LAIKIPIA UNIVERSITY
P. O. Box 1100 – 20300
NYAHURURU
KENYA
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dvcfd@laikipia.ac.ke

PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY

COMPLETION OF TUITION BLOCK B

TECHNICAL SPECIFICATION & BILLS OF QUANTITIES FOR PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

REFERENCE NO. 10295K- TDR –PD-TB- B-0001

Mechanical & Electrical Engineers

Howard Humphreys (EA) Ltd
The Address, Floor 13
Muthangari Drive, Off Waiyaki Way, Westlands
P O Box 30156 – 00100 GPO
NAIROBI

Civil/Structural Engineers

Multi Scope Consulting Engineers
Civil/Structural Engineers.
P. O. Box 12012-00100
NAIROBI

Architects

Clarion Architects
Architects, Planners & Interior Designers
Sharp Centre, Wambui Road
P.O. Box 79047, 00400
NAIROBI

Quantity Surveyors

Cost Care Consultants
Quantity Surveyors and Building Economists.
P. O. Box 75888-00200
NAIROBI

JUNE 2022

REVISION RECORD SHEET

This page is a record of all revisions, if any, made to the attached document. The revisions are listed under "Revisions/Changes". The revisions are part of the document and override the corresponding parts of the original Document.

Revisions/Changes:

Original Issue

Remarks: Issued For Tender

Client:	Laikipia University						
Project:	Proposed Upgrading of Facilities – Completion of Tuition Block B						
Project Title	Tender document for Plumbing, Drainage & Fire Protection Installations						
Doc. No.	10295-TDR-PD-TB-B-0001	**Rev:**	0	**Date:**	**Orig.**	**Check.**	**Appr.**
Attachments	Entire Document			JUNE 2022	SN	NKM	NKM
	Revised Pages Only						

Note: *This page and all its contents are NOT part of the document*

Section 1

Form of Tender & Conditions of Tendering

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES
COMPLETION OF TUITION BLOCK B

PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

CONTENTS

SECTION NO. 1

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES COMPLETION OF TUITION BLOCK B

PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

Supplied as part of the Contract for the Supply, Delivery, Installation and Commissioning of the Plumbing, Drainage & Fire Protection Installation works for the Proposed Upgrading of Facilities at Laikipia University – Completion of Tuition Block B

Issued by:

The Vice Chancellor,
Laikipia University
P O Box 1100-20300
Nyahururu

Prepared by:

Howard Humphreys (East Africa) Ltd
P O Box 30156, 00100
NAIROBI

The Contract for the above mentioned works entered into the .....day of .....20..... by the undersigned parties refers to this tender document.

....
SUB-CONTRACTOR **MAIN CONTRACTOR**

Date..... Date .....

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES COMPLETION OF TUITION BLOCK B

PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

CONDITIONS OF TENDERING

1.01 Each Tenderer must submit enclosed in a sealed envelope, a bona fide Tender on the Tender form provided.

1.02 Each Tenderer must submit the name of a Surety who shall be willing to be bound to the Main Contractor in the sum equal to ten per centum (10%) of the Contract Sum for the due performance of the Contract and must submit together with his Tender the form attached thereto duly filled in and signed by the proposed Surety agreeing to sign a Bond to that effect when and if called upon to do so.

1.03 The venue, time and date of the bid opening shall be as per the time and date stated in the Letter of Invitation to Bid.

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

1.05 Any Tender delivered after the above stipulated time, from whatever cause arising, will be disqualified.

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

1.07 Tenders shall remain valid for ninety (90) days from the final date for submission of Tenders stipulated in Paragraph 1.03 above, and no Tenderer may withdraw his tender within that period.

1.08 The Employer shall not be bound to accept the lowest or any Tender.

1.09 The Engineer shall notify the accepted approved Tenderer (if any) of such acceptance by letter within ninety (90) days during which by Paragraph 3.01 thereof, the Tender is to remain valid and the said Tenderer shall then within the time stated in the form of tender first execute the formal Contract Agreement and then on the same day his approved surety shall sign the Bond. The Engineer however, reserves the right to extend the period of executing the formal Contract Agreement if satisfied that adequate reasons exist for so doing.

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

1.11 The term Engineer wherever used in these Conditions and in all Contract Documents shall be such person or persons as may be duly authorised to represent them on their behalf by the Employer.

1.12 The term Sub-Contractor wherever used in these Conditions and in all Contract Documents shall be synonymous to the term Contractor.

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

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

1.15 If it is found on the examination of a Tender that there is any discrepancy between the Total Amount of the Tender and the amount arrived at by valuing the Priced BoQ at the rates or prices set against them by the Tenderer, then the figure shall be corrected arithmetically and the differences between the Tender and the corrected total shall be applied as a percentage adjustment or addition or omission on all the rates, so that the

original Tender Amount remains unaltered. When calculating the percentage adjustment, the total cost of the Preliminaries, Provisional and P.C Sums, Contingencies and any other items of a similar nature shall be excluded.

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

1.17 The tenderer is advised to complete the prequalification Forms A-D as part of the tender process. Failure to complete the forms will render the tender liable for disqualification.

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

FORM OF TENDER

To:
The Vice Chancellor,
Laikipia University
P O Box 1100-20300
Nyahururu

Sirs,

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES
COMPLETION OF TUITION BLOCK B
PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

1.01 We .....(Names) under and subject to the Conditions of Tendering annexed hereto, hereby Tender and offer to execute and perform the works and provisions and supply all labour and materials and everything of every kind respectively named, shown, described and alluded to in, or to be inferred from the Association of Building and Civil Engineering Contractors Form of Contract Agreement, the General Conditions of Contract, Specification and Schedule of Prices and Drawings to be executed and supplied on the part of the Contractor, for the Works above described for the Sum of:-

Kenya Shillings.....

.....

..... **(Kshs)** .....

1.02 We agree to phase the Contract work in accordance with the construction programme proposed in the scope of works and to be agreed with the Client at the time of letting the Contract.

1.03 We further agree to be bound by and submit to the said General Conditions of contract and Priced Specification Schedules which shall form a basis for valuation of interim Certificates and any extra or omitted work which may from time to time be ordered by the Engineer.

1.04 We submit the name of .....address .....as Surety who has signed the form attached and is willing to be bound to the Client in an amount equal to 10% of the contract amount for the due performance of the contract up to the date of completion of the Works as certified by you and who will when and if called upon sign a Bond to the effect without limitations on the same day as the Contract Agreement is signed but thereafter and in the event of the Surety named herein not being approved by you, the undersigned agree(s) to furnish within seven (7) days another Surety to your approval.

1.05 Whereas it is understood that you reserve to yourself the right to accept or to refuse this Tender whether it be lower or higher than any other Tender or of the same amount the undersigned agree(s) that this Tender shall remain valid and shall not be withdrawn within ninety (90) days from the final date for the submission of Tenders stipulated in the Conditions of Tendering.

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

Signature of Tenderer .....
Name of Tenderer .....
Date .....
Signature of Witness .....
Name of Witness .....
Date .....

NOTE: Tenderers are required to attach the Surety Undertaking, duly signed by the Surety, to this Form of Tender.

SURETY UNDERTAKING

To:

The Vice Chancellor,
Laikipia University
P O Box 1100-20300
Nyahururu

Sirs,

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES
COMPLETION OF TUITION BLOCK B

PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

We.....

(Surety) of..... (Address) are willing to act as Surety and to be bound to the Client for the above Project in the sum equal to Ten per centum (10%) of the Contract amount for the due performance by ..... (Tenderer) of

..... (Address)

a contract which he/they contemplate(s) entering into with the Client for the execution and completion of the above Works according to the terms of the Form of Bond appended to the Agreement Form and Conditions of Building Contract (With Quantities) of the current Form of Agreement and Schedule of Conditions of Building Contract published by the Architectural Association of Kenya a copy of which has been inspected by us without the addition of any limitations.

We further agree that this Surety Undertaking shall remain valid for ninety (90) days or such extended time as agreed upon in writing by the Tenderer, from the final date of submission of the Tender of which this Document forms part.

We agree to enter into a Bond under the above terms within seven (7) days of being called upon to do so.

Signature ..... Date. .....

Designation .....

On Behalf of .....

Address .....

Signature of Contractor .....

Name of Contractor .....

Address .....

.....

Signature of Witness .....

Name of Witness .....

Address .....

.....

Date .....

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

To:

The Vice Chancellor,
Laikipia University
P O Box 1100-20300
Nyahururu

Sirs,

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES
COMPLETION OF TUITION BLOCK B
PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

In connection with the attached Tender for the above sub-contract, we have made full enquiries with manufacturers and/or distributors of the relevant materials and plant required to be incorporated or used in the Works and we hereby declare that we will have available:-

(a) * All the necessary
or
(b) *A proportion of the necessary materials, plant, tools and equipment, supervision and skilled labour

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

Signature of Tenderer .....

Name of Tenderer .....

Address .....

.....

Date .....

NOTES

1. * Delete whichever is not applicable

2. The Tenderer may be required before approval

   (a) To disclose the
   (i) Actual quantities of the various materials
   (ii) Plant available for immediate use
   (iii) Supervision
   (iv) Skilled labour

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

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

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES
COMPLETION OF TUITION BLOCK B

PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

FORM A: CONFIDENTIAL BUSINESS QUESTIONNAIRE

The tenderer is requested to give the particulars indicated in Part 1 and either Part 2 (a), 2 (b) or 2(c) and (2d) whichever applies to their type of business.

The tenderer is 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……..

NCA Registration Category and Class (attach copy of current certificate) ……..……

Maximum value of business which you can handle at any time:
Kenya Shillings……

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.	……	…….	……	……
4.	……	…….	……	……

Part 2(c) – Registered Company

Private or Public ……

State the nominal and issued capita 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.	……..	……	……..	……..

I certify that the above information is correct.

…….. ……..……. ……..……

Title Signature Date

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES
COMPLETION OF TUITION BLOCK B

PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

FORM B: KEY PERSONNEL

The tenderer is requested to give Qualifications and experience of key personnel proposed for administration and execution of the Contract.

The tenderer is advised that it is a serious offence to give false information on this Form.

POSITION	NAME	YEARS OF EXPERIENCE (GENERAL)	YEARS OF EXPERIENCE IN PROPOSED POSITION
1. 2. 3. 4. 5. 6. 7. 8. 9. 10.			

I certify that the above information is correct.

…….. ……..……. ……..……
Title Signature Date

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES
COMPLETION OF TUITION BLOCK B

PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

FORM C: PROJECTS COMPLETED IN THE LAST FIVE (5) YEARS

The tenderer is requested to give details of work performed on projects of a similar nature and volume over the last five years. The tenderer is advised that it is a serious offence to give false information on this Form.

PROJECT NAME	NAME OF CLIENT	TYPE OF WORK AND YEAR OF COMPLETION	VALUE OF CONTRACT (Kshs.)

I certify that the above works were successfully carried out and completed by ourselves.

……. ……. …….
Title Signature Date

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES
COMPLETION OF TUITION BLOCK B

PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

FORM D: SCHEDULE OF ON-GOING PROJECTS

The tenderer is requested to give details of on-going or committed projects, including expected completion date.

The tenderer is advised that it is a serious offence to give false information on this Form.

PROJECT NAME	NAME OF CLIENT	CONTRACT SUM	% COMPLETE	COMPLETION DATE

I certify that the above works are currently being carried out by ourselves.

……. ……..…… …….
Title Signature

Section 2

Preliminaries

SECTION 2 - PRELIMINARIES

CONTENTS

2.01 ABBREVIATIONS

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

"CM"	shall mean Cubic Metre
"SM'	shall mean Square Metre
"LM'	shall mean Linear Metre
"lbs"	shall mean Pounds Weight Avoirdupois
"K.G."	shall mean Kilogram
"NO"	shall mean Number
"PRS"	shall mean Pairs
"M.S."	shall mean Mild Steel
"B.S."	shall mean Current British Standard Specification published by the British Standard Institution, 2 Park Street, London W.1., England
"Do" or Ditto	shall mean the whole of the preceding description except as qualified in the description in which it occurs. Where it occurs in descriptions of succeeding items it shall mean the same as in the first description concerned. Where it occurs in brackets it shall mean the whole of the preceding description which is contained within the appropriate brackets. Where it is underlined it shall mean the whole of that part of the preceding description which is underlined.

Carried to collection Kshs. ----------

KShs

2.02 ALTERATIONS TO TEXT ETC.

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

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

2.03 DEFINITION OF TERMS

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

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

(ii) "NECESSARY, PROPER" ETC.

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

(iii) SINGULAR AND PLURAL

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

Carried to Collection KShs

2.03 DEFINITIONS OF TERMS (ctd) **KShs**

(iv) EMPLOYER
The Employer is Laikipia University of P.O. Box 1100-20300, Nyahururu, Kenya. The terms "Employer" and "Client" wherever used in any contract document shall be synonymous.

(v) THE PROJECT ARCHITECT
The term "the Architect" shall be deemed to mean Messrs, Clarion Architects P. O. Box 79047 – 00400, NAIROBI

(vi) ELECTRICAL/MECHANICAL ENGINEER
The term "The Engineer" shall be deemed to mean the firm of Messrs, Howard Humphreys East Africa, P O Box 30156, Nairobi, Kenya.

(vii) QUANTITY SURVEYOR

The term "The Quantity Surveyor" shall be deemed to mean the firm

of Messrs, CostCare ConsultantP.O Box 7588-0020

(viii) STRUCTURAL ENGINEER
The term "the Structural Engineer" shall be deemed to mean the firm of Messrs, Multiscope Consulting Engineers Ltd, P O Box 12012 -00100, Nairobi, Kenya.

(ix)MAIN CONTRACTOR
Shall mean the person or persons partnership, firm or company, whose tender for the Main Contract Works has been accepted, and who has or have signed the Main Contract and shall include his or their heirs, executors, administer, assignees, successors and duly appointed representatives.

(x)SUB CONTRACTOR
The term "Sub-Contractor" shall be deemed to mean the person or persons, partnership firm or company, whose tender for this work has been accepted, and who has to have signed this Sub-Contract and shall include his or their heirs, etc. as described above.

Carried to Collection Kshs.

2.04 DRAWINGS **KSHS**

The drawings used in the preparation of these Bills of Quantities are scheduled on section 6 hereof and are deemed to be Sub-Contract Drawings

2.05 SITE

The site of the proposed work is at Laikipia University College approximately 20km from Nyahururu Town.

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

No claims will be allowed for traveling or other expenses which may be incurred by the Sub-Contractor in visiting the Site or preparing the Tender for the Works.

2.06 PRICING OF PRELIMINARIES AND BILLS OF QUANTITIES

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

2.07 FORM OF SUB-CONTRACT

(i) The successful tenderer will be appointed as a Nominated Sub-Contractor to the Main Contractor under the terms of the Conditions of Contract.

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

Carried to Collection Page KShs. ----------

2.07 FORM OF SUB-CONTRACT (Ctd) **KShs**

(iii) The Nominated Sub-Contractor will be required to enter into a written Sub-Contract Agreement with the Main Contractor on the latest edition of the Form of Agreement and Schedule of Conditions published by the Association of Building Construction and Engineering Contractors.

(iv) The Particular and General Preliminaries of the Bills of Quantities for the Main Contract where appropriate shall apply equally to the Sub-Contractor who is to examine these sections of the document and allow for all costs which he considers may arise from compliance with these Preliminaries

(v) Copies of the Main Contract Agreement, Conditions of Contract, Bills of Quantities for the Main Contract, Form of Bond, drawings and the General Specification are available for inspection at the offices of the Quantity Surveyors on any working day until the time appointed for the submission of Tenders. If the Tenderer considers that compliance with any of the Condition of Sub-Contract of which the heading are set out hereunder involves him in expense which is not included elsewhere in his prices he shall set down opposite any such condition the value he attaches thereto.

Conditions

1. Sub-Contract Sum
2. Notice of the Main Contract to the Sub-Contractor
3. Execution of the Sub-Contract Works
4. Sub-Contractor's liability under incorporated provisions of the Main Contract
5. Insurance against injury to person and property (see Page ..... Clause A)
6. Damage by Fire (Ditto)
7. Policies of Insurance (Ditto)
8. Variations, etc. (See Page ..... - Clause A)
9. Completion
10. Defects, shrinkage, etc. (See Page ..... Clause C)

Carried to Collection KShs. ----------

2.07 FORM OF SUB-CONTRACT (Ctd) **KShs**

Conditions (Ctd)

11. Sub-Contract Sum - Valuation of Variations
12. Certificate and Payments (See Page ..... Items B & C)
13. Interim Payments to the Sub-Contractor (Ditto)
14. Retention Money (See Page ..... Item A)
15. Dispute as to Certificate
16. Right to Sub-Contractor to suspend execution of Sub-Contract Works
17. Special Interim Payment
18. Final Payment to Sub-Contractor
19. Sub-Contractor's claim to rights and benefits under the Main Contract
20. Contractor's right to deduction or set off
21. Right of Access of Contractor and Engineer
22. Subletting of Sub-Contract Works
23. Provisions of Water etc. for Sub-Contract Works (See Page ....) Clause A (iv) Page ..... Clause B).
24. Temporary Workshops etc. (See Page ..... Clause B)
25. Sub-Contractor's use of scaffolding of Contractor (See Page ..... Clause A(ii).
26. Contractor and Sub-Contractor not to make wrongful use of or interference with the property of the other
27. Plant, tools etc., of Sub-Contractor
28. Determination of Sub-Contract by the Contractor
29. Wages and Conditions (See Page .... Clause A).
30. Bond (See Page ..... Clause A)
31. Fluctuations in Duties and Exchange Rates (See Page ..... Clause A).
32. Arbitration

Carried to Collection Kshs

2.08 PARTICULARS OF INSERTIONS TO BE MADE IN APPENDIX TO MAIN CONTRACT AGREEMENT

KShs

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

Clause 15, 16 & 30	Defects Liability	Six months from Practical Completion
Clause 21	Date of Possession	To be agreed
Clause 21	Date for Completion	As main contract
Clause 22	Liquidated and Ascertained Damages	Rate of 0.1% of Contract Sum per Week or part thereof
Clause 20 (3)	Percentage of Certified Value Retained	10%
Clause 30 (1)	Period of Interim Valuation	Monthly
Clause 30 (1)	Period of Honoring Certificates	30 days from the date of issue
Clause 30 (3)	Limit of Retention Fund	5 % of Contract Sum
Clause 30(5)	Period of Final Measurement and Valuation	Six Months
Clause 31	Amount of Surety	10% of the Contract Sum

2.09 COMPLETION PERIOD

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

Carried to Summary Kshs ----------

2.10 BOND & STAMP CHARGES **KShs**

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

2.11 LICENSING & SUBLETTING

The tenderers for this Sub-Contract must be fully licensed Contractors under the Ministry of Energy Requirements and must be currently registered as approved Contractors with the Contract and Quantities Branch of the Ministry of Works and Housing. No sub-letting or assignment by non-registered firms will be authorised by the Engineer.

2.12 PROGRAMME

All Sub-Contract works must be programmed and co-ordinated in conjunction with the Main Contractor and with the approval of the Engineer. The successful tenderer will be required to submit a co-ordinated Phased Programme within two (2) weeks of the acceptance of his tender to the Main Contractor and to the Engineer for their approval.

2.13 HEALTH AND SAFETY OF THE WORKS

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

Carried to Collection Kshs ----------

2.14 ATTENDANCE BY MAIN CONTRACTOR KShs

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

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

Allowing the use of standing scaffolding, retention of all scaffolding until such time as all relevant Sub-Contractors' works are complete and removal of all scaffolding on completion. Providing space for office accommodation, and for storage of plant and materials; allowing use of sanitary accommodation; the supply of all necessary water, and lighting: and clearing away all rubbish with reasonable assistance from the Nominated Sub-Contractor.

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

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

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

Carried to Collection Kshs.

2.15 PAYMENTS **KShs**

The nominated Sub-Contractor will be entitled to payment from time to time for materials and/or any work carried out under this Sub-Contract, the value of which shall be determined by the Engineer.

2.16 MATERIALS ON SITE

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

Carried to Collection Kshs.

