qty	Rate	Shs	Cts
1.	**ANSUL R-102 KITCHEN FIRE SUPPRESSION SYSTEM** The system shall be an automatic fire suppression system using a wet chemical agent for greese related fireson a kitchen hood size 1340×3800mm The system shall be capable of suppressing fires in the following areas associated with cooking equipment ventilating equipment including hoods,ducts, plenums, and filters, fryers, griddles and range tops,upright, natural charcoal or chain type broilers, electric lava rock mosquito or gas radiant and char-broilers. The system shall be the pre-engineered type having minimum and maximum guidelines established by the manufacturer and listed by the Underwriters Laboratories Inclusive The system shall be installed and serviced by personnel trained trained by the manufacturer The system shall be capable of protecting cooking machines application by utilizing with either dedicated appliance protection and/or overlapping appliance protection . **THE SYSTEM TO COMPRISE OF THE FOLLOWING:-** A)The basic system shall consist of an ANSUL® AUTOMAN®regulated release assembly which includes a regulatedrelease mechanism and a wet chemical storage tank housed within a single enclosure. Nozzles, blow-off caps, detectors,cartridges, agent, fusible links, and pulley elbows shall besupplied in separate packages in the quantities needed for fire suppression system arrangements. Additional equipmentshall include remote manual pull station, mechanical and electrical gas valves, pressure switches, and electrical switches for automatic equipment and gas line shut-off					
	Sub – Total Carried to Main Summary Page					

Item	Description	Unit	Qty	Rate	Shs	Cts
A)	B. Wet Chemical Agent: The extinguishing agent shall be a specially ormulated, aqueous solution of organic salts with a Ph range between 7.8 – 8.2, designed for flame knockdown and foam securement of grease related fires. C. Agent Tank: The agent tank shall be installed in a stainless steel enclosure or wall bracket. The tank shall be constructed of stainless steel. Tanks shall be available in two sizes; 1.5 gallon (5.7 L) and 3.0 gallon (11.4 L).The tanks shall have a working pressure of 110 psi (7.6 bar), a test pressure of 330 psi (22.8 bar), and a minimum burst pressure of 600 psi (41.4 bar). The tank shall include an adaptor/tube assembly containing a burst disc union. D. Regulated Release Mechanism: The regulated release mechanism shall be a spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one or two agent tanks depending on the capacity of the gas cartridge used. It shall contain a factory installed regulator deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar). It shall have the following actuation capabilities: automatic actuation by a fusible link detection system and remote manual actuation by a mechanical pull station. The regulated release mechanism shall contain a release assembly, regulator, expellant gas hose, and agent storage tank housed in a stainless steel enclosure with cover. The enclosure shall contain knock-outs for 1/2 in. conduit. The cover shall contain an opening for a visual status indicator. It shall be compatible with mechanical gas shut-off devices; or, when equipped with a field or factory-installed switch, it shall be compatible with electric gas line or appliance shutoff devices.					
	Sub – Total Carried to Main Summary Page					

Item	Description	Unit	Qty	Rate	Shs	Cts
	E. Regulated Actuator Assembly: When more than two agent tanks are required, the regulated actuator shall be available to provide expellant gas for additional tanks. It shall be connected to the cartridge receiver outlet of the regulated release mechanism providing simultaneous agent discharge. The regulator shall be deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar).The regulated actuator assembly shall contain a regulated actuator, regulator, expellant gas hose, and agent tank housed in a stainless steel enclosure with cover. The enclosure shall contain knockouts to permit installation of the expellant gas line. F. Discharge Nozzles: Each discharge nozzle shall be tested and listed with the R-102 system for a specific application. Nozzles tips shall be stamped with the flow number designation (1/2, 1, 2, and 3). Each nozzle shall have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up. G. Distribution Piping: Distribution piping shall be Schedule 40 black iron, chrome-plated, or stainless steel pipe conforming to ASTM A120, A53, or A106. H. Detectors: The detectors shall be the fusible link style designed to separate at a specific temperature.					
	Sub – Total Carried to Main Summary Page					

Item	Description	Unit	Qty	Rate	Shs	Cts
	1.Cartridges: The cartridge shall be a sealed steel pressurevessel containing either carbon dioxide or nitrogen gas. Thecartridge seal shall be designed to be punctured by the releasing device supplying the required pressure to expel wet chemical agent from the storage tank. J. Agent Distribution Hose: Kitchen appliances manufactured with or resting on casters (wheels/rollers), which have the Fire Suppression System hard piped, shall include a UL Listed agent distribution hose as a component of the suppression system. This shall allow the appliance to be moved for cleaning purposes without disconnecting the appliance fire suppression protection. Hose assembly shall include a restraining cable kit to limit the appliance movement within the range (length) of the flexible hose. K. Flexible Conduit: The manufacturer supplying the Restaurant Fire Suppression System shall offer flexible conduit as an option to rigid EMT conduit for the installation of pull stations and/or mechanical gas valves. The flexible conduit shall be UL Listed and include all approved components for proper installation. L. Pull Station Assembly: The Fire Suppression System shall include a remote pull station for manual system actuation. The pull station shall be designed to include a built-in guard to protect the pull handle. The pull station shall also be designed with a pull handle to allow for three finger operation and shall be red in color for quick visibility.	Item				
	Sub – Total Carried to Main Summary Page					

PROPOSED JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE NA TECHNOLOGY
KITCHEN AND LAUNDRY EQUIPMENT INSTALLATION SERVICES

SUMMARY PAGE

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TOTAL FOR KITCHEN EQUIPMENT AND LAUNDRY INSTALLATION SERVICES.		

JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE NAD TECHNOLOGY

KITCHEN MECHANICAL VENTILATION INSTALLATION SERVICES.