2.17 RETENTION **KShs**

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

2.18 LIQUIDATED & ASCERTAINED DAMAGES

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

2.19 DEFECTS

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

Carried to Collection Kshs ----------

2.20 PURCHASE OF BUILDING MATERIALS IN ADVANCE **KShs**

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

The Client/Employer may as well provide existing materials or procure some materials for fixing by the contractor as indicated in of the Bills of quantities.

2.21 SITE MEETINGS

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

2.22 DAMAGE TO MAIN CONTRACT WORKS, ETC.

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

2.23 SECURITY

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

Carried to Collection **Kshs.** ----------

2.24 "OUT OF BOUNDS" AREAS KShs

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

2.25 WORKING AND STORAGE SPACE

The Sub-Contractor shall provide at his own risk and cost safe storage and custody of materials for the Works. The Sub-Contractor shall be liable for the cost of any storage accommodation provided especially for his use by the Main Contractor. Working and storage space for the Sub-Contractor's materials plant and workmen will be allotted by the Main Contractor within the limits of the area made available to him for this purpose. All activities pertaining to the works will be confined as far as is possible to the specified area or areas. No such activities will be carried out outside the area(s) without the specific authority of the Engineer. If the allotted area is located within an existing building, the Sub-Contractor will be required to erect temporary barricades to the approval of the Engineer and clear them away when no longer required. The Sub-Contractor's attention is drawn to the restricted nature of the site and the limited area available for working and storage. He must therefore make his own arrangements for any additional working or storage space required and obtain the necessary consent, pay all charges or rentals in connection therewith and all else required. No materials shall be stored or stacked on suspended slabs without prior approval of the Engineer.

Carried to Collection Kshs.

2.26 GOVERNMENT ACTS REGARDING WORK, PEOPLE, ETC.

KShs

Allow for complying with all Government Acts, Orders and Regulations in connection with the employment of labour and other matters related to the execution of the works. In particular the Sub-Contractor's attention is drawn to the provisions of the Factory Act 1950, and his tender must include for all costs assigning or resulting from compliance with any Act, Order or Regulation relating to Insurances, Pensions and Holidays for workpeople or to the safety, health or welfare of work people. The Sub-Contractor must make himself fully acquainted with current Acts and Regulations, including Police Regulations regarding the movement, housing, security and control of labour camps, passes for transport, etc. It is most essential that the Contractor, before tendering, shall obtain all such regulations and/or restrictions which may affect the organisation of the woks, supply and control of labour, etc. and allow accordingly in his tender. No claim in respect of particular attention is drawn to the Rules published in Legal Notice 179, dated 2nd June 1979. (Building operations and Works of Engineering Construction)

2.27 SAMPLES

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

Carried to Collection KShs. _____

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2.28 INSURANCE **KShs**

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

2.29 METHOD OF MEASUREMENT

These Bills of Quantities have been prepared in accordance with The Principles of Measurement (International) for Works of Construction, unless otherwise expressly stated.

2.30 MANUFACTURERS' OR PROPRIETERY NAMES

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

Carried to Collection Kshs.

KShs

2.31 CLAIMS FOR EXTRAS

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

2.32 PRIME COST AND PROVISIONAL SUMS

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

2.33 LABOUR CAMPS

The Sub-Contractor will NOT be permitted to house labour on the site and must make his own arrangements to house his labour elsewhere and for transportation where necessary. Cooking and eating facilities for workers will not be permitted on the site without the written authority of the Engineer.

2.34 WORKING AND RECORD DRAWINGS

The Sub-Contractor shall prepare all necessary sets of schematic diagrams, working drawings, etc. required by the Engineer and shall also prepare ALL Records/As Built Drawings in AutoCad R200 format and provide 3 sets of instruction charts and Operation and maintenance manuals, etc. all as specified in the attached General Specification.

Carried to Collection KShs _____

2.35 FIRM PRICE SUB-CONTRACT

KShs

This is a Firm Price Contract and the Sub-Contractor must allow in his tender for any increase in cost of labour and/or materials during the currency of the Sub-Contract. No claim for increased costs will be entertained whatsoever.

2.36 WATER AND ELECTRICITY FOR THE WORKS

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

2.37 PROVISIONAL WORK

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

Carried to Collection KShs

KShs

2.38 CASING UP AND PROTECTING

The Sub-Contractor shall be responsible for casing up or otherwise protecting to the satisfaction of the Engineer all parts of the Sub-Contract Works liable to damage and for removing such protection and making good at completion.

2.39 WORKS TO BE DELIVERED UP CLEAN

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

Carried to Collection	KShs	

2.40 ADDITIONAL ITEMS

Any additional item(s) which the Tenderer may wish to price separately and which he considers have not been included in the foregoing Conditions, Specification and or Bills of Quantities.	
Description	**KShs**
Carried to Collection KShs	

PRELIMINARIES

COLLECTION

	KSHS
Brought Forward from Page No.2-1	
Brought Forward from Page No. 2-2	
Brought Forward from Page No. 2-3	
Brought Forward from Page No. 2-4	
Brought Forward from Page No. 2-5	
Brought Forward from Page No. 2-6	
Brought Forward from Page No. 2-7	
Brought Forward from Page No. 2-8	
Brought Forward from Page No. 2-9	
Brought Forward from Page No. 2-10	
Brought Forward from Page No. 2-11	
Brought Forward from Page No. 2-12	
Brought Forward from Page No. 2-13	
Brought Forward from Page No. 2-14	
Brought Forward from Page No. 2-15	
Brought Forward from Page No. 2-16	
Brought Forward from Page No. 2-17	
Brought Forward from Page No. 2-18	
Brought Forward from Page No. 2-19 (Additional Items)	
Total for Preliminaries Carried to Main Summary KShs.	

Section 3

General Requirements

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES

COMPLETION OF TUITION BLOCK B

PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

GENERAL REQUIREMENTS

1.1 DESCRIPTION OF THE MAIN CONTRACT WORKS

The project entails the completion of construction works to Tuition Block B at Laikipia University. Architectural drawings of the development may be inspected at the offices of the Engineer or Architect provided this is done by appointment.

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

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

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

This section of the contract relates to Plumbing, Drainage & Fire Protection Installations.

2 SCOPE OF THE WORKS

The works to be carried out under this section of the contract shall include the following principal items. These items, together with other contract requirements, have been further expanded under later sections of the Specification.

- Water supply & storage;
- Plumbing & Drainage Installations;
- Sanitaryware Installations;
- Fire protection installations;
- Associated electrical and control systems;
- All other items as may be necessary and required to complete fully the mechanical installations.

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

3. EXTENT OF SUB-CONTRACT

The sub-contractor shall include, in addition to all items scheduled above, for the design, manufacture, inspection and testing, packing for shipment, insurance, shipping, customs, dues, duties, taxes, delivery to site, unloading and all other charges, complete erection, tests on completion, setting to work, finishing, painting and maintenance for a period of twelve calendar months, all to the satisfaction of the Architect and the Engineer, of the items of Plant and Equipment described or implied within this Specification and shown on the relevant Drawings.

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

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

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

4 SUB-CONTRACT PERIOD AND PROGRAMME

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

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

5 DRAWINGS ACCOMPANYING THE TENDER DOCUMENTS

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

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

Details shown on Drawings shall be read in conjunction with items in the Specification.

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

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

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

6 SUB-CONTRACT WORKING DRAWINGS

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

When Drawings have been approved two further copies shall be forwarded to the Engineer, together with copies to the Architect, site and the Employer.

Drawings, and, where relevant, calculations in respect of the following shall be prepared by the sub-contractor and submitted to the Engineer for his approval commencing within ten (10) days from acceptance of the tender.

(a) Details of the pipework runs;
(b) Schematic arrangement details of indoor air conditioning units, outdoor units, fans, pipework etc;
(c) Services ducts, support, fixings and hangers;
(d) General arrangements details of equipment and pipework etc
(e) Details of plant layout;
(f) Details of all plant, incl. motors, couplings, etc;
(g) Controls, control panel details and wiring diagrams;
(h) Fan performance curves;
(i) Layouts of all pipework, chases, holes, trenches and all other services throughout the whole of the building.

All drawings shall be to scale and fully detailed and all-important dimensions shall be given and the material of which each part is to be constructed shall be indicated.

During progress of the building works, the sub-contractor shall make all necessary checks on site to make certain the various Services can be installed as specified and shown on the approved Drawings.

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

The Engineer, in conjunction with the Architect and the Employer, will check and return the Drawings submitted for approval within a reasonable period, not exceeding fourteen (14) days from receipt.

The layouts of plant and equipment are for general guidance only. The sub-contractor shall assess the requirements immediately and prepare a plant layout for approval, the required liaison being maintained with other specialists, sub-contractors and main contractor such that an agreed layout is submitted for approval.

7 RECORD DRAWINGS

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

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

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

8 MAINTENANCE MANUALS

At the start of the defects liability period, the sub-contractor shall hand over to the Architect/Engineer four full sets of maintenance and operations manuals for the plant and equipment as installed. These manuals shall be fully illustrated and written in English.

9 BUILDER'S WORK AND CIVIL WORKS

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

It is the sub-contractor's sole responsibility to ensure that all holes and chases etc are in the required position and that any additional ducts, holes and chases necessary for the erection of the installations in situ concrete walls, floor slabs etc., are included in the early stages of construction as appropriate.

The sub-contractor shall furnish the Architect, the Engineer and the Main Contractor with all information as to where foundations, brackets and fixings are required and shall ensure that such work is done in accordance with such information.

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

The sub-contractor is to set out at the earliest opportunity the position of all holes necessary for the passage of ducts, pipe-work and conduits or otherwise required in connection with his work, and should additional holes or openings be required due to failure of the sub-contractor to fulfil the conditions of this clause, then he must arrange for the main Contractor to make such openings, etc at his own expense.

The sub-contractor is not to arrange for the cutting of any holes or openings unless specifically authorised to do so and should he do so without approval, he will become liable for any damage to the building or fittings.

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

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

10 GUARANTEE

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

11 SETTING TO WORK

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

The sub-contractor shall ensure that the Services Installations are left in complete safe working order and operating to the satisfaction of the Architect and the Engineer.

12 REGULATIONS AND STANDARDS

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

Electrical Services

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

Mechanical Installations

(i) The Kenya Bureau of Standards;
(ii) Relevant British Standard Specifications and Codes of Practice published by the British Standard Institution (hereinafter referred to as B.S. and C.P. respectively);
(iii) Regulations of the Government of Kenya;
(iv) Water Supply and Sewerage Authorities Regulations;
(v) Any other duly constituted authorities regulations having jurisdiction over the works;
(vi) The Specification and accompanying documentation and Drawings;

(vii) The Working Drawings, produced by the sub-contractor and approved by the Architect/Engineer;

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

13 QUALITY OF MATERIALS

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

Uniformity of type and manufacture of fittings or accessories is to be preserved as far as practicable throughout the whole work.

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

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

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

14 WORKMANSHIP

The sub-contractor shall take into consideration, when pricing his tender, that there will be other sub-contractors working. Any disruptions to the existing services must therefore be kept to an absolute minimum, and in this respect the sub-contractor shall include in his prices for carrying out works outside normal operating hours as may be directed by the Architect or the Engineer. No claim will be entertained where abnormal working hours are required to meet this requirement and completion of the works within the specified contract period.

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

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

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

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

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

Where ductwork is to be concealed, the pipes etc shall be in an exact position relative to the finished plaster or such other finishes as may be applied to enable adequate cover to be applied.
Where services are run above the false ceilings the sub-contractor shall ensure that access to all services is readily available such that future maintenance can be carried out without difficulty. Full details shall be included on the Working Drawings such that the Architect and the Engineer can give consideration to the sub-contractor's proposals.

15 LAYING OUT OF WORK

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

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

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

16 ERECTION AND CHECKING OF WORK

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

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

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

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

17 PERFORMANCE AND ACCEPTANCE TESTS ON SITE

The sub-contractor shall give to the Engineer, in writing, at least five days notice of the date after which he will be ready to make the specified tests on completion of installation. Unless otherwise agreed the tests shall take place within seven days after the said date on such day or days as the Engineer shall in writing notify the sub-contractor. The tests shall be carried out under normal working conditions to the satisfaction of the Engineer and shall extend over such continuous periods as he may direct.

All skilled labour, supervision, apparatus, fuel for tests and instruments required for carrying out the tests efficiently will be the responsibility and at the expense of the sub-contractor. The accuracy of the instruments shall be demonstrated if required.

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

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

18 TEST RECORDS

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

The mechanical services will be deemed to be complete when the following obligations have been fulfilled by the sub-contractor:

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

(b) Test records and reports have been received;

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

(d) The issue of an acceptance certificate by the relevant arm of Kenya Government for all works associated with the Plumbing, Drainage & Fire Protection Installations as may be necessary and required;

(e) The issue of an acceptance certificate from the relevant insurance company for the Plumbing, Drainage & Fire Protection Installations.

19 DUST, INSECT AND VERMIN PROOFING

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

20 PAINTING AND FINISHING

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

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

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

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

21 LABELS

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

Identification labels shall be of laminated plastic material engraved, black on white, with no less than 6mm "Lino" style letters and shall be fixed on or adjacent to all items by means of at least two brass screws or to approval.

All main switches, circuit breakers, isolators, valves, motors, switch-fuse, consumer's service units, and distribution boards etc shall be neatly and clearly labelled externally with identification marks corresponding with those on Drawings or in Specifications. Final details shall be agreed.

All labels/plates shall be in English.

22 SPARE PARTS AND SPECIAL TOOLS

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

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

23 SPECIALIST MANUFACTURERS AND SUB-CONTRACTORS

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

The Tenderer shall, on submission of his Tender, indicate the names of all proposed specialist manufacturers and contractors, together with the precise sections of the Works for which each will be responsible. The sub-contractor may be required to seek alternative manufacturers or contractors or to accept specialists nominated by the Employer, it shall be deemed that the prices entered include for this requirement.

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

24 USE OF SITE

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

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

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

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

25 POSSESSION OF SITE

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

26 INTERFERENCE WITH THE WORKS

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

27 WATER AND POWER FOR USE ON THE WORKS

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

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

28 TELEPHONE AND COMMUNICATIONS

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

29 SITE OFFICES, WORKSHOP AND STORAGE

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

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

30 SANITATION OF THE WORKS

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

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

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

31 PROTECTION OF WORKS

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

32 SUNDRIES

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

33 MAINTENANCE CONTRACT

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

34 DELETION OF ITEMS FROM CONTRACT

Where Provisional Sum items have been identified within the Bills of Quantities these may be expended in whole, in part or may be totally deleted from the sub-contract works. In addition, certain items that have been designed, specified and included within the Bills of Quantities may finally be deleted from the sub-contract, as the Employer has not finally decided whether they are to be provided.

It shall be deemed that the tender price entered by the sub-contractor has taken into account the possible deletion of these items, and Provisional Sum items, as no claims for loss of profit or any other such claim will be entertained.

35 AMBIENT CONDITIONS

The altitude of the site is approximately 2300 metres above sea level.

The maximum temperature is 28ºC while the minimum temperature is 9ºC. Relative humidity ranges between 47% - 97%.

36 SCHEDULES OF TECHNICAL DATA

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

37 COPIES OF ORDERS

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

38 INSPECTION AND TESTS AT MANUFACTURER'S WORKS

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

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

Section 4

General Mechanical Specifications

SECTION 4: GENERAL MECHANICAL SPECIFICATION

SECTION 4: GENERAL MECHANICAL SPECIFICATION

1. General

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

2. Quality of Materials

All plant, equipment and materials supplied as part of the 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 Contractor shall be products of reputable manufacturers and so far as the provisions of the Specification is concerned shall be as if they had been manufactured by the Contractor.

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

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

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

3. Regulations and Standards

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

a) The Kenya Government Regulations.

b) The United Kingdom Institution of Electrical Engineers (IEE) Regulations for the Electrical Equipment of Buildings.

c) The United Kingdom Chartered Institute of Building Services Engineers (CIBSE) Guides.

d) British Standard and Codes of Practice as published by the British Standards Institution (BSI)

e) The Local Council By-laws.

f) The Electricity Supply Authority By-laws.

g) Local Authority By-laws.

h) The Kenya Building Code Regulations.

i) The Kenya Bureau of Standards

4. Electrical Requirements

Plant and equipment supplied under this 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 shall be provided and installed under the Electrical Works. All other wiring and connections to equipment shall form part of this section of the works.

The 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 (KPLC) By-laws.

All electrical plant and equipment supplied by the Contractor shall be rated for the supply voltage and frequency obtained in Kenya, that is 415 Volts, 50Hz, 3-Phase or 240Volts, 50Hz, 1-phase.

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

5. Transport and Storage

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

On arrival at 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 Contractor to ensure that plant and equipment do not suffer any deterioration during storage.

Prior to installation all piping 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 Contractor shall replace this equipment at his cost.

6. Site Supervision

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

7. Installation

Installation of all special plant and equipment shall be carried out by the Contractor under adequate supervision from skilled staff provided by the plant and equipment manufacturer or his appointed agent in accordance with the best standards of modern practice and to the relevant regulations and standards described under Clause 3 of this Section.

8. Testing

8.1 General

The Engineer reserves the right to inspect and test or witness all manufactured plant equipment and materials.

The right of the Engineer relating to the inspection, examination and testing of plant during manufacture shall be applicable to Insurance companies and inspection authorities so nominated by the Engineer.

The Contractor shall give two week's notice to the Engineer of his intention to carry out any inspection or tests and the Engineer or his representative shall be entitled to witness such tests and inspections.

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

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

The foregoing provisions relate to tests at manufacturer's works and as appropriate to those carried out at site.

8.2 Material Tests

All material for plant and equipment to be installed under this Contract shall be tested, unless otherwise directed, in accordance with the relevant BS Specification concerned.

For materials where no BS 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 of the materials concerned.

The 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 specially manufactured for the plant and equipment specified is used, then the Contractor shall submit satisfactory evidence to the Engineer that such materials conform to the requirements stated herein in which case tests of material may be partially or completely waived.

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

8.3 Manufactured Plant and Equipment – Work Tests

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

Clause 8.1 shall apply where appropriate.

8.4 Pressure Testing

All pipework installations shall be pressure tested in accordance with the requirements of the various sections of this Specification.

The installations 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 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 Contractor and the specified tests shall then be applied.

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

9. Colour Coding

Unless stated otherwise in the Particular Specification all pipework shall be colour coded in accordance with the latest edition of BS 1710 and to the approval of the Engineer or Architect.

10. Welding

All welding unless stated otherwise shall be arc welding.

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

Welding codes and symbols shall be to BS 499.

For arc welding, welding, welders, welding processes procedures etc. shall be to BS EN 287 & BS EN 288. Materials for welding shall be grouped as per (published document of the BSI) PD CR 15608. Arc welded joints in steel shall comply with the guidelines in BS EN ISO 25817.

Welders where prior approval shall not be required shall comply with BS 4872.

Generally all welding shall comply with the requirements of BS EN 1011.

10.1 Welder's Qualifications

Any welder employed on this Contract shall have passed the trade tests as laid down by the Government of Kenya.

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

Section 5

General Specifications for Plumbing & Drainage

SECTION 5: GENERAL SPECIFICATIONS FOR PLUMBING AND DRAINAGE

GENERAL SPECIFICATIONS FOR PLUMBING AND DRAINAGE

1.0 MATERIALS AND STANDARDS

1.1 General

This section specifies the general requirements for plumbing and drainage forming part of the Contract Works and shall apply except where specifically stated elsewhere in the specification or on the contract Drawings.

Where the standard specified has been withdrawn, superseded or made obsolete, the standard replacing it shall prevail.

Pipework and Fittings

Pipework materials to be used are as follows: -

1.2 Cold Water Mains

Galvanized steel medium or heavy grade, or Chlorinated Polyvinyl Chloride (CPVC) as specified on the drawings.

1.3 Black Steel Pipework

All black steel pipework up to 65mm nominal bore shall be manufactured in accordance with BS 1387 Medium Grade, with tempered place threads in accordance with BS 21. All fittings shall be malleable iron and manufactured in accordance with BS 143.