Item	Description	Unit	Qty	Rate	Shs	Cts
1.0	**EXTRACT FAN.** Duct mounted axial flow extract fan capable of a volume flow rate of $0.33m^3/s$ against a total pressure drop of $200N/m^2$. Fan to be complete with supports, flexible connections and anti-vibration mountings. Fan as "WOODS" model No.31JM running at 1420 RPM pitch angle of 16 degrees, sound pressure level of 44dBA, power supply of 0.12KW 240V 50HZ or equal and approved.	No	1			
2.0	**GREASE ELIMINATOR UNIT** The unit shall consist of a bank of v-mounted grease filter panels with grease collecting drip tray at the bottom and housed in a stainless steel body. The unit to be as Vokes model DS20/4/W.	No	2			
3.0	**EXTRACT HOOD.** Double sided extract hood fabricated from 1.5mm thick polished aluminium sheet covering a kitchen island of length 2000 X 4000mm wide complete with 50 X 50 X 3mm thick aluminium angle frame, bulkhead lights connections, supports, 75 X 25mm deep condensate channel all around with 4No. 20mm diameter drain holes.	M^2	13			
4.0	**DRIP TRAYS** Removable grease drip tray of 1.5mm polished aluminium sheet of size 1400 X 200 X 100mm deep.	No	2			
TOTAL CARRIED FORWARD TO MAIN SUMMARY PAGE						

Item	Description	Unit	Qty	Rate	Shs	Cts
5.0	**DRAIN PLUGS**.					
	20mm diameter plastic drain plugs.	No	4			
6.0	**DUCT WORK.** The extract duct work shall be manufactured form 18 SWG galvanied rolled steel sheets. Joints are to be stiffened by mild steel angle sections and seams of ducting to be rivetted with 8 SWG rivets at 2" centres. All joints and seams shall be sealed with mastic to make them air tight.	M^2	13			
7.0	**FIRE DAMPER.** The fire damper shall be of the "off set" hinged single blade type, held in position by a fusible link, set to release at a temperature of 680C. The damper blade shall be weighted to ensure immediate closure in release (melting) of the link. The link shall be held in position by means of rollers. The damper to incorporate a microswitch to deactivate the fan.	N0	1			
8.0	**ELECTRICAL WORK.** It shall be responsibility of others to provide electrical power supply single phase 240v 50 Hz including fused isolator to a point about 1.5m from the fan.	Item				
9.00	**RECORD DRAWINGS.** Allow for preparation of record (as installed) drawings, operation and maintenance manuals.	Item				
10.0	**INSTRUCTION AND MAINTENANCE** Allow for instruction to the client staff the operation and maintenance of the mechanical ventilation equipment and initial maintenance during the 6 month liability defects period.	Item				
11.0	**TESTING AND COMMISSIONING.** After successful completion of the installation the sub-contractor shall run the ventilation plant and commission the same to the requirement of this specification. Testing and commissioning shall be carried out in the presence of the Engineer or his representative.	Item				
SUB – TOTAL CARRIED FORWARD TO MAIN SUMMARY OF PRICES						

JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE NAD TECHNOLOGY
FOR KITCHEN MECHANICAL VENTILATION SYSTEM.

SUMMARY PAGE.

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TOTAL FOR KITCHEN MECHANICAL VENTILATION SERVICES.		

PROPOSED RESEARCH CENTRE AND HOSTELS FOR JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

MAIN SUMMARY PAGE

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GAS INSTALLATION SERVICES

PROPOSED JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
GAS INSTALLATIONS SERVICES.

Item	Description	Unit	Qty	Rate	Shs	Cts
1.00	**GAS INSTALLATIONS**					
1.01	**EXCAVATION**. Excavate trench from ground level for supply pipe not exceeding 1000mm deep and average 600mm deep, part return, filling, raw remainder cart away.	Lm	45			
1.02	Allow for keeping the whole of the excavation free from water and mud by pumping, bailing or otherwise.	Item	45			
1.03	Allow for coating the buried pipes with bitumen re-inforced with appropriate material to be approved by the Engineer.	Lm	45			
1.04	**PIPEWORK** Supply, deliver and install galvanised Mild steel tubing to BS 1387 Class "B" and fittings to BS 143 and 1256 of approved manufacture with galvanising to BS 729. Tenderers must allow in their pipework prices for all the couplings, connectiors joints, unions etc., as required in running lenghts of pipework and also where necessary, for pipe fixing clips, holderbats plugged and screwed, and sleeves where pipe cross structural members.					
1.05	25mm diameter GMS Tubing.	Lm	45			
	Extra over GMS pipework for the following fittings:-					
1.06	25mm diameter GCI bend.	No	6			
TOTAL CARRIED FORWARD TO MAIN SUMMARY PAGE						

Item	Description	Unit	Qty	Rate	Shs	Cts
1.07	25 X 15 mm diameter GCI Uneaqual Tee.	No	1			
1.08	20 X 15mm diameter GCI Reducer.	No	3			
	VALVES.					
1.09 1.10	15mm diameter fullway gate valves, round body type with solid gun metal wedge and non-rising stem, threads to BSP as peglar pattern 1070 or equal and approved.	No	4			
1.11	25mm ditto.	No	2			
	REGULATORS					
1.12	Rego 2403 V.9 high pressure regulators complete with connections and brackets for gas tanks.	No	1			
1.13	Rego 2503 B low pressure regulator for the manifold feeding the kitchen equipment.	No	1			
	GAS MANIFOLD.					
1.14	23mm diameter GMS Class "C" manifold 1800mm long with 5No. tappings.	Item				
	COPPER TUBING					
1.15	Supply,deliver and install copper tubing to BS 2871: part 1 and capillary and compression fittings to BS 864: part 2. The tubing must be solid drawn round, clean, smooth and free from defects and from deleterious films in the bore. The fittings must be free from internal fins or other irregularities. Compression fittings shall be Type A (non-manipulative). Allow in your pipe work prices for pipe support clips, cradles, jointing, fixing etc.					
1.16	10/12mm diameter copper tubing.	Lm	2			
1.17	15mm ditto.	Lm	2			
SUB – TOTAL CARRIED FORWARD TO MAIN SUMMARY OF PRICES						

Item	Description	Unit	Qty	Rate	Kshs.	Cts
	ADAPTORS					
1.18	10/12 X 15mm diameter adaptor for joining 10/12 copper to tappings from the gas manifold.	No	2			
1.19	15 Cu X 15mm diameter adaptor for joining 15 copper to tappings from the gas manifold.	No	3			
	VALVES.					
1.20	10/12 mm diameter approved high pressure screw-down full way non-raising stemwedge gate valve to BS 6154 with wheel head and joints to copper tubing and compression to BS 804/2.	No	2			
1.21	15mm diameter ditto.	No	3			
	GAS TANKS.					
1.22	1tonne gas tank complete with pressure relief valve, drain, content gauge, pressure gauge, earthing, float, etc as necessary supplied by M/s Serviscope (EA) Ltd. or equal and approved.	No	1			
	INITIAL GAS CHARGE.					
1.23	Allow for filling the gas tanks with the initial 1Tonne gas charge.	Item				
	TESTING AND COMMISSIONING.					
1.24	Allow for setting to work, testing and commissioning.	Item				
TOTAL CARRIED FORWARD TO MAIN SUMMARY OF PRICES						

PROPOSED JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
GAS INSTALLATIONS SERVICES.

SUMMARY PAGE

	KSHS	CTS
Brought forward from collection page 64……..		
Brought forward from collection page 65……..		
Brought forward from collection page 66……..		
TOTAL FOR GAS INSTALLATION SERVICES.		

INCINERATOR INSTALLATION SERVICES

JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY –INCINERATOR INSTALLATIONS

Item	Description	Unit	Qty	Rate	Shs	Cts
	INCINERATOR INSTALLATION					
1.	Supply, deliver, install and test 75kg/hr hospital waste incinerator as a complete packaged unit. The incinerator to be complete with 3No. Burners (ignition and after burners) capable of burning 75kg of mixed hospital waste per hour, FD fan, air receiver, air ductwork unit with its dampers, pressure and temperature gauges, sight glass with fibre glass gaskets and control panel (fully) wired. The incinerator should have two chambers (hearth and after chamber) with upper chamber capable of burning flue waste from lower chamber and eliminating hazardous emissions completely.	Item				
2.	Self supporting chimney (flue) to be mounted on the incinerator of a length of 15m and a diameter corresponding to the diameter of the incinerator's waste gases outlet but approximately 600mm. The whole chimney to be insulated and it will be mounted on a concrete base constructed by others but as per sub-contactor's instructions.	Item				
3.	2.5m high steel tower to support the daily service fuel oil tank and steel ladder, all to be approved.	Item				
4.	Initial filling of the day oil storage tank with class D oil for fire testing and commissioning of the burners.	Litres	800			
5.	Semi-rotary hand transfer pump capable of transferring oil from bulk oil tank to day oil service tank.	No	1			
6.	All Associated interconnecting pipe work between the fuel oil storage tank and the incinerators, which shall be 25mm diameter black mild steel pipe class 'C' about 30 metres long .	LM	30			
7.	25mm diameter tee	No	2			
8.	25mm diameter bend	No	4			
9.	25mm diameter gate valve with associated unions	No	2			
TOTAL CARRIED FORWARD TO MAIN SUMMARY PAGE						

Item	Description	Unit	Qty	Rate	Shs	Cts
10.	Control panel, arranged to DOL start and incorporates an isolator, thermal overload magnetic overload protection, on/off/trip indicator lights, auto/manual hand selector switch and contactors, ammeter and phase failure relay, all in steel enclosure with terminals.	Item				
11.	Electrical wiring					
12.	Initial fill of bulk oil storage tank with class D oil 16,000 litres	Litres				
	FIRE-FIGHTING EQUIPMENT					
13.	4.5kg dry CO2 gas portable fire extinguishers complete with squeeze grip operating head, and discharge nozzle, fully charged.	No	1			
14.	9litres chemical powder fire extinguisher complete with squeeze grip operating head, and discharge nozzle, fully charged.	No	1			
15.	125mm manual alarm bell	No	1			
16.	Fire instruction notice/sign for the incinerator house as indicated in the particular specifications	No				
	BULK FUEL OIL STORAGE TANK					
17.	Horizontal Bulk oil storage Tank for the Incenerator each of capacity 16,000litres with all vents manholes and connections mounted and strapped by tank supplier on baerers in a bunded area built by others tank as maufactured by warren or approved equivalent.	Item	1			
	SUB – TOTAL CARRIED FORWARD TO MAIN SUMMARY PAGE					

Item	Description	Unit	Qty	Rate	Kshs.	Cts
18.	**Pipework associated with relocation'**					
a)	65mm diameter pipe	LM	50			
b)	50mm diameter pipe	LM	50			
c)	50mm diameter gate valves with associated unions	No	4			
d)	50mm diameter strainer	No.	2			
e)	65mm diameter non-return	No.	2			
f)	50mm diameter bends	No.	4			
g)	50mm diameter tee	No.	2			
h)	50mm diameter inlet valve from trailer	No.	1			
19.	Stainless steel sump pump capable of 13m3/hr at 5m head as Grundfos centrifugal submersible waste water pump directly coupled to a 0.6kW single phase motor	No	1			
TOTAL CARRIED FORWARD TO MAIN SUMMARY PAGE						

PROPOSED JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
INCINERATOR INSTALLATION SERVICES

SUMMARY PAGE

	KSHS	CTS
Brought forward from collection page 68……..		
Brought forward from collection page 69……..		
Brought forward from collection page 70……..		
TOTAL FOR INCINERATOR INSTALLATION SERVICES.		