Pipe joints shall be screwed and socketed and sufficient coupling 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 pipeworks, 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 union and coupling for the joint of pipes to valves other items of plant.

All flanges shall comply with the requirements of BS 10 and to the relevant classification.

1.4 Galvanized Steel Pipework

Galvanized Steel pipework shall be manufactured to comply in all respects with the standards described for black Steel pipework in paragraph 1.3 above.

Galvanizing shall be carried out in accordance with the requirements of BS 1387 and BS 143 respectively.

1.5 Copper Tubing

All copper tubing shall be manufactured in accordance with BS EN 1057:1996.

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

Short copper connection tubes between galvanized 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 connection in any way than the use of copper tubing, then a brass straight connector shall be positioned between the galvanized pipe and the copper tube in order to prevent direct contact.

1.6 Cast Iron Pipework

a) Internal Services

Cast Iron pipework and fittings for use above ground in connection with internal building services, shall be manufactured with spigot and socket joints of the weight required by the local authority and shall fully comply with the requirements of BS 416.

All joints on Cast Iron spigot and socket pipes shall be made with an approved cold caulking compound and so installed as to allow for any expansion or contraction, which may take place.

All Cast Iron pipe work, branches, tees bends and other fittings shall be supplied complete with inspection covers for cleaning purposes. These inspection covers shall be included as parts of the fittings and shall comply with requirements of BS 416.

b) External Services

Cast iron pipe work, which is used in connection with buried external services, shall be manufactured, coated and tested in accordance with the requirements of BS 1211 or BS EN 545, BS EN 598 or BS EN 969 where BS 1211 is obsolete.

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

Joining on external cast iron pipes shall be carried out in accordance with one of the methods described in BS 8301 or BS EN 752 (Parts 1 to 4) where BS 8301 is obsolete, to the approval of the Engineer.

1.7 Pitch fibre Pipework

Pitch Fibre Pipework and fittings for use in connection with external drainage services shall be manufactured in accordance with the requirements of BS 2760. Pipes shall be connected by means of purpose tapered joints manufactured in accordance with the requirements of the notes contained under Appendix C of BS 2760.

Until such a time as the use of pitch impregnated fibre is covered by a code of practice, the jointing, laying and cutting of these pipes shall be carried out in accordance with the requirements of the notes contained under appendix C of BS 2760.

1.8 Concrete Pipe

Where concrete pipe and fittings are used in connection with the conveyance surface water of sewage under atmospheric pressure, they shall be manufactured in accordance with the requirements of BS 5911, except where otherwise stated.

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

1) Flexible rebated type (storm water drainage only)
2) Flexible spigot and socket type
3) Ordinary spigot and socket type

4) Ordinary rebated type (Storm water drainage only)

Joints (1) and (2) shall be sealed with suitable rubber gaskets manufactured in accordance with BS 7874:1998, BS EN 681 or BS EN 682:2002.

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

1.9 PVC (Hard) Pressure Pipes and Fittings

All PVC pipes and fittings shall be manufactured in accordance with BS 3505: 1986, BS EN 1452 (Parts 1 to 5) or the relevant Kenya Standard.

Jointing

The method of jointing to be employed shall be that of solvent welding, using the pipe and manufacturer's approved cement. Seal ring joint shall be introduced where it is necessary to accommodate thermal expansion.

Anchoring

The 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.

Pipe Bed

Pipes shall be uniformly laid on a 75mm thick bed, (sand or red soil) and must not be allowed to rest on the joint or on stones etc.

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 and at no time shall heavy rocks, stones or other objects be included in the balance of the backfill that might protrude the initial backfill layer and come into contact with the pipe.

Testing

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

1.10 Polypropylene Random Copolymer Pipe

Where specified, polypropylene Random pipes shall be installed.

Pipes shall be manufactured with materials to BS 4991:1974. Dimensions, test methods, pressure ratings and physical characteristics shall comply with BS 4991:1974. Pipework shall be installed in accordance with CP 312 and the manufacturer's instructions.

1.11 MuPVC Waste Systems

All pipes and fittings shall be manufactured in accordance with BS 5255: 1989 or the relevant Kenya Standard.

Pipe shall be supplied in plain-ended lengths.

Thickness

The Minimum acceptable wall thickness of pipe and fittings shall be as follows:

size(in)	Size (mm)	Pipe and Fittings Wall Thickness (mm)
1¼	32	1.8
1½	40	1.9
2	50	2.0

Jointing

The method of joining to be employed shall be that of solvent welding, using the pipe and manufacturer's approved cement. Seal rings joints shall be introduced where it is necessary to accommodate thermal expansion.

Anchoring

All bends, valves and hydrant tees etc, in the line of 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.

Workmanship

The installation method of jointing shall be solvent welding; and both jointing and fixing shall comply in all respect to the manufacturer's site-work instructions. The maximum intervals between pipe supports at 200c shall be as follows: -

Nominal size (in)	Nominal size (mm)	Horizontal (mm)	Vertical (mm)
1¼	32	500	1200
1½	40	500	1200
2	50	900	2000
3	80	900	2000
4	100	1000	2000
6	150	1000	2000

Pipes shall be fixed in straight runs and horizontal runs and shall be laid to gradients in conformity with BS EN 12056 and in any event not less than 18mm/m unless otherwise specified.

Pipes passing through wall or floor shall be sleeved to allow unrestricted movements.

The works shall be inspected and tested during installation at any stage in accordance with BS EN 12056. All work, which will be concealed, shall be tested before it is finally enclosed and verified by the Clerk of Works.

Pipe Bed

Pipes shall uniformly be laid on a 75mm thick bed, (Sand or red soil) and not be allowed to rest on the joint or on stones etc.

Supports to Fittings

In underground installation care shall be taken to ensure that heavy components such as valves are fully supported so that the pipeline carries no weight.

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 depth of 6" above the crown of the pipe. At no time shall heavy rocks, stones or other object be included in the balance of the backfill that might protrude the initial backfill and come into contact with the pipe.

Testing

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

1.12 A.B.S. Waste System

Where indicated on the Drawings and Schedules, the contractor shall supply and fix A.B.S. waste pipes and fittings.

The pipes, traps and fittings shall be in accordance with the relevant British Standards, including BS EN 274 (parts 1 to 3), and fixed generally in accordance with manufacturer's instructions and BS EN 12056 – 2:2000.

Jointing of pipes shall be carried out by means of solvent welding, the manufacturer's instructions and BS EN 12056 – 2:2000.

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 contractor shall provide purpose made supports, centres of which shall not exceed one metre.

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

1.13 PVC Soil System

The contractor shall supply and fix PVC soil pipes and fittings as indicated on the Drawings and Schedules.

Pipes and fittings shall be in accordance with relevant British Standards, including BS 4514 and fixed to the manufacturer's instructions and BS EN 12056 – 2:2000.

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

Connections to WC pans shall be effected by the use of a WC connector, gasket and cover, fixed to suit pan outlet.

Suitable supporting brackets and pipe clips shall be at maximum of meter centers.

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

1.14 uPVC Square Rainwater System pipe and Gutter

Gutter shall be as specified by the structural engineer.

Rainwater pipes shall be supplied in plain-ended lengths and shall comply with BS EN 12200.

The minimum acceptable wall thickness of rainwater pipes shall be 1.80mm.

Pipe support brackets must be adequate to screen expansion gaps.

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 BS EN ISO 306:1997.

The pipe and gutter shall be colour Grey, to BS 5252, 10.A. 07, black white or rustic

1.15 uP.V.C. Rainwater Fittings

All fittings shall be injection moulded and shall be compatible with pipe and gutters and shall conform to the BS 4576, BS EN 607 or the appropriate Kenya Standard.

All rain-pipes and fittings shall be Colour Grey to British Standard 5252, 12.A. 07 or black, white or rustic.

Brackets shall be to BS EN 1462.

Gutter connecting fittings shall have integrally moulded seal retaining cavities housing a rubber seal of hollow section.

The fitting shall incorporate a gutter-retaining clip.

Gutter shall be supplied in plain-ended lengths.

Rain water pipes shall be circular in section, 75mm nominal diameter complying in al respects to British Standard 4576 or the relevant Kenya Standard.

Rainwater pipes shall be supplied in plain-ended lengths. The minimum acceptable wall thickness of

rainwater pipes shall be 1.80mm

Pipe support brackets must be adequate to screen expansion gaps.

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 BS EN 306:1997.

The pipe and gutter shall be Colour Grey, to BS 5252, 10.A.07. black, white or rustic.

1.16 uPVC Underground Drainage System

(a) Pipes and fitting

The pipes and fittings shall comply in all respects to British Standard 4660 & BS EN 13598 - 1 :2003, BS EN 1401 – 1:1998 or the relevant Kenya Standards.

Pipes shall be supplied in plain-ended lengths.

The minimum acceptable wall thickness of pipe and fittings will be as follows:

110mm pipe	3.0mm	
160mm pipe	3.9mm	
110mm junction only	3.50mm socket	3.80mm body
All other fittings	3.20mm socket	3.40mm body
160mm all fittings	4.30mm socket	4.70mm body

The method of jointing to be employed shall be by lip seal socketted fittings. Jointing to other materials shall be made in the manner specified by the manufacturer.

The grade of UPVC used for the pipes shall have a minimum softening point of 82°C when tested by the 'Vicat' method 102D as described in British Standard BS EN ISO 306:1997, BS 2782-1:1997.

Holderbats shall be made of Mild Steel protected from corrosion by galvanizing or such coating for optimum fit. To fit pipe supports a special purpose made PVC packing piece may be used.

The base of soil and vent stack connection to the below ground drain shall be made with a bend of minimum centre lines radius of 250mm.

Minor changes of direction where permitted shall be made with a variable bend that has a constant effective length.

(b) Excavation of Trenches

The installation, method of joining shall confirm in all respects to the manufacturer's site work instruction.

Trenches shall be excavated to a sufficient depth to allow a 50mm minimum bed below the underside of the pipe. Trenches width shall be not less than the outlet diameter of the plus 300mm and not wider than necessary.

(c) Trench Invert

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 granular material as described below. High spots and rock shall be removed to allow full 50mm-bed depth.

(d) Pipe bed

The bed shall be composed of granular material to the specification called for below and shall cover the full trench width and length and boned to gradient.

(e) Laying and jointing

Pipes and fitting shall be laid true to gradient in straight lines and joined in accordance with manufacturer's instructions. All pegs used for alignment and other purposes must be removed after use and before side filling. All joints shall be watertight complying with BS 8301:1985, BS EN 752 (parts 1 to 4).

Pipe barrels shall be in continuous contact with the trench bed when laid.

(f) Side Filling

The side filling of pipes shall be composed of hard granular material, which shall be to the requirements below.

Side fillings must be placed equally on both sides of the pipe 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.

(g) 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 tramped. Above the 300mm level mechanical fillings and compaction 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.

(h) Granular Material for Bed and Side Fill

The material may be composed of crushed stone, clinker, quarry scalping, ballast, gravel, shingle or all-in aggregate to British Standard BS EN 12620:2002.

All material for bed and site fill shall be hard and granular passing 20mm sieve and shall contain not more than 5 per cent fines passing 3mm sieve.

The material shall have a compaction factor of 0.3 or less.

1.17 <u>Valves</u>

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 fitment shall be manufactured in accordance with the requirements of BS 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 requirements of BS 3464.

All gate valves required for fitting to buried water mains shall be of Cast Iron construction in accordance with the requirements of BS 5163.

All gate valves up to and including 65mm nominal bore shall be of Bronze construction in accordance with the requirements of BS 5154 and BS EN 12288:2003.

The pressure classification of all 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 BS 5154 and BS EN 12288:2003.

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 80mm nominal bore and above shall be of the swing check type of Cast Iron construction in accordance with the requirement of BS EN 12334:2001.

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

e) Float operated Valves

All float operated valves for use in connection with hot and cold water services shall be of the Portsmouth 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 bars maximum
(ii)	Medium pressure	-	7.72 bars maximum
(iii)	High pressure	-	12.62 bars maximum

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

(f) Manually Operated Mixing Valves

Mixing valves for shower fittings and other appliances being provided under the contractor Works shall be manufactured in accordance with the requirements of BS EN 1287:1999 from Bronze or other corrosion resistant materials.

1.18 Waste Fitment Traps

a) Standard and Deep Seal P & S Traps

Where standard or deep seal traps are specified they shall be manufactured in suitable non-ferrous materials in accordance with the full requirements of BS EN 274.

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 BS 1291.

b) Anti-Syphon Traps

Where anti-syphon traps are specified, these shall be similar or equal to the range of traps manufactured by Geberit Limited, New Hythe Business Park, Aylesford, Kent, England.

The trade name for traps manufactured by this company is 'Terrain'.

1.20 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 support shall be kept to a minimum and their design shall be such as to facilitate quick and secure fixings to metal, concrete, masonry or wood.

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

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

The contractor shall submit all his proposals for pipe supports to the Engineer for approval before any erection works commence.

b) Steel and Copper Pipes and Tubes

Pipe runs shall be secured by 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 spacing in metres for Steel and Copper pipe and tube is given in the following table for horizontal runs.

Size Nominal s Bore	Copper Tube To BS EN 1057:1996	Steel Tube To BS 1387
15mm	1.25m	2.0m
20mm	2.0m	2.5m
25mm	2.0m	2.5m
32mm	2.5m	3.0m
40mm	2.5m	3.0m
50mm	2.5m	3.0m
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 Spigot and Socket Jointed Pipes**

Cast Iron socketed pipes shall generally be supported at every socket joint by means of either Holderbats secured rigidly to the structure, or purpose made scrapes for attachments to rigid steel support brackets.

When Holderbats are used, they shall conform to the requirements of BS 416. Suitable anchors shall be provided at all changes of pipe directions, junctions and tees to counteract the effect of end thrust loads.

(d) **Concrete and Pitch Pipes**

These pipes shall not be used for above ground application.

(e) **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 working limits prescribed in the relevant BS specification.

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 contractor when arranging his piping shall ensure that no expansion movements are transmitted directly to connections and flanges on pumps or other items of plant.

The contractor shall supply flexible joints to prevent vibrations and other movements being transmitted from pumps to piping systems or vice versa.

1.20 Sanitary Appliances

All sanitary appliances supplied and installed as part of the contract works shall comply with the general requirements of BS 6465 and the particular requirements of the latest BS Specifications.

1.21 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 PVC except where they pass through the structure, where they shall be of mild steel. The sleeves shall have 6mm – 12mm clearances all around the pipe or for insulated pipework all around the installation. The sleeve will then be packed with slag wool or similar material.

2.0 Installation

2.1 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 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.

2.2 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 small stepladder, extension spindles with floor or wall pedestals shall be provided.

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

Full allowances shall be made for the expansion and contraction of pipework, precautions being taken to ensure that any force produced by the 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.

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 4.5 litres 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 system shall be installed in accordance with the best standard of modern practice as described in BS EN 12056 – 2:2000 to the approval of the Engineer.

The contractor shall be responsible for ensuring that all ground waste fittings are discharged to a gully trap before passing to the sewer via a manhole.

The contractor shall provide all necessary rodding and inspection facilities within the draining system in positions where easy accessibility is available.

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

The vent stacks shall terminate above roof level and where stack passes through roof, a weather skirt shall be provided. The 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 galvanized steel wire guard.

Access for rodding and testing shall be provided at the foot of each stack.

c) Sanitary Appliances

All sanitary appliances associated with the contract works shall be installed in accordance with the best standard of modern practice as described in BS 6465 to the approval of the Engineer.

2.3 Underground Installation

a) General

All underground water and drainage service installations shall be carried out in accordance with the best standard of modern practice as described in BS EN 752 and BS 6700 respectively and the following clause.

b) Sequence of Operation for Underground Service Installation

(i) Setting Out

As described in BS EN 752

(ii) Breaking Up Surface (If in Roads)

As described in BS EN 752

(iii) Excavation and Timbering

As described in BS EN 752 and 503 and the following:-

Excavation shall be made to such depths and dimensions as may be required by the Engineer to obtain prior falls and firm foundations. No permanent constructions shall be commenced on any bottom until the excavation has been examined and approved by the Engineer.

Should the Contractor in error or without the instructions of the Engineer make any excavation below the required level of the pipe or bed, as the case may be, then he shall be required to refill such excavation to

the correct levels with concrete 1: 4 : 8 to 38mm maximum aggregate size.

The Contractor's prices shall have included for excavating in all materials met with, for trimming bottoms to the necessary falls and for any extra excavation required for planking, strutting and working space.

The Contractor shall keep the whole of the trenches or other excavations free from water and shall execute such works and install such pumps as may be necessary to keep the excavation dry at all times.

No sub-soil water shall discharge into the sewage system without written permission of the Engineer.

(iv) Laying of Concrete Beds or other Supports for Pipes

As described in BS EN 752 and the following:-

All drains below buildings and roads shall be encased in concrete 150mm thick.

Concrete beds and supports shall be concrete 1:3:6 to 25mm maximum aggregate size.

(v) Pipe Laying and Jointing

Drain pipes shall be laid and jointed as described under BS EN 752.

Water pipes shall be laid and jointed as described under BS EN 752

(vi) Manholes

(a) General

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

All manholes shall be watertight and if constructed of brickwork, solid block work or stone work, 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 ought 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 surface with a coat of 1:1 cement mortar.

In all other respects, manhole shall be constructed in accordance with BS EN 752.

(b) Rectangular and Square Manholes

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

Depth below Ground of Outgoing Invert	internal Access shaft Dimension sL X W	Size of Main Shaft Diameter	Internal Chamber Dimension sL X W	Height of Chamber above Benching	Wall Thickness
Up to 740	-	100 to 150	610x460	-	150
Up to 740	-	230 to 460	760x760	-	150
Up to 1200	-	100 to 150	760x760	-	150
160 to 1200	-	230 to 460	910x910	-	150
1220 to 1800	-	100 to 150	910x910	-	150
1220 to 1800	-	230 to 460	1070x910	-	150
1830 to 4550	760x760	100 to 150	1370x910	1370	230
1830 to 4550	760x760	230 to 460	1370x1070	1370	230
4570 & Over	760x760	100 to 150	1370x1140	1680	230
4570 &Over	760x760	230 to 460	1370x1140	1680	230

When branches are connected into the manhole, the length and width dimension 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

230and 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 plug

160mm 460mm or the diameter of the main drain which ever is the greater

(d) Precast Concrete Circular Manholes

Where specified straight through precast concrete manholes shall be manufactured and constructed to comply with BS 5911 and the following dimensional requirements, (Dimension: Millimetres)

Depth Ground of Outgoing Invert	Internal Access Shaft Diameter	Size Main Channel Diameter	Chamber Diameter	Height Chamber Above Benching
Up to 740	-	100 to 460	910	-
760 to 2410	-	100 to 460	1070	-
2440 to 4550	-	100 to 460	1220	1370
4570 & over	760	100 to 460	1370	2680

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

(d) Steps Iron and Covers

Access shaft to manhole of depth greater than 760mm shall be provided with approved steps iron at suitable intervals. Every manhole or manhole access shaft shall be fitted with a removable airtight cast iron cover to adequate size and strength, fixed
in a manner that prevents surface water gaining into the system.

Cast manhole covers and frames shall be manufactured in accordance with the requirements of BS EN 124:1994 and shall generally be classified into the following categories:

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

(e) 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.

(f) 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.

(g) 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 the Specification.

(h) Concrete Bedding Hunching and Surround

Concrete 3 bedding, hunching and surrounding shall be provided as necessary or where called for by the Engineer in accordance with the requirements laid down in BS EN 752.

(i) Backfilling

Backfilling of trenches, headings and around manholes shall be carried out in accordance with the methods described in BS BS EN 752.

(j) Reinstatement of Surface

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 excavation have been carried out in public highways or other areas are not forming part of the site, the 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 concerned.

No Claims for extra in this respect will be accepted.

(k) Sewer Connection

Sewer contractor shall pay all charges associated with the connection by the local Authority of the drainage to the main sewer, including necessary reinstatements

3.0 Testing and Inspection

3.1 Site Tests – Pipework Systems

a) Above Ground Internal Water Services 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 half times to design working pressure.

If preferred, the contractor may test the pipelines in sections. Any such section found to be satisfactory need not be the subject of a further test when 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 contractor and the section re-tested.