MAIN SUMMARY PAGE

	KSHS.	CTS
Brought forward for plumbing and drainage from page 28……..……		
Brought forward Solar water heating from page 36……		
Brought forward swimming pool installation from page 43……		
Brough forward kitchen and laundry equipment, kitchen mechanical ventilation from page 63…….		
Brought forward gas installation from page 67……		
Brought forward incinerator installation from page 71……		
Total Carried to Form of Tender		

SECTION VIII

STANDARD FORMS

(i) Form of Invitation for Tenders
(ii) Form of Tender
(iii) Appendix to Form of Tender
(iv) Letter of Acceptance
(v) Form of Agreement
(vi) Form of Tender Security
(vii) Performance Bank Guarantee (unconditional)
(viii) Bank Guarantee for Advance Payment
(ix) Tender Questionnaire
(xi) Confidential Business Questionnaire
(x) Statement of Foreign Currency Requirement
(xi) Schedule of Materials;- Basic Prices
(xii) Schedule of Labour;- Basic Prices
(xiii) Schedule of Plant and Equipment
(xv) Details of Sub-Contractors
(xvi) Certificate of Tenderer's Site visit
(xvii) Form of Written Power of Attorney
(xviii) Key Personnel
(xix) Completed Civil Works
(xx) Schedule of Ongoing Projects
(xxi) Other Supplementary Information
(xxii) Request for Review Form

FORM OF INVITATION FOR TENDERS

_____*[date]*

To: _____ *[name of Contractor]*
_____*[address]*
_____
_____

Dear Sirs:

Reference: [Contract Name]

You have been prequalified to tender for the above project.

We hereby invite you and other prequalified tenderers to submit a tender for the execution and completion of the above Contract.

A complete set of tender documents may be purchased by you from

[mailing address, cable/telex/facsimile numbers].

Upon payment of a non-refundable fee of Kshs

All tenders must be accompanied by number of copies of the same and a security in the form and amount specified in the tendering documents, and must be delivered to

[address and location]

at or before **(time and date).** ***Tenders will be opened immediately thereafter, in the presence of tenderers' representatives who choose to attend.***

Please confirm receipt of this letter immediately in writing by cable/facsimile or telex.

Yours faithfully,

Authorised Signature
Name and Title

FORM OF TENDER

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

_____*[Name of Contract]*

Dear Sir,

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

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

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

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

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

Dated this _____ day of _____20_____

Signature _____in the capacity of_____

duly authorized to sign tenders for and on behalf of _____*[Name of Employer]* of_____[*Address of Employer]*

Witness; Name_____

Address_____

Signature_____

Date_____

APPENDIX TO FORM OF TENDER

(This appendix forms part of the tender)

CONDITIONS OF CONTRACT	CLAUSE	AMOUNT
Tender Security (Bank Guarantee only)		Kshs
Amount of Performance Security (Unconditional Bank Guarantee)	10.1	___ percent of Tender Sum in the form of Unconditional Bank Guarantee
Program to be submitted	14.1	Not later than ___ days after issuance of Order to Commence
Cashflow estimate to be submitted	14.3	Not later than ___ days after issuance of Order to Commence
Minimum amount of Third Party Insurance	23.2	Kshs.
Period for commencement, from the Engineer's order to commence	41.1	_____ days
Time for completion	43.1	……
Amount of liquidated damages	47.1	Kshs. per day
Limit of liquidated damages	47.1	___% of Contract Value
Defect Liability period	49.1	Months
Percentage of Retention	60.5	___ of Interim Payment Certificate
Limit of Retention Money	60.5	___ % of Contract Price
Minimum amount of interim certificates	60.2	Contract value/Time for completion in months
Time within which payment to be made after Interim Payment Certificate signed by Engineer	60.8	_____days
Time within which payment to be made after Final Payment Certificate signed by Engineer	60.8	_____ days
Appointer of Arbitrator	67(3)	Chief Justice of The Republic of Kenya
Notice to Employer and Engineer	68.2	The Employers address is: Permanent Secretary, Ministry of……, P.O.Box …… NAIROBI The Engineer's address is: Chief Engineer(……), Ministry of……, P.O.Box…… NAIROBI

Signature of Tender……Date……

LETTER OF ACCEPTANCE

[letterhead paper of the Employer]

_____*[date]*

To: _____
[name of the Contractor]

_____
[address of the Contractor]

Dear Sir,

This is to notify you that your Tender dated _____
for the execution of _____
[name of the Contract and identification number,as given in the Tender documents] for the Contract Price of Kshs. _____ *[amount in figures]*[Kenya Shillings_____*(amount in words)*] in accordance with the Instructions to Tenderers is hereby accepted.

You are hereby instructed to proceed with the execution of the said Works in accordance with the Contract documents.

Authorized Signature ……

Name and Title of Signatory ……

Attachment : Agreement

FORM OF AGREEMENT

THIS AGREEMENT, made the _____ day of _____ 20 _____ between_____of[or whose registered office is situated at]_____

(hereinafter called "the Employer") of the one part AND
_____of[or whose registered office is situated at]_____
(hereinafter called "the Contractor") of the other part.

WHEREAS THE Employer is desirous that the Contractor executes
_____
(name and identification number of Contract) (hereinafter called "the Works") located at_____*[Place/location of the Works*]and the Employer has accepted the tender submitted by the Contractor for the execution and completion of such Works and the remedying of any defects therein for the Contract Price of Kshs_____[*Amount in figures*],Kenya Shillings_____[*Amount in words]*.

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents shall be deemed to form and shall be read and construed as part of this Agreement i.e.