The 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 contractor's expenses.

b) 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 used 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, to 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 Contractor shall provide suitable end supports to withstand the end thrust of the water pressure in the main.

c) Above Ground Soil Waste and Ventilation System

All soil, waste and ventilating pipe system forming part of the above ground installation, shall be given appropriate test procedures as described in BS EN 12056 – 2:2000.

Smoke tests on above ground soil, waste and ventilating pipe system shall not be permitted.

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

In all respects, tests shall comply with the requirements of BS EN 12056 – 2:2000.

d) Underground Drainage System

A site test shall be carried out on all drainage pipes before concrete hunching 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.

Water tests shall be carried out in accordance with the methods described under BS EN 752 and the test pressure shall not be less than 1,520mm head at the highest point in the pipe section and not more than 10,360 head at any point it 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 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 BS EN 752.

Testing of manholes shall be carried out in accordance with the methods described under BS EN 752.

(e) Above Ground Soil Waste and Ventilation System

All soil waste and ventilating pipe system forming part of the above ground installation, shall be given appropriate test procedures as described in BS 12056.

Smoke tests on above ground soil, waste and ventilation pipe system shall not be permitted.

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

In all other respects, testes shall comply with the requirements of BS 12056 –2:2000.

3.2 <u>Site Test – Performance</u>

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

All hot water pipework shall be installed with pre-formed 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 suitable filler until the canvas weave disappears and allow to dry.

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

All lagging for cold and hot water pipes erected in crawl ways, ducts and above false ceiling which, after erection are not visible from the corridors of rooms, shall be covered with a reinforced aluminium foil finish 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 standard of modern practice as described in CP 342 and BS 6700 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 of large 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 contractor shall be deemed to have included in his price for all test pumps, and other equipment required under this 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 BS specification designates a maximum test pressure.

4.0 Sterilization of Hot and Cold Water Systems

All underground and above ground water distribution systems cisterns, tanks, 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 contractor in accordance with the requirements of BS 6700:1997 and to the approval of the Engineer.

5.0 Water Mains

5.1 Piping

All piping shall be plain ended and suitable for use with flexible mechanical couplings (e.g. Viking Johnson, Dresser or Gibault). Steel pipes shall comply with BS 534 or BS EN 10224:2002. Galvanised steel pipes for distribution system shall comply with BS Galvanized steel pipes for distribution system shall comply with BS 1387-1967 medium tubes and be supplied with flanges on pipes 75mm diameter and over.

All pipes less than 75mm diameter shall be screwed and socketed, unless otherwise stated.

5.2 U.P.V.C Pipes

UPVC piping shall be in accordance with BS 3505: 1986.

The maximum sustained working pressure to which the pipes and fittings will be subjected is based on water at a temperature of 20°C.

The Contractor shall submit full details of the colour of the pipe he intends to supply. The Colour of the pipe shall be such as to meet the requirements of 'material' and 'opacity' in BS 3505 or BS EN 1452.

The pipes up to and including 50mm diameter shall be of solvent weld type. The pipe shall be supplied with interchangeable sockets pre-formed at the factory and of such internal diameter that it takes the plain and of the pipe with same nominal diameter.

The joints shall sustain the end thrust to which the pipe shall be submitted. The contractor shall supply sufficient quality of the cleaner and adhesive which shall be required to make the joints with the pipes.

The pipes of 75mm diameter and over shall consist of a grooved socket at one end of the pipe. The socket shall be designed to give a clearance fit on the outside diameter of the parent pipe. The sealing medium that shall seat in the groove shall be a rubber ring.

If the formation of the socket and groove results in the thinning of the original wall thickness of the pipe, it shall be compensated for by shrinking the outside of the socket area as by reinforcing sleeve of the same material as the pipe.

The socket and groove shall incorporate no sharp angles where the stress points are created.

The socket and groove shall incorporate no sharp angles where the stress points are created.

The joint shall take 10% deformation of the spigot at the point where the stress points where it enters the socket without leakage from the pipe when subjected to the test pressure specified for the pipe.

Thermal expansion of the pipe shall be accommodated in the joint. The joint shall be capable of lined deflection up to 30°C.

The sealing ring shall supply be of the first grade natural rubber and the physical properties of the mix shall meet the requirement of BS 7874:1998, BS EN 681 or BS EN 682.

The contractor shall supply sufficient quantity of any lubricant or other material that shall be needed to make the joint, which shall be assembled by hand.

The fittings shall have the same type of joint and or the pipes to be used. The contractor shall submit full lists of the materials, dimensions and test pressures of the fittings offered.

Precautions shall be taken to avoid damage of the pipes and fittings.

In handling and storing the pipes and fittings, every care shall be taken to avoid distortion, flattening, scoring or other damage. The pipes and fittings shall not be allowed to drop or strike objects. Pipe lifting and lowering shall be carried out by approved equipment only. Special care shall be taken in transit, handling and storage to avoid any damage to the ends.

All jointing of pipes and fittings shall be carried strictly in accordance with the manufacturer's instructions.

5.3 Manufacturer's Instructions

The contractor shall be responsible for obtaining copies of any manufacturer's instructions for pipe joining and shall familiarize himself and his employees with these instructions.

All necessary tools and equipment required for laying, jointing and testing of pipes and joints shall be provided by the contractor at no extra cost.

5.4 Fittings and Specials for Galvanized Steel Pipes

All specials shall be of such dimensions as will meet with piping supplied. Screw down stop valves shall comply with BS 1010. Specials shall comply with BS EN 10241:2000.

5.5 Flanged Adaptors and Flanges

Flanged adaptors shall be piece suitable for connecting a flanged sluice valve to the type of piping supplied. All flanged or special shall conform to BS 10 part 1 and shall be drill to Table 'C' and machined across the faces. The flanged adaptors shall comply with BS 78 and BS 3961. All PVC flanged shall be supplied with metal backing rings jointing of flanges shall be carried out using the joint rings, bolts and washers as necessary.

5.6 Tees

The spigot ends of all tees shall be suitable for connection to the pipework supplied using the aforementioned flexible mechanical joints and branches shall be flanges drilled to BS 10 table 'C'.

5.7 Hydrants

Hydrants shall comprise a 75mm sluice valve and a 75mm Duckfoot bend with gunmetal screw connection to detailed drawings. These specials shall comply with the requirements of BS 750.

5.8 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 requirements of BS 3464.

All gate valves required for fitting to buried water mains shall be of cast iron construction in accordance with the requirements of BS 5163.

All gate valves up to and including 65mm nominal bore shall be of bronze construction in accordance with the requirements of BS 5154:1991 and/or BS EN 12288:2003.

The pressure classification of all valves shall depend upon the pressure conditions pertaining to the site of works.

5.9 Air Valves

Air valves shall be of cast iron conforming to BS EN 1561:1997. They shall not be suitable for working pressure nor less than that specified for the class of pipe to which they are connected.

5.10 Ball Float Valves

Ball float valves shall be to BS 1212 parts 1 and 2 shall be suitable for working pressure not less than the working pressure for the class of pipe specified for connection to the ball float valve.

5.11 Non-Return Valves

Non-return valves shall be of cast iron with flanges and shall conform to BS EN 12334:2001.

5.12 Stop Cocks

Stopcock up to 50mm diameter shall be brass and shall conform to BS 1010.

5.13 Rubber and Insertion Jointing

Rubber and insertion jointing for flange jointed shall comply with BS 7874,:1998, BS EN 681, BS EN 682 and no jointing rings shall be used in the contract, which have not been supplied by manufacturers approved by the Engineer.

5.14 Bituminous paints

All bituminous or tar paints for protection of buried steel bolts, pipes specials etc. shall be the best of their respective kinds manufactured by approved makers.

5.15 Steel Pipe and Fittings for Rising Main

All piping shall be plain ended and suitable for use with flexible mechanical couplings (e.g. Viking Johnson, dresser). The grade of steel used shall comply with the requirements of BS EN 10216 – 1:2002, BS EN 10217 – 1:2002. Pipes shall be welded or seamless and shall conform to BS 534: 1990 and/or BS EN 10224:2002 or an equivalent acceptable standard.

All pipes shall be externally and internally protected with bitumen in accordance with BS 534: 1990 and/or BS EN 10224:2002.

The external protection shall be reinforced with oven glass, cloth glass , tissue wrapping or by other approved material.

The ends of all bitumen lined pipes, fittings and specials shall be closed by means of discs or other suitable covers firmly held in place.

5.16 Drain-Off Taps, Stops Valves for Water Services

Fittings for mains of size 50mm or under shall comply with BS 1010. Samples must be submitted to the Engineer for approval prior to installation of fittings.

5.17 Storage of Plants and Material

The contractor shall, at his own expenses, make arrangements for dumps along the route of the pipe line for a storage of pipes, his plant and materials to suit his own convenience, but such arrangements shall be subjected to the Engineer's approval.

5.18 Loading, Handling and Conveying of Pipes

The contractor shall before commencing to lay the pipes, valves or other materials examine them and ascertain that they are in perfectly sound condition and he shall be responsible for any laying. The stocking of pipes and specials on site, loading and unloading etc. shall be carried out to the satisfaction of the Engineer.

5.19 Interferences with Fences, Drains, Pipes, Property etc.

The contractor shall ensure the proper reinstatement of fences, drains, telephone lines, KP&LC. Cables etc where affected by his work. All service shall be adequately protected and propped to the satisfaction of the Engineer. The contractor shall be liable for any damage caused to the service due to his failure to provide adequate protection.

5.20 Method of Excavation

a) The Contractor shall excavate the pipe trenches in the line and to the depths indicated by the Engineer. Except where otherwise indicated on the Drawings or indicated by the Engineer, it is intended that the trench shall be excavated to such a depth as will allow of a minimum cover of 5000mm over top of the barrel of the pipe when laid plus or minus a tolerance of 75mm either way. All trenches shall be excavated in open cuttings.

b) Where the trenches passes through grassland, arable land or garden, whether enclosed or otherwise, the turf, if any shall be pared off and stalked, and the productive soil shall be carefully removed for a width of 600mm greater than the nominated trench width or equal to the overall width of track of the excavating machine, whichever is greater, and laid aside to be subsequently used in reinstating the surface of the ground after the trench has been refilled.

c) The bottom of the trench shall be property trimmed off, and all low places or irregularities shall be where rock or large stones are encountered, they shall be cut down to a depth of at least 75mm below the level at which the bottoms of the barrel of the pipes are to be laid, and covered to a like depth with materials, so as to form a fine and even bed for the pipe.

d) Joints holes shall be excavated to suit minimum dimension as to allow the joints to be well and properly jointed.

e) The pipe trench shall be kept clear of water at all times.

f) The contractor shall whenever necessary by means of timbering, or otherwise support the sides of the trench so as to make them thoroughly secure, and afford adequate support to adjoining roads, lands, buildings and property during the whole time the trench remains open and shall remove such timbering or other work shall be deemed to be included in the rate for excavation. Incase the Contractor is instructed by the Engineer to leave any portion of such timber in position, he will be paid for it accordingly.

g) The cleared width inside the timbering in the case of single pipes shall be at least 320mm in excess of the external diameter of the pipe be laid, in order to allow it to be freely lowered into position, in the trench without damage to the external protection.

h) Where more than one pipe is to be laid parallel, then the clear width inside the timbering shall be at least 520mm in excesses of the combined external diameters of the pipes.

i) Should the excavations be taken out to a greater depth than is specified the bottom shall be made good to the correct level with mix 1:3:6 concrete or other materials approved by the Engineer. No payment shall be made for any other excavation carried out by the contractor and the coat of filling up to required levels.

j) If a mechanical excavator is used by the contractor, he shall indemnify the employer against all claims for damages that in the opinion of the Engineer, may be caused by the use of this plant. When a mechanical excavator is used the bottom 230mm of excavation shall be got out by hand to ensure an even bed for the pipes.

5.21 Main Laying

Mains shall be laid in straight lines and/or smooth curves as indicated on the drawings. The vertical profile of the pipes shall be to even gradients. Any pipes not so laid shall be removed if so directed by the Engineer, and re-laid in proper manner at the contractor's expense.

In laying the pipes and specials, care shall be taken not to damage the protective linings and the pipes shall be handled with tackle as directed by the Engineer.

The pipes and specials shall be slug and sounded with hammer for flaws before they are lowered into trench. After the pipes or specials have been checked they shall be cleaned internally and carefully lowered into trench and set to proper gradient and line so that is a continuos rise from each washout to air valve.

5.22 Temporary Bench Marks and Sight Rails.

The contractor shall fix rails for use with boning rods at intervals of not more than 65 meters and temporary Bench mark related to the survey of Kenya Datum shall be provided at intervals as directed by the Engineer.

5.23 Curves and Bends

Large diameter curves of main shall wherever possible be formed by giving a set not exceeding 30 to each joint, bends being used only where large diameter curves are not possible.

5.24 Cutting of Pipes

The contractor shall, subject to approval of the Engineer, cut pipes to such lengths as directed. Pipes should be cut off clean and square while the axis cuts should be made with an approved cutter from rotary cutting machine, engineer may approve cutting by oxyacetylene cutters.

5.25 Flanged Joints

In laying pipes and specials with flanged joints, flanges shall be brought together and bolted with the faces absolutely parallel. A rubber jointing ring 3mm thick shall be used in each flange joint and one washer with each bolt. The ring shall be a strip ring lying within the bolt circle and full flange width ring.

The bolts shall be tightened up gradually and equally in customary manner in order to distribute the stress evenly over the flange.

5.26 Surface Boxes

Sluice valves, air valves and fire hydrants shall be covered with surface boxes in accordance with details as shown on the Drawings. In roads and footpaths the boxes shall be laid flush with the surface.

5.27 Fixing of Valves, Air Valves and Washouts Pipes

The contractor shall fix the sluice valves, air valves, washout pipes pipes complete with iron casing for spindles and surface boxes in accordance with and in position shown on the drawings. As far as possible the cutting of pipes for this should be avoided.

5.28 Support and Anchor Blocks

Concrete mix 1:3:6 shall be placed around and against bends and other specials in trenches.

5.29 Colour Coding

All underground pipes are to be wrapped with adhesive plastic tape at each meter in colours blue for drinking water and green for untreated water. All pipework above ground and valves in valve chambers and pits are to be painted in similar colours.

5.30 Lettering

The lettering for sluice valves, fire hydrants, air valve and washout abbreviated SV FH and WO respectively shall be in accordance with the detail shown on the Drawings colour as detailed hereafter: -

Untreated water:	White lettering on green background
Drinking water:	White on blue background
Fire Hydrant:	White lettering on yellow background

5.31 Testing

a) The test pressure shall be one and a half the maximum working pressure except where a pipe is manufactured from a material for which the relevant BS specification designates a maximum test pressure should not exceed 120,180 and 240 meters/head for clause B, C, or D pipes, respectively.

   The pump shall maintain the test pressure for about one hour and if there is any leakage it shall be measured by the quantity of water pumped into the main that time.

b) When a section of the mains has been jointed, the ends shall be closed with caps, plugs or flanges, which must be strongly strutted against a solid backfilled rammed as hereinafter and as shown on the Drawing, for it's whole length so as to cover the mains to a depth of not less than 500mm, except at the joint holes which shall be kept clear of all backfiring, if necessary by the

use of timbering, so that each joint is left fully exposed for inspection. No backfililng will be permitted before testing of each section.

As long a section of main as possible shall be tested at one time subject to the maximum length of open trench approved by Engineer or permitted by the Highway Authority, and the test shall be carried out within 12 working days of the completion of such sections of mains.

Where a main is laid across a road or in such a position as to interfere seriously with the normal use of the road, the contractor may, with the consent of the Engineer and at his own risk, fill in such joint holes as may be necessary.

He shall at his own expense, re-excavate any or all joint holes necessary to locate a leak and carry out repair work should the results of his hydraulic test prove unsatisfactory.

The section shall then be filled with mains water, great care being taken to drive out all air through air valves, ferrules or otherwise to the approval of the Engineer.

c) After the section to be tested has been charged and all air liberated it shall standing underrate moderate pressure for several days' final airing. The leakage from the mains and connections from each section tested shall not exceed 4 litres per 25mm diameter of main, per 2Km. Length each 24 hours, every 30 meters head of pressure, and any visible individual shall be repaired.

To determine the rate of leakage, the contractor shall furnish a suitable hydraulic test pump, pressure gauge, connection and water meter or other appliance, for measuring the amount of water pumped.

If the leakage were at a greater rate than that specified, the contractor should re-excavate the trench where necessary and shall remake the joints and replace defective work until the leakage shall be reduced to the allowable amount.

d) The employer shall charge the contractor the cost of any coupling required to join up tested lengths of main if, in the Engineer's opinion, greater lengths could reasonably have been tested or if failure under test requires the pipe to be cut, or other methods of laying should have been adopted.

The contractor shall supply water used by the contractor in testing the main.

The contractor shall carry out all work, which may be necessary for making temporary connections to the existing mains to obtain water for testing at his own expense.

e) In carrying out the test for water tightness only the Engineer shall authorize the operation of all valves, but the contractor shall provide all the necessary labour to assists in the opening and closing of the valves to the Engineer's instructions and he shall allow in his price for all his expenses in connection with testing on completion.

The Engineer shall be the sole judge of water tightness.

5.32 Cleansing and Sterilizing the Main

When a pipeline is complete and where applicable, has successfully passed the test it shall be thoroughly washed out using, if possible, an open end. Thereafter it shall be sterilized by being filled with a suitable solution containing not less than 20p.p.m. of free available chorine or such other Sterilizing agent as the Engineer shall approve. After standing for 24 hours the main shall again be washed out and refilled with mains water prior to the taking of Bacteriological samples.

The contractor shall provide all necessary stop-ends fittings and chemicals for this work.

Emptying and washing out of the pipes shall be done in such a manner as not to damage the trench or cause due flooding of vicinity, and the contractor shall supply and use such piping, specials and/or hose as may be necessary to facilitate the flow of water to the nearest drain or watercourse. Water used for washing out and sterilizing will be supplied by the employer.

Before any section of the mains is put into use, bacteriological samples will be taken by the Engineer's representatives and only on the receipt of a satisfactory certificate from the medical Research Laboratory of the Employer will the main or section of main be permitted to be put into supply and be considered as having been substantially completed.

Any expenditure involved in Providing facilities or materials for taking of samples shall be included in the contractor's tendered rates and Engineer will specify and shall be sole judge as to the number of sample required and points at which they are to be taken.

The cost of the Bacteriological Examination will be borne by the employer but if the sample and samples are not satisfactory the cost of any subsequent analyses will be borne by the contractor.

5.33 Clearance of Site

The contractor shall remove all surplus pipes, special and other fittings from the site as directed by the Engineer. The site of works shall be leveled and all surplus excavation, debris, cut trees or bushes shall be carted to the approved tip sites.

5.34 Existing Installations

a) Cold Water

Where pipes for cold water are to be connected up to existing installations, the condition of the existing installation is to be reported to the Engineer in order to establish if part of the existing installation is to be replaced.

b) Sanitary Fittings

Where existing sanitary fittings are to be removed or replaced, the fittings are to be removed with utmost care and fittings and taps to be handed over to the client.

c) Sealing Off Existing Drains and Manholes

Existing foul, surface water and subsoil drains exposed during progress of work are to be recorded and reported for investigation by the Architects. Where not required to be removed, seal off with concrete or grout solid as directed. Seal o connection to manholes, demolish wall to 50mm below surrounding ground level and fill remainder of manhole with consolidated approved rubber and cover to level of surrounding ground as directed.

6.0 <u>Cold Water Storage Tanks</u>

Cold-water storage tanks shall include the ball valves and connectors for inlet, supply, washout, and overflow and may also include in his pricing the price of the overflow and amount pipes to a place to be indicated by the Engineer. He shall also include the washout valve.

Where paint is required the contractor shall use the paints, which will not be toxic.

The tanks shall be manufactured to the following British Standards: -

(a) Galvanized Mild Steel tanks to BS 417.
(b) Sectional Steel tanks to BS 1564.

Where non-standard sizes shall be used, they shall be manufactured to the relevant standard but with the approval of the Engineer.

7.0 Water Heaters

Electricity Heated

Non-pressure and low-pressure types domestic electric water heaters shall comply with BS EN 60335 and/or BS 3456 – 201:1990. High-pressure types shall be of a standard not less than the appropriate BS

Domestic heaters shall, if nothing else is pacified with 25mm thick fibreglass lagging and enclosed in the corrosion-proofed steel, finished in white stove enamel and be similar to manufactured ' HEATRAE'

Electric thermostatically controlled immersion heaters shall comply with BS 3456 – 201:1990 and/or BS EN 60335 and BS 6700.

Purpose made storage water heaters of the specified size shall comply with BS 853 and shall be to the specified working and test pressure. The heaters shall be provided with all necessary bosses, coils etc, and shall be hot dip galvanized after manufacture. Installation shall, if nothing else is specified, be fiberglass to the specified thickness with finish suitable for painting.

Domestic heaters for floors mounting shall, if not provided with legs, be mounted on a minimum 100mm high concrete plinth.

Floor mounted purpose made heaters shall be provided with minimum 225mm high legs of sufficient strength welded to the heaters and to suitable floor plates. Before galvanizing, wall mounted heaters shall be supplied with all necessary brackets.

8.0 Electrical Services - Motors

Suitably rated control panels shall be supplied and installed as part of this section of the Contract to meet the starting and operating characteristics of the fan, and motors.

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

8.1 Motor Control Panels

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

- Triple pole isolating switch removable neutral link and HRC fuses.
- Control circuit fuses of the HR cartridge type
- Under voltage release, adjustable and complete tower to allow for voltage associated with the electrical supply and motor starting.
- Over voltage protection.
- Phase failure protection.
- Ammeter of the moving iron mounted on panel with selector switch.
- Voltmeter
- Automatic changeover for duty/standby pump installation
- Level control relay (relay from float switch)
- Pressure switch relay
- Pilot lamp, green.
- Rotary switch for HAND/OFF/AUTO operation, where required. Removable neutral link of heavy section copper.
- Motor winding over-temperature release. The Contractor shall provide this feature in conjunction with the specified thermistor protection
- Duty selection switches.
- Manual stop-start button units to operate in conjunction with rotary switch.
- Hours run meter/counter.

The Contractor shall allow at present for the contactors to re-close automatically on the restoration of the mains voltage. This requirement shall be subject to further discussions with the Employer to suit the Diesel plant and the mode of operation of electrical supplies.

All starter panels shall include sufficient miniature circuit breakers, with neutral bar, to supply auxiliary or associated equipment. Two spare 15A SP MCBs shall be included as spares.

All starter panels, motor starters and controllers shall comply with BS EN 60470:2001 and/or BS EN 60947 – 4 – 1:2001. Enclosures shall be rigid, at least 1.6mm thick, with rolled corners stiffened as necessary, dust-proof, vermin-proof, damp and corrosion protected with a grey colour stone enamel or other approved finish, fully tropicalised, with washable air filters. Instruments, gauges, ammeters, indicator lamps, etc shall be flush mounted. Panel doors shall include isolating switches to prevent them being opened unless the switches are in the off position. Each door shall be provided with a lock, and three sets of keys for all panel door locks shall be handed over to the Engineer.

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

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

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

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

Contactors shall be of air-break type BS EN 60470:2001 and/or BS EN 60947 – 4 – 1:2001, and shall be provided as follows:

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

Starters shall be rated as follows:

Ordinary duty	-	For motors which will run continuously for periods in excess of two hours.
Intermediate duty	-	For motors under automatic control other than time controls. When the intervals of operation are greater than two hours.

Starters shall be of the following type:

- Up to and including 4KW motor: Single phase on/off with overload protection (D.O.L.).
- Over 4 kW and up to 15 kW: Star Delta starter.
- For starters incorporating reduced voltage starting the changeover of voltage shall be automatic.

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

8.2 Motors

Motors shall comply with BS 3456 and/or BS 3676 – 1:1989, BS 5733:1979, BS 6220:1983, BS EN 60669 –1:2000 and shall be arranged for conduit entry as specified.

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

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

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

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

All motors shall be rated 3 phases, 415 volt or single phase, 240 volt. High power factor continuous maximum rating complying with BS 5000 Part 99 and Class F insulation complying with BS 2757 unless otherwise specified. All motors larger than 4 kW shall be three phase.

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

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

No motor shall run at a speed higher than 1500 rpm unless otherwise specified. Motors driving through Vee-belts shall be fitted with slide rails. The power factor shall not be less than 0.9 lagging. All motors shall be from the same manufacturer as far as possible.

8.3 Cabling and Wiring

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

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

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

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

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

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

Section 6

Particular Specifications for Plumbing & Drainage

SECTION 6 : PARTICULAR SPECIFICATIONS FOR PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

PARTICULAR SPECIFICATIONS FOR PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

1 Introduction

The specifications cover the execution of Mechanical Services installations and should be read in conjunction with other relevant specifications, drawings and contract documents issued to the contractor in conjunction with the sub-contract.

2 Included in the Contract

The works include, unless otherwise specified, supply delivery, installation, testing and commissioning, cleaning-up and setting to work all the installations described in the specifications, as measured in the bills of quantities and as shown on the contract drawings.

The provisions of all labour, materials, tools instruments testing apparatus and scaffolding necessary to execute the work in a first class manner, even such labour materials instruments or apparatus which are not specifically mentioned in the contract but are necessary for the satisfactory completion of the work, including such elements as:-

- Cold water supply pipe-work and fittings.

- Water storage tanks complete with all necessary covers, fittings, washout and overflow pipes and supports. The contractor is expected to take the overflow and washout pipes to a reasonable discharge point.

- The water supply pipework to the functional and sanitary as shown on the drawing plus the necessary fixing support and jointing materials from the water storage tanks.

- The sanitary and operational fittings together with the fixing supports and jointing of the supply and discharge pipes.

- The waste and soil pipework from the sanitary and operational fittings to the first manhole including all fixing, supports and jointing materials.

- Rainwater drainage to point of connection with civil works.

- All Fire protection services (Hosereel system and portable fire equipment).

- All cutting away drilling chasing etc. and all making good will be the responsibility of the contractor whether measured or not. The contractor shall ensure that this work is kept to a minimum and be responsible for the correct marking out of all chases and holes with all details.

- The contractor shall ensure that runs for floor or wall chases, holes to be cut or left will be marked out at the appropriate stage of structural work.

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

- The contractor shall as part of his tender supply all necessary information such as manufacture, catalogue or type numbers, brochures or copies of catalogue pages, weight and all other relevant information which are necessary to classify the equipment tendered

for.

- All other material, labour, tools instruments, scaffolding, etc, which are necessary for completion in a first class manner of the plants to the Engineer satisfaction.

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

- Provide the Engineer for his approval complete working and manufacturing drawing as specified.

- Commissioning and testing of the plants as specified.

- Supply of complete operation and maintenance manuals as specified as well as adequate instruction of the client's maintenance personnel as specified.

- The contractor shall include for full maintenance during initial maintenance period as specified.

- All other works / accessories not necessarily captured in the drawings and bills of quantities but essential for the satisfactory performance of the various plumbing, drainage & fire protection installations.

3. Extent of the Contractor's Duties

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

Any item or material found to be defective shall be replaced by the contractor within seven days of his being notified and any result of defective workmanship shall be repaired including supply of new parts if necessary, immediately upon being notified.

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

The contractor shall when authorized in writing by the Architect or the Engineer, make variations from the specifications and drawing. No profit will be allowed on omitted items or works.

The contractor shall submit to the Architect or to the Engineer claims for any work for which he considers demanding extra payments before the beginning of such work.

The contractor shall be responsible for verifying all dimensions relative to his work by actual measurements taken in the site.

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

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

The Engineer and Architects shall have full rights to inspect the work in progress and all materials equipment for use in the installation prior to its erection whether these are on site or the contractor's workshop.

The contractor shall allow for all reasonable access to the works for this purpose.
Where large items of equipment are to be installed, the shall ensure that access is provided for installation before work is commenced on site.

The contractor or his responsible representative shall be in all site meetings as and when required in order to discuss the works, make necessary decisions, receiving relevant instructions and to confirm fulfilment of time schedules.

4 Finish Painting

When all the installations have been set to work, tested and commissioned, the sub-contractor shall prime the pipework with an undercoat and paint 2 No. coats of paints in accordance to BS 1710 Colour coding and to the satisfaction of the Engineer and the Architect.

Section 7

Particular Specifications for Portable Fire Protection Equipment

SECTION 7: PARTICULAR SPECIFICATION FOR PORTABLE FIRE EXTINGUISHERS

PARTICULAR SPECIFICATION FOR THE SUPPLY AND INSTALLATION OF PORTABLE FIRE EXTINGUISHERS

1. General

The particular specifications details the requirements for the supply, installation and commissioning of the portable fire extinguishers which shall conform to BS EN 3. Colour coding shall be to BS 7863. The Sub-Contractor shall include 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 equipment.

2. Scope of works

The sub-contractor shall supply, deliver, erect, test and commission all the portable fire extinguishers which are called for in this specification and shown on the contract Drawings and listed in the Bills of Quantities.

3. Water/CO_2 Fire Extinguishers

The portable 9 litre water filled CO_2 cartridge operated portable fire extinguishers shall comply with BS EN 3. Cylinder shall be manufactured with 1.6mm Mild Steel Grade CR1 & CR3 to BS 1449. Cylinder lining shall be polythene. Operating valve shall be in diecast Zinc Alloy to BS 1004. Extinguisher shall be colour coded to BS 7863. The fire extinguisher shall have an operating temperature range of 5°C to 60 C. The fire extinguisher shall have been tested to a pressure of 23 bar and have an operating pressure of 12 bar at 20 C. Extinguisher shall have a pressure dial to indicate pressure in fire extinguisher. Minimum discharge time shall be 63 seconds. Discharge range and safe operating distance shall be 6m and 2m respectively.

The extinguishers shall be clearly marked with the following: -

a) Method of operation
b) The words '**WATER TYPE' (GAS PRESSURE)** in prominent letters, or similar indicating type of extinguishant and propellant
c) Name and address of the manufacturer or responsible vendor.
d) The nominal charge of the liquid in litres
e) Colour code to BS 7863
f) The year of manufacture
g) British Standard kite mark with the number of the British Standard.

4. Portable Carbon-Dioxide Fire Extinguishers

The 5 Kilogram Portable Carbon-Dioxide fire extinguishers shall comply with BS EN 3 and be colour coded to BS 7863. Cylinder of extinguisher shall be Alloy steel. Operating valve shall be in brass hot stamping. The fire extinguisher shall have an operating temperature range of -20°C to 60 C. The fire extinguisher shall have been tested to a pressure of 250 bar and have an operating pressure of 55 bar at 20 C. Extinguisher shall have a discharge hose complete with a horn and clearly indicate how to use extinguisher safely without getting CO_2 burns. Minimum discharge time shall be 15 seconds. Discharge range and safe operating distance shall be 3m and 2m respectively.

The extinguishers shall be clearly marked with the following:

a) Method of operation

b) The words **'CARBON-DIOXIDE TYPE'(STORED PRESSURE)** in prominent letters, or similar indicating type of extinguishant and propellant
c) Name and address of the manufacturer or responsible vendor.
d) The nominal charge of gas
e) Colour code to BS 7863
f) The year of manufacture
g) British Standard kite mark with the number of the British Standard.
h) The words "Re-charge after use"

5. ABC Dry Powder Portable Fire Extinguishers

The 9 Kilogram portable ABC dry powder fire extinguishers shall comply with BS EN 3, be colour coded to BS 7863 and shall be capable of extinguishing class A, B & C fires. The dry powder charge shall be non-toxic and retain its free flowing properties under normal storage conditions. Any pressuring agent used as an expelling shall be in dry state; in particular compressed air. The discharge tube and gas tube if either is fitted shall be made of steel, brass, copper or other not less suitable materials. Where a hose is provided it shall not exceed 1.060m and shall be acid and alkali resistant. Provision shall be made for securing the nozzle when not in use. Cylinder of extinguisher shall be1.6mm Mild steel Grade CR1 & CR3 Alloy to BS 1004. Operating valve shall be in die-cast zinc alloy to BS 1004. The fire extinguisher shall have an operating temperature range of -20°C to 60 C. The fire extinguisher shall have been tested to a pressure of 23 bar and have an operating pressure of 12.5 bar at 20 C. Minimum discharge time shall be 46 seconds. Discharge range and safe operating distance shall be 7m and 2m respectively.

The extinguishers shall be clearly marked with the following:

a) Method of operation
b) The words **'ABC DRY POWDER TYPE' (GAS CATRIDGE)** in prominent letters, or similar indicating type of extinguishant and propellant
c) Name and address of the manufacturer or responsible vendor.
d) The nominal charge of dry powder
e) Colour code to BS 7863
f) The year of manufacture
g) British Standard kite mark with the number of the British Standard.
h) The words "Re-charge after use"
i) Where appropriate, complete instructions for recharging the extinguisher shall be clearly marked on the extinguisher or otherwise be supplied with the refill.

6. Foam Spray Portable Fire Extinguishers

The 9 litre portable foam spray fire extinguishers shall comply with BS EN 3 and be colour coded to BS 7863. Cylinder of extinguisher shall be1.6mm Mild steel Grade CR1 & CR3 Alloy to BS 1004. Operating valve shall be in die-cast zinc alloy to BS 1004. The fire extinguisher shall have an operating temperature range of 5°C to 60 C. The fire extinguisher shall have been tested to a pressure of 23 bar and have an operating pressure of 12.5 bar at 20 C. Minimum discharge time shall be 21 seconds. Discharge range and safe operating distance shall be 4m and 2m respectively.

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

The fire extinguisher shall be complete with a discharge nozzle and gas tube and a pressure dial indicate

pressure in fire extinguisher. Provision shall be made for securing the nozzle when not in use.

The extinguisher shall be clearly marked with the following information:-

a) Method of operation
b) The words **'FOAM SPRAY TYPE' (GAS CATRIDGE)** in prominent letters, or similar indicating type of extinguishant and propellant
c) Name and address of the manufacturer or responsible vendor.
d) The nominal charge in litres
e) Colour code to BS 7863
f) The year of manufacture
g) British Standard kite mark with the number of the British Standard.
h) The words "Re-charge after use"\
i) Where appropriate, complete instructions for recharging the extinguisher shall be clearly marked on the extinguisher or otherwise be supplied with the refill.

7 Fire Blanket

The fire blanket shall be made from cloth woven with fibreglass or any other fire proof material and to measure 1210 x 1210mm and shall be fitted with specialties folded so as to offer instantaneous single action release blanket from storing jacket.

Section 8

Particular Specifications for Hosereel Equipment

SECTION 8

PARTICULAR SPECIFICATIONS FOR HOSEREEL INSTALLATION

1.0 BOOSTED HOSE REEL SYSTEM

1.1 General

The Particular Specification details the requirements for the supply, installation and commissioning of the hose reel installation. The hose reel installation shall comply in all respects to the requirements set out in C.O.P 5306 Part 1: 1976, B.S 5041 and B.S 5274. The System shall comprise of a pumped system.

1.2 Fire Pumps

The fire hose reel pumps shall be as specified and in any case capable of delivering 10 m^3/hr at a running pressure of 2.5 bar.

1.3 Control Panel

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

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

'On' push button for setting the control panel to live.

Green indicator light for indicating control panel live.

Duty / Stand-by pump auto change over.

Duty pump run green indicator light.

Stand-by pump run green indicator light.

Duty pump fail red indicator light.

Stand-by pump fail red indicator light.

Low water condition pump cut-out with red indicator light.

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

1.4 Hose Reel

The hose reel to the installation shall consist of a recessed, swing-type hose reel as Angus Fire Armour Model III or from other approved manufacturers.

The hose reel shall comply with B.S EN 671-1:1995 and EN 694 and is to be installed to the requirements of C.P. 5306 Part 1: 1976.

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

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

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

1.5 Pipe Work

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

1.6 Pipe Fittings

The pipe fittings shall be wrought steel pipe fittings, welded or seamless fittings conforming to B.S. 1740 or malleable iron fittings to B.S 143.

All changes in direction will be with standard bends or long radius fittings. No elbows will be provided.

1.7 Non-return Valves

The non-return valves up to and including 80mm diameter shall be to B.S. 5153: 1974.

The valves shall be of cast iron construction with gunmetal seat and bronze hinge pin.

1.8 Gate Valves

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

1.9 Sleeves

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

1.10 Earthing

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

1.11 Finish Painting

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

1.12 Testing and Commissioning

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

1.13 Instruction Period

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

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

Section 9

Technical Schedules

SECTION 9

TECHNICAL SCHEDULE OF ITEMS TO BE SUPPLIED

CONTENTS

TECHNICAL SCHEDULE

1. General Notes to the Tenderer

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

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

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

1. TECHNICAL SCHEDULE: SANITARYWARE

ITEM	DESCRIPTION	MANUFACTURER	COUNTRY OF ORIGIN	MODEL (Catalogue No.etc.)
1.	Water Closet- Close coupled			
2.	Water closet Flush Valve			
3.	Water closet – special needs			
4.	Wash hand Basin – countertop			
5.	Wash hand basin – wall mounted			
7.	Wash hand basin – special needs			
8.	Urinal bowl			
9.	Urinal flush valve			
10.	Kitchen Sink			
11.	Undersink heater			
12.	Sink Mixer tap			
13.	Cleaner's sink Soap dispenser			
14.	Hand dryer			
15.	Toilet roll holder			
16.	WHB Press action tap			

2. TECHNICAL SCHEDULE: PLUMBING & DRAINAGE

ITEM	DESCRIPTION	MANUFACTURER	COUNTRY OF ORIGIN	MODEL (Catalogue No.etc.)
1.	CPVC pipes			
2.	u PVC – pipe (rainwater system)			
3.	u PVC – pipe (foul water drainage – heavy gauge)			
4.	u PVC – pipe (foul water drainage – grey)			
5.	Towel rails			
6.	Gate valves			
7.	P E water storage tank			
8.	GMS Pipework Class C			
9.	Angle regulating valves			
10.	Water meter			
11.	Manhole cover			
12.	Domestic water booster pumps			

3. TECHNICAL SCHEDULE: FIRE PROTECTION SYSTEMS

ITEM	DESCRIPTION	MANUFACTURER	COUNTRY OF ORIGIN	REMARKS (Catalogue No.etc.)
1.	Swinging type hosereel			
2.	9 litre water/CO_2 fire extinguisher			
3.	4.5 kg CO_2 fire extinguisher			
4.	Air release valve			
5.	Hosereel fire pump (Electric)			
6.	Hosereel system control panel			

Section 10

Bills of Quantities

SECTION 10 - BILLS OF QUANTITIES

TABLE OF CONTENTS

PROPOSED UPGRADING OF LAIKIPIA UNIVERSITY FACILITIES
COMPLETION OF TUITION BLOCK A
PLUMBING, DRAINAGE & FIRE PROTECTION INSTALLATIONS

BILLS OF QUANTITIES - PREAMBLE

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

2. The Tenderer is required to check the numbers of the pages of these Bills of Quantities against the Contents Page and should he find any missing, in duplicate or indistinct he must inform the Engineer at once and have the same rectified.

3. Should the Tenderer be in doubt about the precise meaning of any item or figure, for any reason whatsoever, he must inform the Engineer in order that clarification is provided prior to the date for submission of the tenders. In addition, should the Tenderer find any of the specified items and / or reference numbers indistinct or inconsistent, for any reason whatsoever, he must inform the Engineer in order that clarification is provided prior to the date for submission of the tenders.

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

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

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

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

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

9. The rate entered against each item shall be **EXCLUSIVE of VAT**. VAT shall be shown as an item on the main summary page. The Total of Tender for Plumbing, Drainage & Fire Protection Installations shall be carried to the Form of Tender. The Total of Tender shall include for the design, manufacture, inspection and testing, packing for shipment, insurance, customs dues, delivery to site, unloading, and all other charges, complete erection, testing, setting to work, finishing, painting, maintenance for a period of six calendar months and the instruction period all to the satisfaction of the Architect and Engineer, of the items of Plant described or implied within the Specification and shown on the Drawings.