   (i) Letter of Acceptance

   (ii) Form of Tender

   (iii) Conditions of Contract Part I

   (iv) Conditions of Contract Part II and Appendix to Conditions of Contract

   (v) Specifications

   (vi) Drawings

   (vii) Priced Bills of Quantities

3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

The common Seal of _____

Was hereunto affixed in the presence of _____

Signed Sealed, and Delivered by the said _____

Binding Signature of Employer _____

Binding Signature of Contractor _____

In the presence of (i) Name_____

Address_____

Signature_____

[ii] Name _____

Address_____

Signature_____

FORM OF TENDER SECURITY

WHEREAS ……..(hereinafter called "the Tenderer") has submitted his tender dated …… for the construction of ……
…… *(name of Contract)*

KNOW ALL PEOPLE by these presents that WE …… having our registered office at ……(hereinafter called "the Bank"), are bound unto ……(hereinafter called "the Employer") in the sum of Kshs.…… for which payment well and truly to be made to the said

Employer, the Bank binds itself, its successors and assigns by these presents sealed with the Common Seal of the said Bank this ……. Day of ……20……

THE CONDITIONS of this obligation are:

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

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

   (a) fails or refuses to execute the form of Agreement in accordance with the Instructions to Tenderers, if required; or
   (b) fails or refuses to furnish the Performance Security, in accordance with the Instructions to Tenderers;
   (c) rejects a correction of an arithmetic error in the tender.

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

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

_____ _____
[date[*[signature of the Bank]*

_____ _____
[witness] *[seal]*

(Amend accordingly if provided by Insurance Company)

PERFORMANCE BANK GUARANTEE (UNCONDITIONAL)

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

Dear Sir,

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

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

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

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

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

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

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

SIGNATURE AND SEAL OF THE GUARANTOR _____

Name of Bank _____

Address _____

Date _____

(Amend accordingly if provided by Insurance Company)

BANK GUARANTEE FOR ADVANCE PAYMENT

To: _____ *[name of Employer]* _____*(Date)*
_____ *[address of Employer]*

Gentlemen,
Ref: _____*[name of Contract]*

In accordance with the provisions of the Conditions of Contract of the above-mentioned Contract, We,_____*[name and Address of Contractor]* (hereinafter called "the Contractor") shall deposit with _____*[name of Employer]* a bank guarantee to guarantee his proper and faithful performance under the said Contract in an amount of Kshs._____*[amount of Guarantee in figurers]* Kenya Shillings_____*[amount of Guarantee in words]*.

We, _____[*bank or financial institution*], as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, the payment to _____[*name of Employer*] on his first demand without whatsoever right of objection on our part and without his first claim to the Contractor, in the amount not exceeding Kshs_____[*amount of Guarantee in figures*] Kenya Shillings _____[*amount of Guarantee in words*], such amount to be reduced periodically by the amounts recovered by you from the proceeds of the Contract.

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

No drawing may be made by you under this guarantee until we have received notice in writing from you that an advance payment of the amount listed above has been paid to the Contractor pursuant to the Contract.

This guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until _____(*name of Employer*) receives full payment of the same amount from the Contract.

Yours faithfully,

Signature and Seal _____

Name of the Bank or financial institution _____

Address _____

Date _____

Witness: Name: _____

Address: _____

Signature: _____

Date: _____

TENDER QUESTIONNAIRE

Please fill in block letters.

1. Full names of tenderer

   ……

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

   ……

3. Telephone number (s) of tenderer

   ……

4. Telex address of tenderer

   ……

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

   ……

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

   ……

   ……

_____
Signature of Tenderer

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

ANTI – CORRUPTION POLICY IN THE PROCUREMENT PROCESS

UNDERTAKING BY BIDDER ON ANTI – CORRUPTION POLICY / CODE OF CONDUCT AND COMPLIANCE PROGRAMME

The governments of Kenya is committed to fighting corruption in all its forms and in all its institutions to ensure that all the government earned revenues are utilized prudently and for the purpose intended with a view to promoting economic development as the country work towards actualizing Vision 2030.

Here at Jaramogi Oginga Odinga University of Science and Technology and also being one of the government entities mandated under the government to provide quality education and transforming lives, on behalf of the government, we are highly committed to fighting any form of corruption in our organization to ensure that all the monies that the government entrust with us, is optimally and prudently utilized for the benefits of all the people we serve.

The following is a requirement that every Bidder wishing to do business with JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY must comply with:

(1) Each bidder must submit a statement, as part of the tender documents, in the format given and which must be signed personally by the Chief Executive Officer or other appropriate senior corporate officer of the bidding company and, where relevant, of its subsidiary in Kenya. If a tender is submitted by a subsidiary, a statement to this effect will also be required of the parent company, signed by its Chief Executive Officer or other appropriate senior corporate officer.

(2) Bidders will also be required to submit similar No-bribery commitments from their subcontractors and consortium partners; the bidder may cover the subcontractors and consortium partners in its own statement, provided the bidder assumes full responsibility.

(3) a) Payment to agents and other third parties shall be limited to appropriate compensation for legitimate services.

b) Each bidder will make full disclosure in the tender documentation of the beneficiaries and amounts of all payments made, or intended to be made, to agents or other third parties (including political parties or electoral candidates) relating to the tender and, if successful, the implementation of the contract.

c) The successful bidder will also make full disclosure [quarterly or semi- annually] of all payments to agents and other third parties during the execution of the contract.

d) Within six months of the completion of the performance of the contract, the successful bidder will formally certify that no bribes or other illicit commissions have been paid. The final accounting shall include brief details of the goods and services provided that are sufficient to establish the legitimacy of the payments made.

e) Statements required according to subparagraphs (b) and (d) of this paragraph will have to be certified by the company's Chief Executive Officer, or other appropriate senior corporate officer.

(4) Tenders which do not conform to these requirements shall not be considered.

(5) If the successful bidder fails to comply with its No-bribery commitment, significant sanctions will apply. The sanctions may include all or any of the following:

a) Cancellation of the contract;

b) Liability for damages to the public authority and/or the unsuccessful competitors in the bidding possibly in the form of a lump sum representing a pre-set percentage of the contract value (liquidated).

(6) Bidders shall make available, as part of their tender, copies of their anti-Bribery Policy/Code of Conduct, if any, and of their-general or project - specific - Compliance Program.

(7) The Government of Kenya through Ethics and Anti-Corruption Commission has made special arrangements for adequate oversight of the procurement process and the execution of the contract. Those charged with the oversight responsibility will have full access if need be to all documentation submitted by Bidders for this contract, and to which in turn all Bidders and other parties involved or affected by the project shall have full access (provided, however, that no proprietary information concerning a bidder may be disclosed to another bidder or to the public).

1. MEMORANDUM (FORMAT)

(Clause 46 of Kenya Public Procurement and Asset Disposal Act 2015)

This company _____*(name of company)* has issued, for the purposes of this tender, a Compliance Program copy attached -which includes all reasonable steps necessary to assure that the No-bribery commitment given in this statement will be complied with by its managers and employees, as well as by all third parties working with this company on the public sector projects or contract including agents, consultants, consortium partners, subcontractors and suppliers')"

Authorized Signature:_____

Name and Title of Signatory: _____

Name of Bidder: _____

Address: _____

CONFIDENTIAL BUSINESS QUESTIONNAIRE

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

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

Part 1 – General

Business Name ……

Location of business premises; Country/Town……

Plot No…… Street/Road ……

Postal Address…… Tel No……

Nature of Business……

Current Trade Licence No…… Expiring date……

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

Name of your bankers……

Branch……

Part 2 (a) – Sole Proprietor

Your name in full…… Age……

Nationality…… Country of Origin……

*Citizenship details ……

Part 2 (b) – Partnership

Give details of partners as follows:

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

Part 2(c) – Registered Company:

Private or public……

State the nominal and issued capital of the Company-

Nominal Kshs……

Issued Kshs……

Give details of all directors as follows:

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

1.
……
2.
……
3.
……
4.
……

Part 2(d) – Interest in the Firm:

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

I certify that the information given above is correct.

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

* Attach proof of citizenship

STATEMENT OF FOREIGN CURRENCY REQUIREMENTS

(See Clause 60[5] of the Conditions of Contract)

In the event of our Tender for the execution of_____
_____(*name of Contract*) being accepted, we would require in accordance with Clause 21 of the Conditions of Contract, which is attached hereto, the following percentage:

(Figures)……
(Words)……

of the Contract Sum, (Less Fluctuations) to be paid in foreign currency.

Currency in which foreign exchange element is required:

……
……

Date: The …… Day of …… 20……

Enter 0% (zero percent) if no payment will be made in foreign currency.

Maximum foreign currency requirement shall be _____(percent) of the Contract Sum, less Fluctuations.

_____
(Signature of Tenderer)

SCHEDULE OF MATERIALS;-BASIC PRICES
(Ref: Clause 70 of Conditions of Contract)

MATERIAL	UNIT	ORIGIN AND PRICE			TRANSPORTATION COST FROM SOURCE OF ORIGIN	
		COUNTRY OF ORIGIN	SUPPLIER	PRICE	MODE	PRICE (KSHS)
Cement	Mg					
Lime	Mg					
Sand	Mg					
Aggregate	Mg					
Diesel	L					
Regular Petrol	L					
Super Petrol	L					
Kerosene	L					
Structural steel	Mg					
Gabion Mesh	M2					
Reinforcement Steel	Mg					
Explosives	Kg					
Oil and Lubricants	L					
Bitumen Emulsion A3	L					
Bitumen Emulsion A4	L					
Bitumen Emulsion K1	L					
Bitumen Emulsion K3	L					
Bitumen 80/100	Kg					
Bitumen MC 30	ML					
Bitumen MC 70	L					
Bitumen MC 3000	L					
Ammonium nitrate for blasting	Kg					

I certify that the above information is correct.

…… …… ……

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

The prices inserted above shall be those prevailing 30 days before the submission of Tenders and shall be quoted in Kenya Shillings using the exchange rates specified in the Appendix to Form of Tender.

Prices of imported materials to be quoted CIF Mombasa or Nairobi as appropriate depending on whether materials are imported by the tenderer directly or through a local agent.

Transportation costs for imported materials to be quoted from Mombasa or Nairobi as appropriate to _____(Contract Site) depending on whether materials are imported directly by the tenderer or through a local agent.

LETTER OF NOTIFICATION OF AWARD

Address of Procuring Entity

_____

_____

To:_____

_____

_____

_____

RE: Tender No._____

Tender Name_____

This is to notify that the contract/s stated below under the above mentioned tender have been awarded to you.

_____

_____

1. Please acknowledge receipt of this letter of notification signifying your acceptance.

2. The contract/contracts shall be signed by the parties within 30 days of the date of this letter but not earlier than 14 days from the date of the letter.

3. You may contact the officer(s) whose particulars appear below on the subject matter of this letter of notification of award.

   *(FULL PARTICULARS)*_____

   _____

SIGNED FOR ACCOUNTING OFFICER

ANTI – CORRUPTION POLICY IN THE PROCUREMENT PROCESS

UNDERTAKING BY BIDDER ON ANTI – CORRUPTION POLICY / CODE OF CONDUCT AND COMPLIANCE PROGRAMME

The governments of Kenya is committed to fighting corruption in all its forms and in all its institutions to ensure that all the government earned revenues are utilized prudently and for the purpose intended with a view to promoting economic development as the country work towards actualizing Vision 2030.

Here at Jaramogi Oginga Odinga University of Science and Technology and also being one of the government entities mandated under the government to provide quality education and transforming lives, on behalf of the government, we are highly committed to fighting any form of corruption in our organization to ensure that all the monies that the government entrust with us, is optimally and prudently utilized for the benefits of all the people we serve.