10. The bidder or tenderer shall fill in rates and prices for all items of the Works in the contract bills. Items against which no rate or price is entered by the bidder will not be paid for by the Employer when executed and shall be deemed to be covered by the rates for other items and prices in the Bills of Quantities.

11. The rates and prices quoted by the bidder shall not be subject to adjustment during the performance of the Contract on account of price fluctuations or fluctuations in the rate of exchange of the various currencies.

12. The contractor shall be deemed to have included in his prices for all labour and all materials, accessories, components, quantities and commissioning to provide complete installation as described in the Specification. It shall be deemed that the contractor has included for all requirements contained within the Specification and Bills of Quantities.

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

14. Irrespective of the requirements contained within the East African Standard method of Measurement it shall be deemed that the contractor has included all requirements contained within the Specification and Bills of Quantities.

15. The Client reserves the right to omit / phase certain works, if necessary, at any stage of the contract. The contractor shall spread his profit uniformly across all items as no claims for loss of profit shall be entertained.

16. In no case will any expense incurred by Tenderers in preparation of this Tender be allowed.

17. The copyright of these Bills of quantities is vested in the Engineer and no part thereof may be reproduced without their express permission given in writing.

ITEM	DESCRIPTION	UNIT	QTY.	RATE KShs	AMOUNT KShs
1.00	**SANITARY FITTINGS**				
	Supply and install the following appliances including their support brackets, screws, mastic, silicon etc. and all other necessary accessories to make the appliances operational. All connections to water supply, waste/soil drainage and electrical power supply are to be the responsibility of the contractor and must be priced for:-				
	NOTE: TRADE NAMES Where Trade Names are mentioned below, the tenderer MUST provide the same materials. Alternatives will only be accepted if approved in writing by the Architect/Engineer.				
	WC Suites				
A	"Twyford Bathrooms Ltd's Refresh WC pan in white vitreous china, wash-down action with open flushing rim WC pan Ref No. AV1968WH with horizontal outlet, fixing screws, mastic.WC to be complete with heavy duty white single seat and cover Ref No. AV7865WH	No.	35		
B	WC "S" or "turned P" connector to drain pipe for horizontal outlet WC Pan as Twyfords Bathrooms Ltd Ref. No. WF 1241 WH.	No.	35		
C	Chrome plated 32mm nominal diameter "Cobra" standard flushmaster exposed manual flush valve with escutcheon plate, vacuum breaker, lever and all fixing brackets, bolts & connecting fitments from flush valve to bowl and fixing screws.	No.	35		
	Special Needs WC Suite				
D	Twyford Bathrooms Ltd's " Avalon HO" Ref No.AV 1168 WH white vitreous china, close-coupled WC pan with horizontal outlet, connector and fixing screws. WC pan to be complete with 6 litre cistern (ref. No. AV 2611 WH) and cistern fittings and "Germshield" 25mm single ring seat with stainless steel hinges (ref No. GR 7877 WH) WC to complete with all fixing supports.		16		
E	Twyford Bathrooms Ltd's 4 No. 600 mm long support rails (cat No. AV 4902 WH), 1 No. hinged support rail with toilet roll holder (cat No. AV 4910 WH).		16		
F	Twyford Bathrooms Ltd's white vitreous china Wash basin (WB 1711 WH) with no chain or overflow, with centre taphole cat, a pair of wall hangers cat No. SR 5307 XX, grid waste cat No. WF 4341CP, 1 No. lever operated spray tap cat No. SF 5247 CP and 32 mm diameter chrome plated bottle trap.		16		
G	WC "S" or "turned P" connector to drain pipe for horizontal outlet WC Pan as Twyfords Bathrooms Ltd Ref. No. WF 1241 WH.	No.	16		
	WC Suites Accessories				
H	Kimberly- Clark anti-vandal lockable bathroom tissue dispenser SQ2/MR2 in Satin Aluminium or equal and approved complete with toilet roll holder roller	No.	35		
I	Satin Aluminium coat hook complete with screws.	No.	51		
	TOTAL CARRIED FORWARD TO NEXT PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE	AMOUNT
				KShs	KShs
	Total Brought Forward from Previous Page 10/1				
	Wash Hand Basins				
A	Twyford Bathrooms Ltd. Wall mounted white vitreous china "Classic 560", 560x415 mm basin with 2 No. tapholes Ref. No. AD 4212 WH, complete with wall brackets (ref. No. SR1005XX) for wall fixing	No.	44		
	WHB Accessories				
B	"Cobra" Code KM2-102 chrome plated ½" demand press action pillar tap (operating pressure: 0.2bar minimum) complete with aerator and all necessary accessories.	No.	44		
C	Twyford Bathrooms Ltd. Ref. No. 308 chrome plated 1¼" grid basin waste complete with 62mm diameter flange, 86mm long shank and backnut.	No.	44		
D	Cobra Watertech Ref. No. 340 chrome plated 1¼" bottle trap with 75 mm deep seal and 200 mm long tail pipe, cap-nut and wall flange.	No.	44		
	Mirrors				
E	600 x 750mm, 6 mm, thick plate rectangular-shaped glass mirror with bevelled edge boundary and concealed domed screws for installation.	No.	44		
	Kitchen Sink				
F	Associated Steel Ltd. Ref No. 140 single bowl, single drainer kitchen sink size 1000x500mm made out of 18SWG 18/8 stainless steel sheet with 420 x 355x 150 mm deep bowl in bright machine polish finish.	No.	7		
G	Chrome plated two-hole pressure vented swivel type sink mixer complete with all fittings such as backnuts, washers, compression fittings etc. and sink chain and plug	No.	7		
H	"Bricon" Ref. No. 316 chrome plated heavy cast 1½" sink grid waste, 70 mm diameter flange, 45 mm long shank, unslotted with plug, chain and backnut.	No.	7		
I	"Cobra Watertech" Ref. No. 340 chrome plated 1¼" bottle trap with 75 mm deep seal and 200 mm long tail pipe, cap-nut and wall flange.	No.	7		
J	"Heatrae Sadia Express 7" undersink heater of 7 litres capacity with 3.0Kw heating element and complete with adjustable thermostat (5-75^{o}C), over-temperature cut-out , dry start cut-out, 15mm copper pipe connections for cold water inlet and hot water outlet at top to fit into pressure vented tap mixer described elsewhere. Entire installation to be complete with electrical wiring to a local isolator.	No.	7		
	TOTAL CARRIED FORWARD TO NEXT PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE	AMOUNT
				KShs	KShs
	Total Brought Forward from Previous Page 10/2				
	Urinal Bowl				
A	"Twyfords Bathrooms Ltd. Clifton" white vitreous china Urinal bowl Ref No.VC 7002 WH with exposed pipework complete with Pair of bowl supports Ref No. SR 5307 XX , Plastics 1½" diameter domed outlet grating Ref No. WF 9370 XX.	No.	24		
	Urinal Bowl accessories				
B	"Cobra Watertech" Model No. FJ6.000 chrome plated, push button ¾" Flushmaster Junior exposed urinal flush valve, top entry with integral ball-o-stop valve and wall plate complete with; exposed chrome plated urinal flush and tail pipe with inlet adapter and backmount spray rose/spreader.	No.	24		
C	1½" diameter chrome plated brass bottle P-Trap with brass extension pipe to wall and wall flange.	No.	24		
D	"Twyfords Bathrooms Ltd. " 305 mm wide x 620 mm high bowl urinal division Ref No. VC 8051 WH and Ref No. SR 5706 XX Hangers.	No.	24		
	Soap Dispenser				
E	"Mediclinics" or equal and approved, impact resistant, heavy duty liquid soap dispenser in stainless steel complete with initial charge, key and mounting brackets.	No.	16		
	Hand Dryer				
F	"Mediclinics" or equal and approved 1.6kW automatic no-touch sensor operated, impact resistant, heavy duty hand dryer in stainless steel complete with mounting brackets, and electrical wiring from hand dryer to a power point provided by others.	No.	16		
	Cleaner's sink				
G	"Twyford Bathrooms Ltd." 465x400mm cleaners sink in enamelled fireclay with hardwood pad & stainless steel grating Ref. FC 1034 WH. The sink is to be complete with legs & bearers with sink screwed to wall (Ref SR 3048 XX).	No.	8		
H	"Bricon" chrome plated heavy duty back inlet bib tap with 150mm long chrome plated extension.	No.	8		
	Cleaner's Sink Accessories				
I	"Bricon" Ref. No. 316 chrome plated heavy cast 1½" sink grid waste, 70 mm diameter flange, 45 mm long shank, unslotted with plug, chain and backnut.	No.	8		
J	1½" Tubular plastic P-trap, 75 mm seal, with reverse nut entry with BSP thread and universal compression outlet as "Terrain" Ref. No. 631.	No.	8		
	TOTAL CARRIED FORWARD TO COLLECTION PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE	AMOUNT
				KShs	KShs
2.00	**INTERNAL PLUMBING**				
	Supply, deliver and install Astral Flow Guard CPVC 4120 SDR 13.5 plastic pipes to ASTM Standard. **Tenderers must allow in their pipework prices for all the couplings, connectors, unions, nipples, sockets, endcaps, bridges, expansion loops, jointing cement / solvent etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, collars, holderbats plugged and screwed, and pipe sleeves through structural members. Installation method shall be as per manufacturer's printed instructions.**				
A	20 mm nominal diameter CPVC 4120 SDR 13.5 pipes	LM	88		
B	25 mm ditto	LM	96		
C	32 mm ditto	LM	90		
D	40 mm ditto	LM	120		
E	50 mm ditto	LM	42		
F	65 mm ditto	LM	24		
G	80 mm ditto	LM	54		
	Extra Over CPVC 4120 SDR 13.5 Tubing for the following:-				
H	20 mm diameter elbow/bend, 90°/45°	No.	220		
I	25 mm ditto	No.	168		
J	32 mm ditto	No.	103		
K	40 mm ditto	No.	52		
L	50 mm ditto	No.	32		
M	65 mm ditto	LM	30		
N	80 mm ditto	LM	24		
O	25 mm diameter equal tee	No.	80		
P	32mm ditto	No.	62		
Q	40mm ditto	No.	62		
R	50 mm ditto	No.	32		
S	65 mm ditto	LM	30		
T	80 mm ditto	LM	24		
	TOTAL CARRIED FORWARD TO NEXT PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE	AMOUNT
				KShs	KShs
	Total Brought Forward from Previous Page 10/4				
A	25x20 mm diameter reducer	No.	75		
B	32x25 mm ditto	No.	34		
C	40x32 mm ditto	No.	35		
D	50x32 mm ditto	No.	15		
E	50x40 mm ditto	No.	20		
F	65x50 mm ditto	No.	4		
G	80x50 mm ditto	No.	2		
H	20mm x ½" diameter male/female transition piece round/hexagonal.	No.	88		
I	25mm x ¾" ditto	No.	44		
J	32mm x 1" ditto	No.	24		
K	40mm x 1¼" ditto	No.	20		
L	50mm x 1¼" ditto	No.	31		
	Gate Valves				
M	20 mm diameter brass high pressure screw-down fullway non-rising stem, solid wedge disc gate valve as "Pegler" and to be complete with matching diameter union.	No.	6		
N	25mm diameter ditto	No.	6		
O	32mm diameter ditto	No.	15		
P	40mm diameter ditto	No.	10		
Q	50mm diameter ditto	No.	8		
R	65mm diameter ditto	No.	4		
R	80mm diameter ditto	No.	4		
	Pressure Testing				
R	Allow for pressure testing of all existing and new plumbing pipework	Item	1		
	TOTAL CARRIED FORWARD TO NEXT PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE KShs	AMOUNT KShs
	Total Brought Forward from Previous Page 10/5				
	Roof Water Storage Tank				
A	Rotationally moulded polyethylene cylindrical roof water storage tank of nominal capacity 5000 litres as 'TOPTANK' on bearing supports to structural Engineer's detail complete with cover. The tank is to be complete with the following; a) 50mm diameter overflow for each tank b) 32mm diameter washouts for each tank c) 40mm diameter washouts for each tank d) 80mm diameter outlet for each tank e) 32mm diameter inlet with high pressure float valve for each tank f) Tank connectors for all incoming & outgoing pipes During manufacture, the polyethylene material composing the tanks shall blended with Carbon Black (at least 2.3%) by means of melt compounding to protect against UV rays.	No.	4		
B	32mm diameter MOH Pattern high pressure ball valve for 5 bar inlet pressure minimum	No.	4		
	Angle Regulating Valves				
C	½" Chrome plated angle regulating valve with compression nut, backnut and 350 mm long copper service connection.	No.	98		
	Sterilisation				
D	Allow for sterilization of plumbing system with chlorine.	Item	1		
	TOTAL CARRIED FORWARD TO COLLECTION PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE	AMOUNT
				KShs	KShs
3.00	**FOUL WATER DRAINAGE**				
	Supply and fix uPVC soil system and MuPVC waste systems with screwed and socketed joints **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 etc as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holderbats plugged and screwed and for any associated builder's work such as sleeves, plastering, cutting, chasing, drilling, making good etc.**				
A	32 mm diameter waste pipe	LM	48		
B	40 mm diameter waste pipe	LM	98		
C	50 mm diameter Waste pipe	LM	120		
	Extra Over MuPVC Waste Pipework for the following:-				
D	32 mm diameter 90°/135° Sweep Bend	No.	68		
E	40 mm ditto	No.	34		
F	50 mm ditto	No.	40		
G	32 mm diameter 90°/135° Sweep Tee	No.	34		
H	40mm ditto	No.	83		
I	50mm ditto	No.	40		
J	100mm ditto	No.	35		
K	40 x 32 mm diameter Socket Reducer	No.	40		
L	32 mm diameter Access Plug	No.	40		
M	40 mm ditto	No.	40		
N	50 mm ditto	No.	12		
O	100mm ditto	No.	21		
P	100 x 50 mm diameter Boss Connector	No.	26		
Q	100 x 40 mm ditto	No.	16		
R	100 mm diameter Trapped Floor Gully with 2 No. 40 mm diameter inlets and 50 mm diameter outlet and floor gully inlet.	No.	26		
	uPVC Soil System Heavy Gauge Class 41 Pipework				
S	100 mm diameter Grey Soil Pipe	LM	164		
	TOTAL CARRIED FORWARD TO NEXT PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE KShs	AMOUNT KShs
	Total Brought Forward from Previous Page 10/7				
	Extra Over uPVC Soil Pipework for the following: -				
A	50 mm diameter Grey Air Admittance Valve complete with 50x100mm diameter socket reducer	No.	4		
B	100 mm diameter Grey Short Radius Bend	No.	51		
	uPVC Buried Drain System Heavy Gauge Class 41 Pipework				
C	100 mm diameter Golden Brown Buried Drain Pipe	LM	84		
D	150 mm diameter Golden Brown Buried Drain Pipe	LM	60		
	Extra Over uPVC Buried Drain Pipework for the following:-				
E	100 mm diameter Golden Brown Sweep Bend	No.	51		
F	100 mm diameter Golden Brown Short Radius Bend	No.	16		
	Inspection Chambers				
G	Allow excavation, concreting to Class 1:3:6, walling 150 mm thick solid concrete block walls with 1:3 mortar and plastering to 1:2, Medium duty Rectangular Cover and Frame to specification for manhole not exceeding 1500 mm depth.	No.	12		
	Gully traps				
H	Masonry gulley trap complete with golden brown uPVC P-trap with seal drain pipe and concrete cover.	No.	5		
	Excavation				
I	Excavate trench for buried drain pipes not exceeding 1000 mm and average 1500 mm deep, part return, fill in, ram and remainder cart away (Final ground finish is to Architect's specification).	LM	144		
	Pressure Testing				
J	Allow for pressure testing of all existing and new drainage pipework	Item	1		
	TOTAL CARRIED FORWARD TO COLLECTION PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE KShs.	AMOUNT KShs.
4.00	**RAIN WATER DRAINAGE**				
	Supply and fix uPVC rain water system with solvent welded, seal ring or dry joints to manufacturer's instruction.				
	Tenderers must allow in their pipework prices for all the brackets, adaptors, couplings, connectors, joints etc as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holderbats plugged and screwed and for any associated builder's work such as plastering, cutting, chasing, drilling, making				
	Rain Water System uPVC High Pressure Class 41 Pipework				
A	75mm diameter UPVC Rainwater Downpipe	LM	330		
	Extra Over uPVC Rainwater Pipework for the following: -				
B	100mm diameter galvanized steel fulbora rainwater outlet complete with dome type grating, flange, raising ring, PVC adaptor and other accessories including connecting to 75mm diameter uPVC downpipe.	No.	24		
C	75mm diameter 90°/135° Bend	No.	48		
D	75mm diameter short short radius bend	No.	24		
E	75mm diameter rainwater shoe	No.	24		
F	Allow for undercoat and painting of entire pipework & fittings to Architect's colour	Item	1		
	Pressure Testing				
G	Allow for pressure testing of all existing and new rainwater drainage pipework	Item	1		
	TOTAL CARRIED FORWARD TO COLLECTION PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE KShs.	AMOUNT KShs.
5.00	**PORTABLE FIRE EQUIPMENT**				
	CO_2 Fire Extinguishers				
A	5 kg Carbon Dioxide Steel Stored pressure gas fire extinguishers conforming to BS EN 3 complete with:- - charge and fixing bracket - pictorial instructions - colour coding to BS 7863 - discharge horn and hose. - pressure indicator	No.	8		
	Dry Chemical Powder Fire Extinguishers				
B	9kg Cartridge operated dry powder fire extinguisher manufactured to BS EN 3 complete with:- - initial charge and fixing bracket - pictorial instructions - discharge nozzle and hose - colour coding to BS 7863	No.	8		
	Water / CO_2 Gas Fire Extinguishers				
C	9 Litre Water /Carbon Dioxide Steel Stored pressure gas fire extinguishers conforming to BS EN 3 complete with:- - charge and fixing bracket - pictorial instructions - colour coding to BS 7863 - discharge horn and hose. - pressure indicator	No.	8		
	Fire Blanket				
D	1210 x 1210mm Fire Blanket in woven fibreglass material to be installed in kitchen.	No.	7		
E	Supply and install standard "FIRE POINT" sign to Architect's approval	No.	8		
	TOTAL CARRIED FORWARD TO COLLECTION PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE KShs	AMOUNT KShs
6.00	**HOSE-REEL INSTALLATIONS**				
	Hose-Reel Pressurization Pump Set				
A	Hosereel Booster set (Duty Standby pump operation), complete with the following :- • 2 No. automatic electrical motor driven pressure set to a capacity of 1.38l/s at 2.5 bar as Dayliff SGH 5/25 (with Grundfos CH 4-40 Pumps) • All equipment to be mounted on galvanised base frame with anti-vibration mountings. • 10mm dial pressure gauge (0 - 15bar) • 'Varem' pressure vessel (60 litres capacity), to be installed in series with the pump. • Pressure switch (double Pole) arrangement including flow switch and necessary valve and fittings. • Inlet & outlet 4No diameter 50mmm gate valves. • Line strainer, 2 No.check valves, elbows, tees, unions, etc. • all pipework interconnecting pumps and pressure vessels to match suction & inlet pipe size in GMS Class 'C' pipes including elbows, tees, unions, etc. • Control Panel for automatic pump operation with 'run' & 'trip' indicator, overload protections and able to cycle pumps duty to standby and vice versa on each pump operation cycle. • Weather proof & burglar proof pump system enclosure complete with cover, padlock and all other necessary items / ancillaries to operate booster pump set.	Set	1		
	Electrical installations				
B	Allow for electrical & control wiring between control & pump including conduit, wired from a local Isolator installed by others	Item	1		
	Fire hose reel				
C	"Angus" Type 230 Standard manual swinging fire hose reel with 19mm bore 30m long hose and 25mm diameter gate valve.	No.	8		
	Supply and fix the following including all materials and jointing to supply pipes, supports, etc:-				
D	25 mm Nominal diameter GMS class 'C' Pipes.	LM	30		
E	50 mm ditto	LM	130		
	Extra Over GMS class 'C' tubing as follows:-				
F	25mm diameter Bend	No.	24		
G	50 mm ditto	No.	12		
	Pressure Testing				
H	Allow for pressure testing of all existing and new hosereel pipework	Item	Sum		
	TOTAL CARRIED FORWARD TO COLLECTION PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE KShs.	AMOUNT KShs.
7.00	**WATER RETICULATION**				
	WATER BOOSTER PUMP				
A	Automatic water booster pump with a capacity of 4.0m^3/hr at 30 metres static head. Pump to be complete with: - Control panel - Automatic watertech press control unit for on-demand water supply - Connecting GMS pipework, isloation & non return valve etc. - Electrodes for low level cut-out - Baseframe - Close coupled motor suitable for continuous operation complete with electrical and mechanical overload protection Pump to be as 'Pedrollo Prulijet 4/100' or equal and approved	No.	1		
B	Allow for suitable electrical & control wiring between electrodes and pump isolator.	Item	1		
	Pipework				
	Supply, deliver and install GMS Class C pipes to specification. Tenderers must allow in their pipework prices for all the couplings, connectors, unions, nipples, sockets, endcaps, bridges, expansion loops, jointing materials etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, collars, holderbats plugged and screwed, and pipe sleeves through structural members.				
C	40 mm Nominal diameter GMS pipes	LM	30		
D	50 mm ditto	LM	286		
	Extra over GMS tubing for the following:-				
E	40 mm diameter GMS elbow/bend, 90°/45°	No.	12		
F	50 mm ditto	No.	12		
G	50 mm diameter GMS equal tee	No.	2		
	Gate Valves				
H	40 mm diameter brass high pressure screw-down fullway non-rising stem, solid wedge disc gate valve as "Pegler" and to be complete with matching diameter GMS union.	No.	2		
I	50mm diameter ditto	No.	2		
	TOTAL CARRIED FORWARD TO NEXT PAGE				