The following is a requirement that every Bidder wishing to do business with JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY must comply with:

(1) Each bidder must submit a statement, as part of the tender documents, in the format given and which must be signed personally by the Chief Executive Officer or other appropriate senior corporate officer of the bidding company and, where relevant, of its subsidiary in Kenya. If a tender is submitted by a subsidiary, a statement to this effect will also be required of the parent company, signed by its Chief Executive Officer or other appropriate senior corporate officer.

(2) Bidders will also be required to submit similar No-bribery commitments from their subcontractors and consortium partners; the bidder may cover the subcontractors and consortium partners in its own statement, provided the bidder assumes full responsibility.

(3) a) Payment to agents and other third parties shall be limited to appropriate compensation for legitimate services.

b) Each bidder will make full disclosure in the tender documentation of the beneficiaries and amounts of all payments made, or intended to be made, to agents or other third parties (including political parties or electoral candidates) relating to the tender and, if successful, the implementation of the contract.

c) The successful bidder will also make full disclosure [quarterly or semi- annually] of all payments to agents and other third parties during the execution of the contract.

d) Within six months of the completion of the performance of the contract, the successful bidder will formally certify that no bribes or other illicit commissions have been paid. The final accounting shall include brief details of the goods and services provided that are sufficient to establish the legitimacy of the payments made.

e) Statements required according to subparagraphs (b) and (d) of this paragraph will have to be certified by the company's Chief Executive Officer, or other appropriate senior corporate officer.

(4) Tenders which do not conform to these requirements shall not be considered.

(5) If the successful bidder fails to comply with its No-bribery commitment, significant sanctions will apply. The sanctions may include all or any of the following:

c) Cancellation of the contract;

d) Liability for damages to the public authority and/or the unsuccessful competitors in the bidding possibly in the form of a lump sum representing a pre-set percentage of the contract value (liquidated).

(6) Bidders shall make available, as part of their tender, copies of their anti-Bribery Policy/Code of Conduct, if any, and of their-general or project - specific - Compliance Program.

(7) The Government of Kenya through Ethics and Anti-Corruption Commission has made special arrangements for adequate oversight of the procurement process and the execution of the contract. Those charged with the oversight responsibility will have full access if need be to all documentation submitted by Bidders for this contract, and to which in turn all Bidders and other parties involved or affected by the project shall have full access (provided, however, that no proprietary information concerning a bidder may be disclosed to another bidder or to the public).

2. MEMORANDUM (FORMAT)

(Clause 46 of Kenya Public Procurement and Asset Disposal Act 2015)

This company _____*(name of company)* has issued, for the purposes of this tender, a Compliance Program copy attached -which includes all reasonable steps necessary to assure that the No-bribery commitment given in this statement will be complied with by its managers and employees, as well as by all third parties working with this company on the public sector projects or contract including agents, consultants, consortium partners, subcontractors and suppliers')"

Authorized Signature:_____

Name and Title of Signatory: _____

Name of Bidder: _____

Address: _____

NON-DEBARMENT STATEMENT

I/We/Messrs……

of .....Street/avenue, ...Building, P. O. Box……Code ...…, of ..... (Town),

.... (Nationality), Phone: ..... E-mail .....….

declare that I/We /Messrs ……

are not debarred from participating in public procurement by the Public Procurement Oversight Authority pursuant to section 115 of the Public Procurement and Disposal Act, 2005.

Dated this .....day of ..... 20.....

Authorized Signature.....Official Stamp .....

Name and Title of Signatory…….....

STATEMENT OF COMPLIANCE

a) I confirm compliance of all clauses of the General Conditions, General Specifications and Particular Specifications in this tender.

b) I confirm I have not made and will not make any payment to any person, who can be perceived as an inducement to win this tender.

Signed: ……for and on behalf of the Tenderer

Date: ……..

Official Rubber Stamp: ……

DETAILS OF LITIGATIONS OR ARBITRATION PROCEEDINGS
IN WHICH THE TENDERER IS INVOLVED AS ONE OF THE PARTIES

1. .
2. .
3. .
4. .
5. .
6. .
7. .
8. .
9. .
10 .

REPUBLIC OF KENYA

PUBLIC PROCUREMENT ADMINISTRATIVE REVIEW BOARD

APPLICATION NO…….OF…….….20……...

BETWEEN

…….APPLICANT

AND

……RESPONDENT *(Procuring Entity*)

Request for review of the decision of the…… (*Name of the Procuring Entity)* of ……dated the…day of ……..20…….in the matter of Tender No……..…of ……..20…

REQUEST FOR REVIEW

I/We……,the above named Applicant(s), of address: Physical address…….Fax No……Tel. No……..Email ……, hereby request the Public Procurement Administrative Review Board to review the whole/part of the above mentioned decision on the following grounds , namely:-

1.

2.

etc.

By this memorandum, the Applicant requests the Board for an order/orders that: -

1.

2.

etc

SIGNED …….(Applicant)

Dated on…….day of ……/…20…

FOR OFFICIAL USE ONLY

Lodged with the Secretary Public Procurement Administrative Review Board on …… day of ……...20….……

SIGNED
Board Secretary

EVALUATION CRITERIA

Technical Evaluation Form: The tenderer is expected to complete Part 1 and 3 of this form

Part A: General Information

Tenderer Name……..
Postal Address……...
Telephone (Office)……..Mobile……..
Physical Address……

Part B: Evaluation Stages

Stage 1: Mandatory Requirements

*Applicants **must** qualify in all the requirements below for them to proceed to the Evaluation Stage 2-Technical evaluation*