ITEM	DESCRIPTION	UNIT	QTY.	RATE KShs.	AMOUNT KShs.
	Total Brought Forward from Previous Page				
	Valve Chamber				
A	Construct a masonry valve chamber of internal dimensions 300x300x300mm deep complete with precast concrete cover. The chamber should be able to accommodate the valves	No.	2		
	Excavation				
B	Excavate trench for buried irrigation pipework not exceeding 1000 mm wide and average 750 mm deep, part return, fill in, ram and remainder cart away (Final ground finish is to Architect's specification).	LM	286		
C	Allow for encasement of buried water reticulation pipework passing under drive-way, parking, etc with 150mm thick concrete surround to the approval of the Civil Engineer	LM	15		
	Pressure Testing				
D	Allow for pressure testing of all existing and new hosereel pipework	Item	1		
	TOTAL CARRIED TO COLLECTION PAGE				

ITEM	DESCRIPTION	
8.00	**COLLECTION PAGE**	
A	Total for sanitaryware Brought Forward from Page 10/3	
B	Total for plumbing Brought Forward from Page 10/6	
C	Total for foul drainage Brought Forward from Page 10/8	
D	Total for rainwater drainage Brought Forward from Page 10/9	
E	Total for portable fire extinguishers Brought Forward from Page 10/10	
F	Total for hosereel installation Brought Forward from Page 10/11	
G	Total for water reticulation Brought Forward from Page 10/13	
	TOTAL FOR CARRIED FORWARD TO SUMMARY PAGE	

BILL NO.	DESCRIPTION	Amount KShs.
9.00	**SUMMARY PAGE**	
A	Total for Preliminaries Brought Forward From Page No. 2-20	
B	Total brought forward from Collection Page 10/14	
	Drawings	
C	Prepare and submit working & record (as-installed) drawings to the satisfaction of Engineer in easily readable scale, A1 or A0 paper size format as follows; i) general arrangement drawings of all equipment, plant etc. ii) routes - types and sizes and arrangement of all pipework iii) wiring(electrical & control) details iv) any other details as per specifications Drawings are to be submitted in soft copy (AutoCAD 2000 format) & hard copy to the client, the Architect and the Engineer (tri-plicate).	
	Testing & Commissioning	
D	Allow for testing and commissioning of all the Plumbing, Drainage & Fire Protection to the satisfaction of the Engineer	
	Operation & Maintenance Manuals	
E	Prepare & submit draft and three final copies of operation, instruction and maintenance manuals to Engineer's approval.	
F	Contingency Sum	750,000.00
G	Sub-Total	
H	Add 16% VAT	
	TOTAL FOR TUITION BLOCK B CARRIED FORWARD TO FORM OF TENDER (VAT INCLUSIVE)	

AMOUNT IN WORDS: KENYA SHILLINGS_____

_____

SIGNED _____

SUB-CONTRACTOR'S OFFICIAL STAMP _____

_____

DATE _____

Appendix

Schedule of Drawings

PLUMBING, DRAINAGE & FIRE PROTECTION – CONTRACT DRAWINGS LIST.

DRAWING No.	DRAWING TITLE.	REVISION STATUS.
LUC–TB–M–PD–R–00	TUITION BLOCK B – PLUMBING, DRAINAGE & FIRE FIGHTING – CONTRACT DRAWING LIST	T0
LUC–TB–M–PD–R–001	TUITION BLOCK B – DRAWING LEGED & GENERAL NOTES	T0
LUC–TB–M–PD–G–001	TUITION BLOCK B – GROUND FLOOR – MECHANICAL SERVICES – FOUL & RAIN WATER DRAINAGE	T0
LUC–TB–M–PD–G–002	TUITION BLOCK B – FIRST FLOOR – MECHANICAL SERVICES – FOUL & RAIN WATER DRAINAGE	T0
LUC–TB–M–PD–G–003	TUITION BLOCK B – SECOND FLOOR – MECHANICAL SERVICES – FOUL & RAIN WATER DRAINAGE	T0
LUC–TB–M–PD–G–004	TUITION BLOCK B – THIRD FLOOR – MECHANICAL SERVICES – FOUL & RAIN WATER DRAINAGE	T0
LUC–TB–M–PD–G–005	TUITION BLOCK B – GROUND FLOOR – MECHANICAL SERVICES – PLUMBING & FIRE FIGHTING	T0
LUC–TB–M–PD–G–006	TUITION BLOCK B – FIRST FLOOR – MECHANICAL SERVICES – PLUMBING & FIRE FIGHTING	T0
LUC–TB–M–PD–G–007	TUITION BLOCK B – SECOND FLOOR – MECHANICAL SERVICES – PLUMBING & FIRE FIGHTING	T0
LUC–TB–M–PD–G–008	TUITION BLOCK B – THIRD FLOOR – MECHANICAL SERVICES – PLUMBING & FIRE FIGHTING	T0
LUC–TB–M–PD–G–009	TUITION BLOCK B – ROOF PLAN – MECHANICAL SERVICES – PLUMBING & FIRE FIGHTING	T0

NOTES

FOR TENDER

Signed: Technical Lead _____

REV	REVISIONS		SIGN	DATE	APPROVED
		BY			
		CHECKED			
		BY			
		CHECKED			
		BY			
		CHECKED			
T0	ISSUED FOR TENDER	BY	COD	JUN'22	
		CHECKED			

Project

PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY -COMPLETION OF TUITION BLOCK B

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Drawing Title

TUITION BLOCK B PLUMBING, DRAINAGE & FIRE FIGHTING CONTRACT DRAWING LIST

Designed by SN	Drawn by COD
Checked by NKM	Approved by NKM
Scale As Shown(A1size)	Date JUNE'22
Job No. 10295K	ACAD File: TB–M–PD–R–00T0
T STATUS	DRG No. LUC/TB/M/PD/R/00	TO REV

PLUMBING LEGEND: –

- COLD WATER SERVICE
- VALVE (SERVICE AS INDICATED ON LAYOUT
- COLD WATER SERVICE (PLUGGED)
- PIPE BEND AT BOTTOM OF RISE/DROP
- PIPE BEND AT TOP OF RISE/DROP
- FLOAT VALVE (WATER STORAGE TANK)
- HOSE REEL WITH BALL VALVE
- PORTABLE FIRE EXTINGUISHER (TO SPECIFICATION)

A	AIR RELEASE VALVE
GV	GATE VALVE
TB	TO BELOW
TA	TO ABOVE
CWS	COLD WATER SERVICE
FB	FROM BELOW
FA	FROM ABOVE
RM	RISING MAIN
SP	STAND PIPE

DRAINAGE LEGEND: –

SWO	STORMWATER OUTLET
SWDP	STORMWATER DRAIN PIPE
WP	WASTE PIPE
SWP	SOIL AND WASTE PIPE
SVP	SOIL AND VENT PIPE
VP	VENT PIPE
FT	FLOOR TRAP
PD	PIPE DROP

- STORMWATER PIPING
- PIPE BEND AT TOP OF RISE/DROP
- PIPE BEND AT BOTTOM OF RISE/DROP
- VERTICAL PIPE
- SEWER WASTE PIPING
- OUTLET/VENT
- GT GULLEY TRAP
- IC INSPECTION CHAMBER
- ACCESS POINT
- RODDING EYE
- ø75MM RAIN WATER UPVC DOWN PIPE DISCHARGING FREELY TO STORM DRAIN AT GROUND LEVEL

NOTES.

1– ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.

2– DO NOT SCALE FROM THESE DRAWINGS, USE FIGURED DIMENSIONS ONLY.

3– GALVANISED STEEL PIPING TO BE USED AS FOLLOWS HOSEREEL & WATER RETICULATION – GMS CLASS B

4– INTERNAL COLD WATER SERVICE PIPE WORK TO BE ASTRAL FLOWGUARD CPVC 4120 SDR 13.5 TO ASTM STANDARDS.

5– ALL RAINWATER DRAINAGE PIPING IN COLUMNS OR OTHERWISE TO BE PVC HIGH PRESSURE PIPES (CLASS 41)

6– ALL PLUMBING/WASHDOWN WATER PIPING TO BE TO BS EN 6700:1997 BS EN 806(ALL PARTS)

7– ALL FOUL&WASTE DRAINAGE TO BE UPVC OR MU PVC JOINTED TO MANUFACTURES SPECIFICATION.

8– ALL FOUL DRAINAGE WORKS TO COMPLY WITH BS EN 12056 (ALL PARTS) AND BS EN 752(ALL PARTS).

9– ALL SANITARY INISTALLATION TO COMPLY WITH BS EN 6465–1:2006 BS EN 6465–3:2006

10– STANDPIPES TO BE FIXED 600MM AFFL

11– ALL PIPES RUNNING IN FLOOR SLAB, DRIVEWAY, ETC TO BE ENCASED IN 150MM THICK CONCRETE SURROUND

12– ALL HORIZONTAL DRAINAGE PIPES TO HAVE A MINIMUM SLOPE OF 1:100 OR AS INDICATED

13– ALL MOUNTING HEIGHTS/POSITIONS TO BE RECONFIRMED ON SITE WITH ENGINEER PRIOR TO INSTALLATION

14. ALL PIPEWORK MUST BE PROPERLY SUPPORTED AND ANCHORED TO SLAB SOFFITS, WALLS, COLUMNS, BEAMS, ETC

15– CONTRACTOR TO CROSS–CHECK ALL DIMENSIONS & PROPOSED ROUTING OF SERVICES ON SITE PRIOR TO COMMENCEMENT OF WORK. ANY DISCREPANCIES TO BE CLARIFIED WITH ENGINEER IMMEDIATELY

NOTES

FOR TENDER

Signed: Technical Lead _____

REV	REVISIONS		SIGN	DATE	APPROVED
		BY			
		CHECKED			
		BY			
		CHECKED			
		BY			
		CHECKED			
TO	ISSUED FOR TENDER	BY	COD	JUN'22	
		CHECKED			

Project

PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY -COMPLETION OF TUITION BLOCK B

Client

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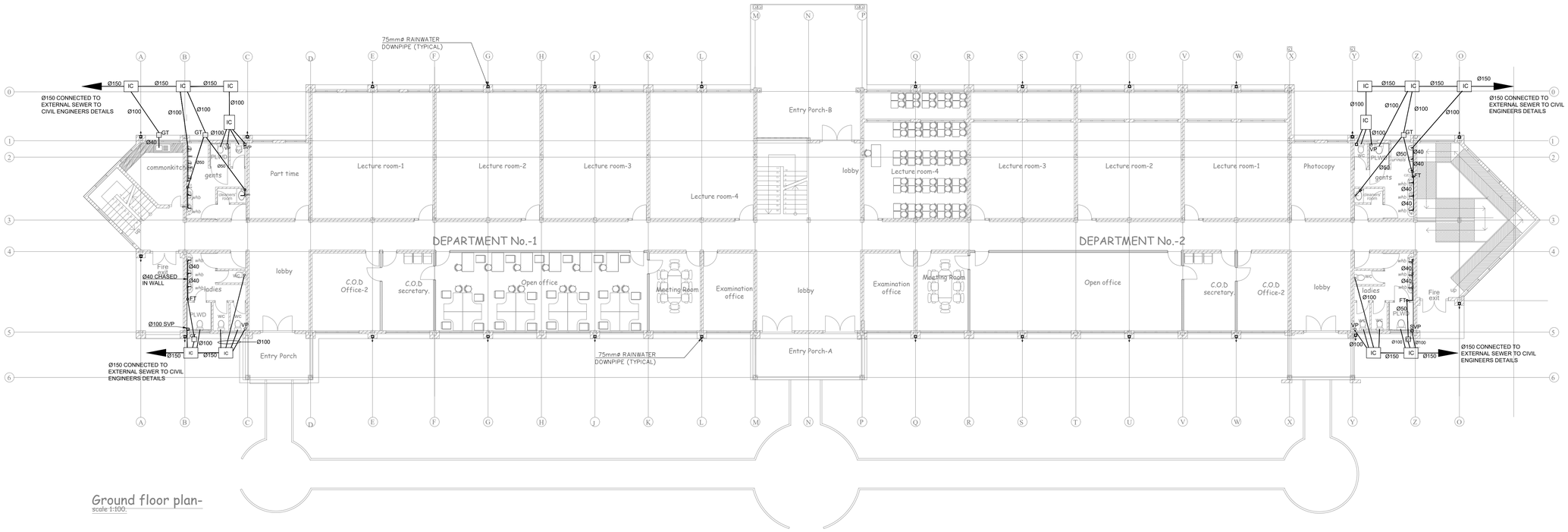
Drawing Title

TUITION BLOCK B
DRAWING LEGEND & GENERAL NOTES

Designed by SN	Drawn by COD
Checked by NKM	Approved by NKM
Scale As Shown(A1size)	Date JUNE'22
Job No. 10295K	ACAD File: TB–M–PD–R–001T0
T STATUS	DRG No. LUC/TB/M/PD/R/001 TO REV



Ground floor plan-
scale 1:100

NOTES

FOR TENDER
Signed: Technical Lead _____

REV	REVISIONS		SIGN	DATE	APPROVED
		BY			
		CHECKED			
		BY			
		CHECKED			
		BY			
		CHECKED			
T0	ISSUED FOR TENDER	BY	COD	JUN'22	
		CHECKED			

Project

PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY -COMPLETION OF TUITION BLOCK B

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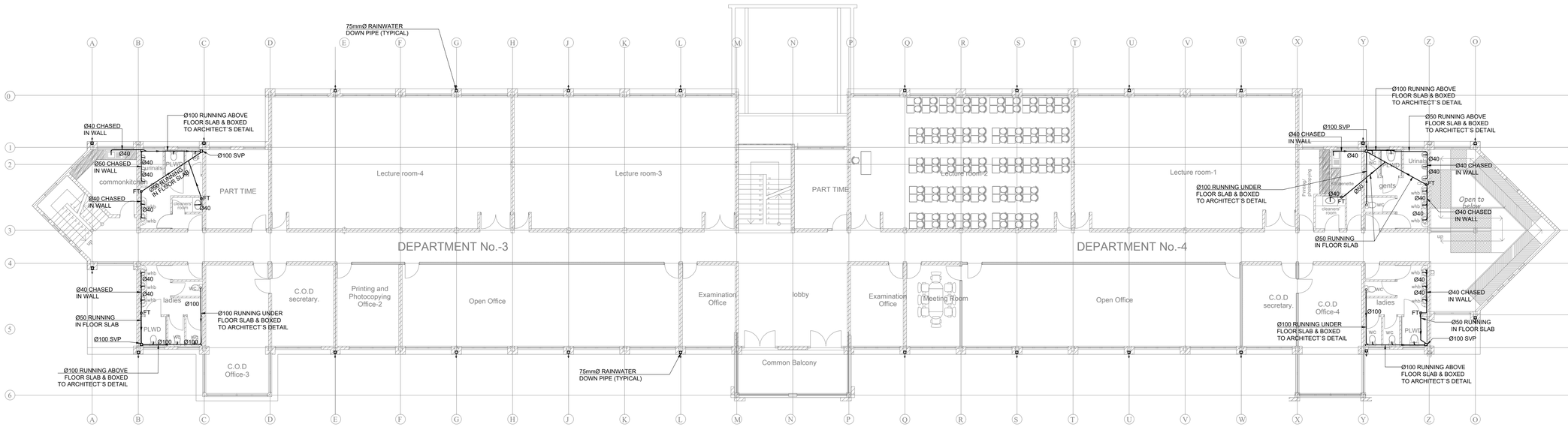
Drawing Title

TUITION BLOCK B
GROUND FLOOR–MECHANICAL SERVICES
FOUL & RAIN WATER DRAINAGE

Designed by	SN	Drawn by	C.O.D
Checked by	NKM	Approved by	NKM
Scale	As Shown(A1size)	Date	JUNE'22
Job No.	10295K	ACAD File:	TB–M–PD–G–001T0
T STATUS	DRG No. LUC/TB/M/PD/G/001		T0 REV



First floor plan-
scale 1:100.

first floor plan—

NOTES

FOR TENDER
Signed: Technical Lead _____

REV	REVISIONS		SIGN	DATE	APPROVED
		BY			
		CHECKED			
		BY			
		CHECKED			
		BY			
		CHECKED			
T0	ISSUED FOR TENDER	BY	COD	JUN'22	
		CHECKED			

Project

PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY -COMPLETION OF TUITION BLOCK B

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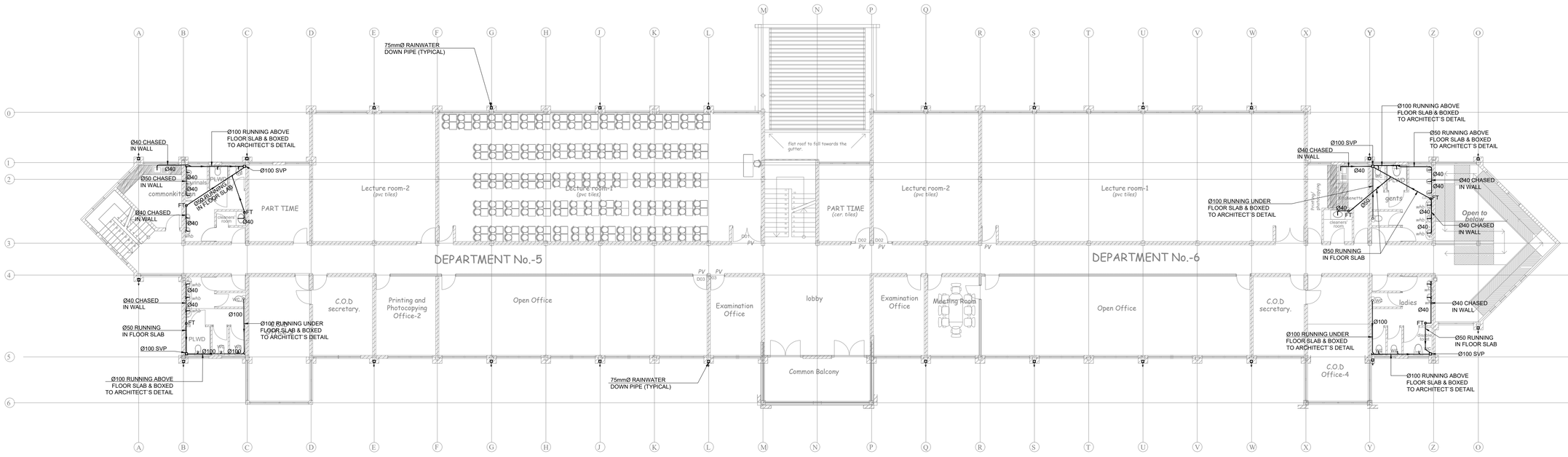
Drawing Title

TUITION BLOCK B
FIRST FLOOR-MECHANICAL SERVICES
FOUL & RAIN WATER DRAINAGE

Designed by SN	Drawn by COD
Checked by NKM	Approved by NKM
Scale As Shown(A1size)	Date JUNE'22
Job No. 10295K	ACAD File: TB-M-PD-G-002T0
T STATUS	DRG No. LUC/TB/M/PD/G/002 TO REV



Second floor plan-
scale 1:100

NOTES

FOR TENDER
Signed: Technical Lead _____

REV	REVISIONS		SIGN	DATE	APPROVED
		BY			
		CHECKED			
		BY			
		CHECKED			
		BY			
		CHECKED			
T0	ISSUED FOR TENDER	BY	COD	JUN'22	
		CHECKED			

Project

PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY -COMPLETION OF TUITION BLOCK B

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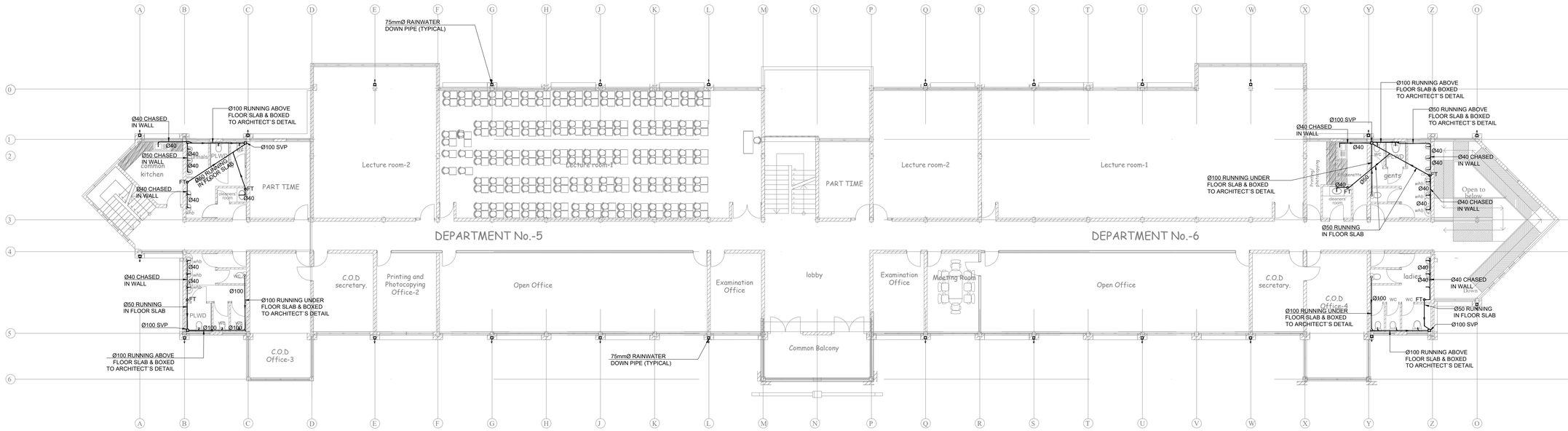
Drawing Title

TUITION BLOCK B
SECOND FLOOR-MECHANICAL SERVICES
FOUL & RAIN WATER DRAINAGE

Designed by SN		Drawn by C.O.D	
Checked by NKM		Approved by NKM	
Scale As Shown(A1size)		Date JUNE'22	
Job No.	10295K	ACAD File: TB-M-PD-G-003T0	
T STATUS	DRG No. LUC/TB/M/PD/G/003		TO REV



Third floor plan-
scale 1:100.

NOTES

FOR TENDER
Signed: Technical Lead _____

REV	REVISIONS		SIGN	DATE	APPROVED
		BY			
		CHECKED			
		BY			
		CHECKED			
		BY			
		CHECKED			
TO	ISSUED FOR TENDER	BY	COD	JUN'22	
		CHECKED			

Project

PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY -COMPLETION OF TUITION BLOCK B

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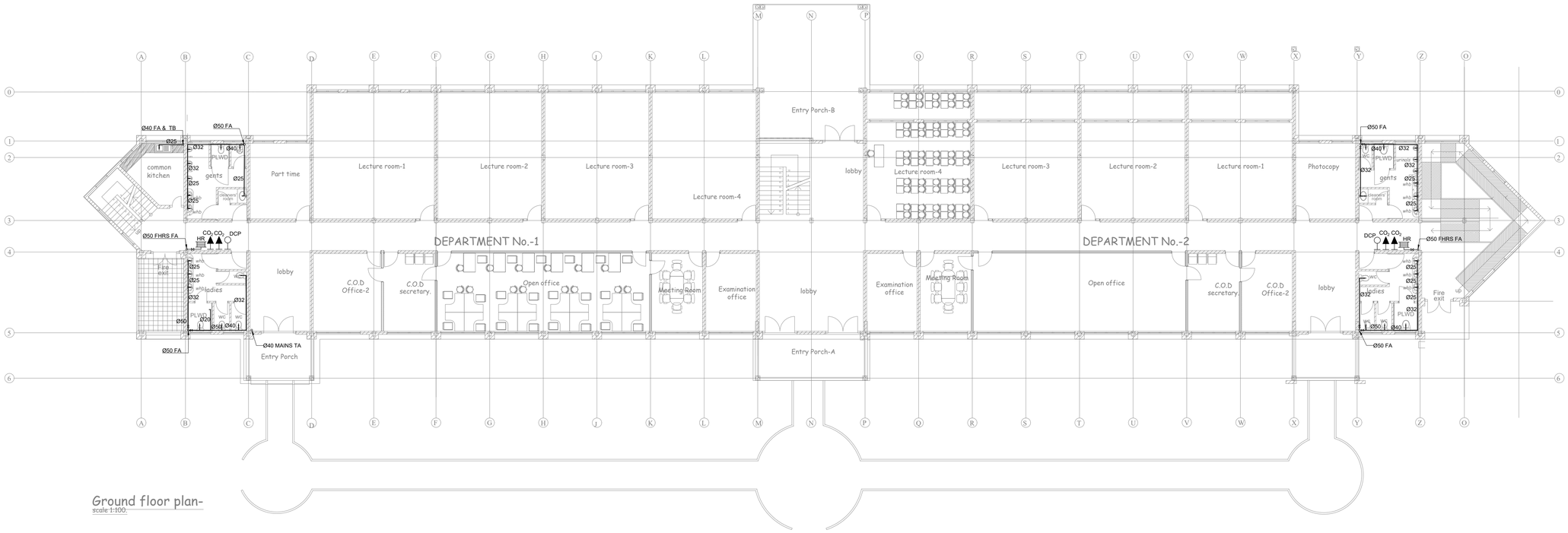
Drawing Title

TUITION BLOCK B
THIRD FLOOR–MECHANICAL SERVICES
FOUL & RAIN WATER DRAINAGE

Designed by SN	Drawn by COD
Checked by NKM	Approved by NKM
Scale As Shown(A1size)	Date JUNE'22
Job No. 10295K	ACAD File: TB-M-PD-G-004T0

T STATUS	DRG No. LUC/TB/M/PD/G/004	TO REV



Ground floor plan-
scale 1:100

NOTES

FOR TENDER
Signed: Technical Lead _____

REV	REVISIONS		SIGN	DATE	APPROVED
		BY			
		CHECKED			
		BY			
		CHECKED			
		BY			
		CHECKED			
T0	ISSUED FOR TENDER	BY	COD	JUN'22	
		CHECKED			

Project
PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY -COMPLETION OF TUITION BLOCK B

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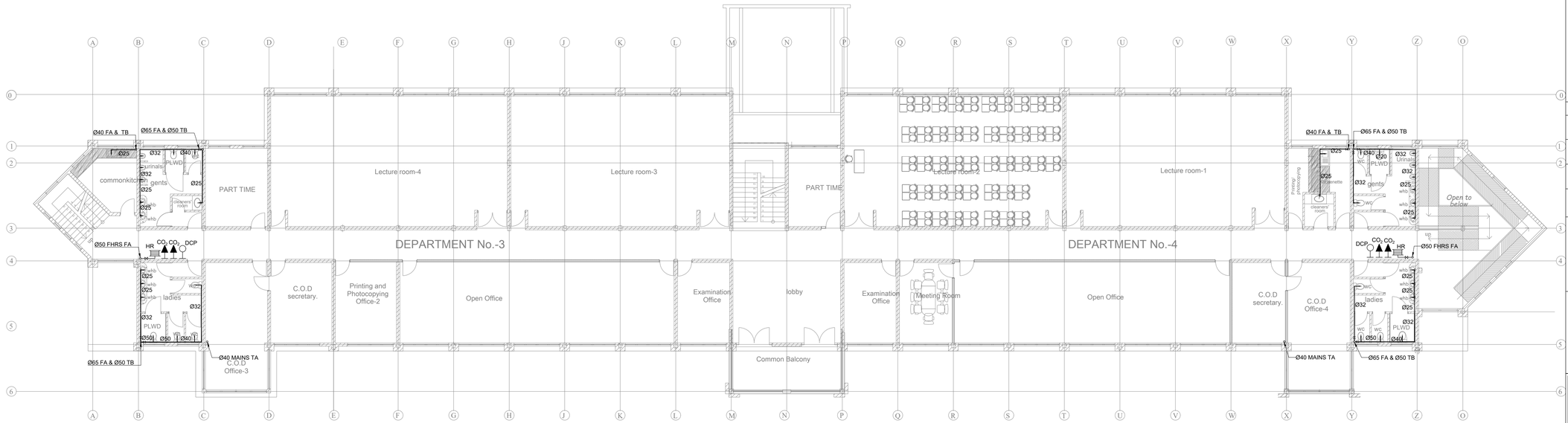
Drawing Title
TUITION BLOCK B
GROUND FLOOR–MECHANICAL SERVICES
PLUMBING & FIRE FIGHTING

Designed by SN		Drawn by COD	
Checked by NKM		Approved by NKM	
Scale As Shown(A1size)		Date JUNE'22	
Job No.	10295K	ACAD File: TB–M–PD–G–005T0	
T STATUS	DRG No. LUC/TB/M/PD/G/005		T0 REV



First floor plan-
scale 1:100.

NOTES

FOR TENDER
Signed: Technical Lead _____

REV	REVISIONS		SIGN	DATE	APPROVED
		BY			
		CHECKED			
		BY			
		CHECKED			
		BY			
		CHECKED			
T0	ISSUED FOR TENDER	BY	COD	JUN'22	
		CHECKED			

Project
PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY -COMPLETION OF TUITION BLOCK B

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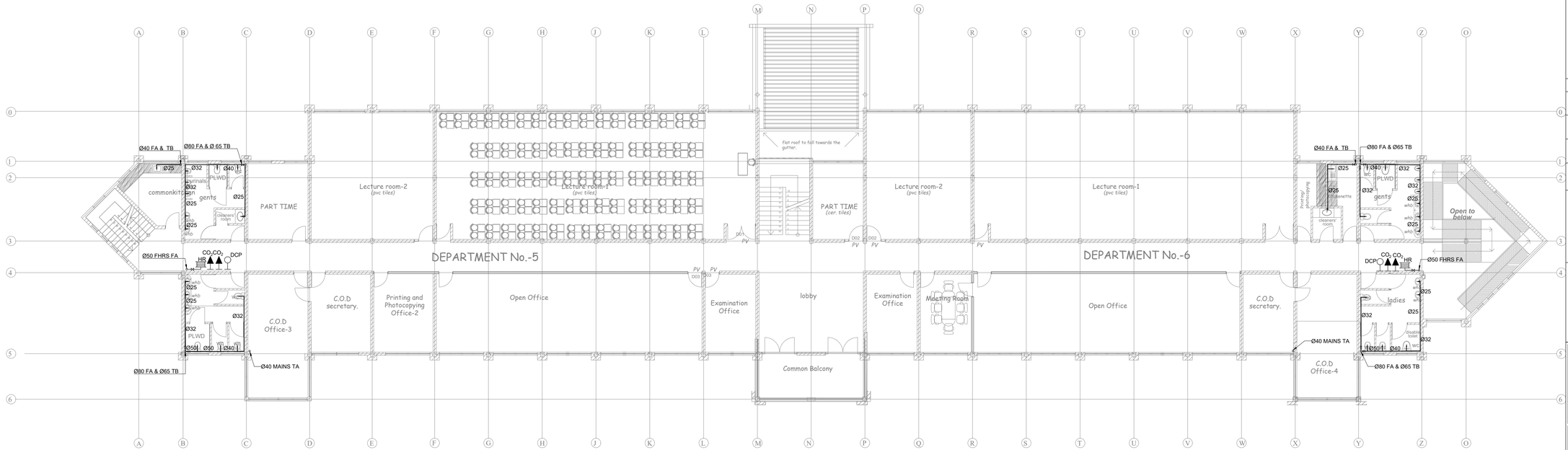
Drawing Title
TUITION BLOCK B
FIRST FLOOR–MECHANICAL SERVICES
PLUMBING & FIRE FIGHTING

Designed by SN	Drawn by COD
Checked by NKM	Approved by NKM
Scale As Shown(A1size)	Date JUNE'22
Job No. 10295K	ACAD File: TB–M–PD–G–0067O
T STATUS	DRG No. LUC/TB/M/PD/G/006 TO REV



Second floor plan-

scale 1:100

NOTES

FOR TENDER

Signed: Technical Lead _____

REV	REVISIONS		SIGN	DATE	APPROVED
		BY			
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		BY			
		CHECKED			
		BY			
		CHECKED			
T0	ISSUED FOR TENDER	BY	DN	JUN'22	
		CHECKED			

Project

PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY -COMPLETION OF TUITION BLOCK B

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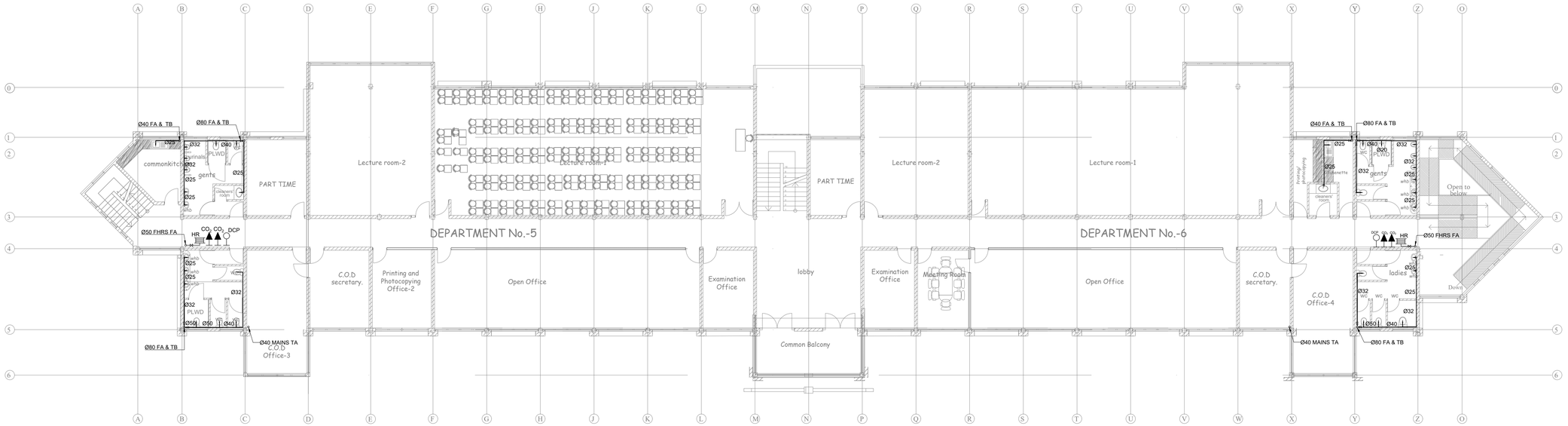
Drawing Title

TUITION BLOCK B
SECOND FLOOR–MECHANICAL SERVICES
PLUMBING & FIRE FIGHTING

Designed by SN	Drawn by COD
Checked by NKM	Approved by NKM
Scale As Shown(A1size)	Date JUNE'22
Job No. 10295K	ACAD File: TB–M–PD–G–007T0
T STATUS	DRG No. LUC/TB/M/PD/G/007	TO REV



Third floor plan-

scale 1:100

NOTES

FOR TENDER

Signed: Technical Lead _____

REV	REVISIONS		SIGN	DATE	APPROVED
		BY			
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		BY			
		CHECKED			
T0	ISSUED FOR TENDER	BY	COD	JUN'22	
		CHECKED			

Project

PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY -COMPLETION OF TUITION BLOCK B

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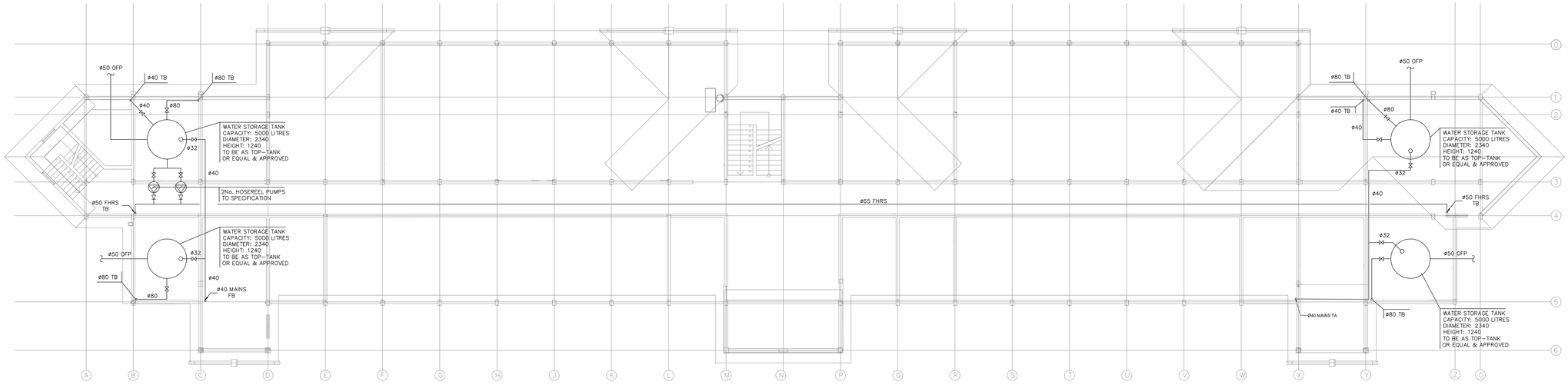
Drawing Title

TUITION BLOCK B
THIRD FLOOR–MECHANICAL SERVICES
PLUMBING & FIRE FIGHTING

Designed by SN	Drawn by COD
Checked by NKM	Approved by NKM
Scale As Shown(A1size)	Date JUNE'22
Job No. 10295K	ACAD File: TB–M–PD–G–0080
T STATUS	DRG No. LUC/TB/M/PD/G/008 TO REV



Roof plan—

scale 1:100.

NOTES

FOR TENDER

Signed: Technical Lead _____

REV	REVISIONS		SIGN	DATE	APPROVED
		BY			
		CHECKED			
		BY			
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		BY			
		CHECKED			
T0	ISSUED FOR TENDER	BY	COD	JUN'22	
		CHECKED			

Project

PROPOSED UPGRADING OF FACILITIES AT LAIKIPIA UNIVERSITY -COMPLETION OF TUITION BLOCK B

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Drawing Title

TUITION BLOCK B
ROOF PLAN—MECHANICAL SERVICES
PLUMBING & FIRE FIGHTING

Designed by	NKM	Drawn by	COD
Checked by	SN	Approved by	NKM
Scale	As Shown(A1size)	Date	JUNE'22
Job No.	10295K	ACAD File:	TB-M-PD-G-009T0
T STATUS	DRG No. LUC/TB/M/PD/G/009		TO REV