S/No	Mandatory requirement
1	Must provide National Construction Authority (NCA) Category 6 and above registration certificate under the category of Mechanical Installations. In the event of a joint venture, the certificate maybe submitted by any one of the members of the venture.
2	Must provide Copy of current annual contractors practicing license from National Construction Authority (NCA). In the event of a joint venture, the certificate will be submitted by the holder of the NCA registration certificate.
3	Solar PV Installations Sub-Contractors must have a current (Energy Regulatory Commission), ERC license as a Solar Water Heating Contractor. (provide Copy of current annual license)
4	Must provide Detailed Company profile.
5	Must provide certified copy of Certificate of Incorporation. If joint venture, ALL member of the venture shall submit their respective certificates.
6	Must attach proof of certified Company Ownership (CR12).
7	Must attach certified copy of Single Business Permit for the year 2020
8	Must provide valid Certificate of Tax Compliance from Kenya Revenue Authority; (certified copy). If joint venture, ALL member of the venture shall submit their respective certificates.
9	Must Dully fill, sign and stamp the Form of Tender.
10	Must attach Certified Audited financial reports prepared by registered Auditors for the last three consecutive years for the years ended 2017, 2018 and 2019.
11	Must Dully fill, sign and stamp the Confidential Business Questionnaire
12	Must Provide Dully filled, signed and stamped Non-Debarment Declaration Form.
13	Must Provide Dully signed and signed/stamped Litigation Declaration Form.)
14	Site visit/ pre-tender conference is mandatory (as indicated in the advertisement)
15	Must provide a bid bond of 2% of the tender amount from a commercial bank recognized by CBK and must be valid for 120 days from the date of tender closing.
16	Must provide Manufacturers letter of Authority for the specified equipment
17	Must dully fill sign and stamp the Anti-corruption declaration form
18	Must Provide proof of Power of attorney of Tender Signatory in the event of a joint

Stage 2: Technical Evaluation

Award of points for the Technical Evaluation shall be as shown in Table 1 below:

Item	Description	Points Scored	Max Points	Total Points
1.	Key Personnel (Attach evidence)			
	a) Project Engineer qualification • Holder of Degree ---------- 5 marks • Holder of Diploma ---------- 3marks • Holder of Certificate --------- 0 marks		5	25
	b) Project Engineer's experience • Over ten (10) year relevant experience -- 5 marks • Five (5) to ten (10) years relevant experience --------- 4 marks • Under five (5) years relevant experience ---- 2 marks • No experience ---------- 0 marks		5	
	c) Works Inspector Qualification • Holder of Degree in electrical engineering ---------- 5 marks • Holder of Diploma in electrical engineering ---------- 3 marks • Holder of Certificate in relevant engineering ---------- 1 mark • No Qualification ---------- 0 marks		5	
	d) Works Inspector's Experience • Over 10 years' relevant experience---------- 5 marks • Five (5) to ten (10) years' relevant experience ---------- 3 marks • Under 5 years' relevant experience ---------- 1 marks • No experience ----------0 marks		5	
	e) Experience of Site Technicians with minimum of certificate qualification in relevant Engineering field • Over 10 years' relevant experience ---------- 5 marks • Five (5) to ten (10) relevant experience -------- 3marks • Under 5 years' relevant experience ------ 1mark • No relevant experience ---------- 0 marks		5	
2.	Contracts completed in the last five (5) years; a max of 5 No. projects (Attach evidence in form of completion certificates or letters from		25	25

Item	Description	Points Scored	Max Points	Total Points
	clients/consultants.) • Project of similar nature, complexity and magnitude of equal or higher value. ---------- 5 marks each • Project of similar nature and complexity but of lower magnitude than the one in consideration ------ 3 marks each • No completed project of similar nature ---- 0 marks			
3	On-going projects (A max of 2 No. projects) (Attach evidence; Letters of Award/ Interim certificates/ Contracts) • Project of similar nature, complexity and magnitude ---------- 5 marks each • Project of similar nature, but of lower value than the one in consideration ---------- 2.5 marks each • No ongoing project of similar nature ---------- 0 marks		10	10
5.	Evidence of business physical address. (Offices/Workshops). Provide copies of ownership or lease agreement documents.		5	5
6.	Financial report Audited financial report (last three [3] years) - 2017-2019 • Average Annual Turnover equal or higher than to Kshs. 40.0 Million ---------- 15 Marks • Average Annual Turnover between Kshs. 20 Million and Kshs 39.9 Million ---------- 10 Marks • Average Annual Turnover between Kshs. 10 Million and Kshs 19.9 Million ---------- 5 Marks • Average Annual Turnover below Kshs 10 Million ---------- 0 Marks		15	15
7.	Evidence of financial resources (cash in hand, lines of credit, overdraft facility etc.) • Amount equivalent to or above 25% of submitted tender sum ---------- 20 Marks • Amount equivalent to 20% but below 25% of submitted tender sum ---------- 15 Marks • Amount equivalent to 15% but below 20% of submitted tender sum ---------- 10 Marks • Amount equivalent to 10% but below 15% of submitted tender sum ---------- 5 Marks		20	20

Item	Description	Points Scored	Max Points	Total Points
	• Amount below 10% of submitted tender sum -------- 0 Mark			
	TOTAL			100

Any tenderer who scores 70 points and above in this Technical Evaluation shall be considered for further evaluation.

Stage 3: Financial Evaluation

Only tenderer's who score 70% and above of the overall marks on the technical evaluation shall qualify for financial evaluation.

This will be carried out only for those tenders that have passed BOTH mandatory requirements and Technical evaluation. The client will;

1. Undertake price comparison and ranking of prices.
2. The prices shall be compared and checked for completeness including all local taxes.

Stage 4: Due Diligence and Recommendation for Award

Particulars of post – qualification if applicable. The Client may inspect the premises due diligence to seek further clarification/confirmation if necessary, to confirm authenticity/compliance of any condition of the tender/qualifications of the tenderer in line with Section 83 of the Public Procurement and Asset Disposal Act, 2015.

The tenderer shall not be awarded the Sub-Contract if they fail to pass the compliance test. The second lowest tenderer shall be considered for due diligence.

Award Criteria: The firm achieving the lowest evaluated price will be awarded the Sub-Contract in line with Section 86 of the Public Procurement and Disposal Act, 2015

Particulars of performance security; 10% of Sub-Contract sum.