

**PROPOSED COMMERCIAL DEVELOPMENT ON PLOT LR NO.  
NAIROBI/BLOCK 40/15 DESAI ROAD, NAIROBI COUNTY FOR  
MWITO DT SACCO LTD**



**FORM OF TENDER**

**CONDITIONS OF CONTRACT**

**SPECIFICATIONS AND BILLS OF QUANTITIES**

**FOR**

**INTERNAL PLUMBING, DRAINAGE AND FIRE FIGHTING**

**INSTALLATION WORKS – PHASE 1**

**VOLUME 2C OF 3**

**ARCHITECTS**

**M&R CONSULT ARCHITECTS  
P.O. BOX 20111 - 00100,  
NAIROBI.**

**CIVIL/STRUCTURAL  
ENGINEERS**

**MANKAN CONSULTING ENGINEERS LTD.  
P.O. BOX 57866 - 00200,  
NAIROBI.**

**QUANTITY SURVEYORS**

**BILLS PARTNERSHIP LTD  
P.O. BOX 27090 - 00100,  
NAIROBI.**

**ELECTRICAL &  
MECHANICAL ENGINEERS**

**METROCOM CONSULTANTS LTD  
P.O. BOX 27090 - 00100,  
NAIROBI.**

**MARCH, 2025**

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**FORM OF TENDER**  
**PROPOSED COMMERCIAL DEVELOPMENT ON PLOT LR NO. NAIROBI/BLOCK 40/15**  
**DESAI ROAD, NAIROBI COUNTY FOR MWITO DT SACCO LTD**

**INTERNAL PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS**

1. Having examined the Drawings, Conditions of Contract, Standard and Particular Specifications and Bills of Quantities for the works described in these documents we, the undersigned, offer to construct, complete and maintain the whole of the said works in conformity with the said Drawings, Conditions of Contract, Standard and Particular Specifications and Bills of Quantities for the sum of Kenya Shillings:

(Amount in words): .....

.....

(Amount in figures) Kshs.:.....

2. We undertake, if our Tender is accepted, to commence the works immediately on receipt of Architect's or Employer's order to commence.
3. Within ten (10) days of the written notice of acceptance of our Tender, we will execute the formal sub-Contract Agreement.
4. We understand that if our tender is accepted, we will be required to carry out the work as nominated Sub-Contractor to the Main Contractor.
5. We agree to abide by this Tender for a Period of Ninety (90) days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
6. Unless and until a formal Agreement is prepared and executed, this Tender together with your written acceptance thereof, shall constitute a binding Contract between us.
7. We undertake that you are not bound to accept the lowest or any Tender you may receive and that no expenses incurred by me/us in the preparation of this Tender will be allowed.

TENDERER:.....

.....

SIGNATURE:.....

DATE:.....

WITNESS:.....

SIGNATURE:.....

DATE:.....

## **TENDER QUESTIONNAIRE**

1. Full names of tenderer

.....

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

.....

3. Telephone number(s) of tenderer

.....

4. Postal Address of tenderer

.....

5. Name of tenderers representative to be contacted on matters of the tender  
during the tender period.

.....

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

.....

.....

\_\_\_\_\_  
Signature of Tender

## CONFIDENTIAL BUSINESS QUESTIONNAIRE

You are requested to give the particulars indicated in Part1 and either Part 2(a), 2(b) or 2(c) and 2(d) whichever applies to your type of business.

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

### ***Part 1 - General***

Business Name.....

Location of business premises; Country/Town.....

Plot No..... Street/Road .....

Postal Address ..... Tel. No.....

Nature of Business .....

Current Trade License No..... Expiring date.....

Maximum value of business which you can handle at any time: K. pound.....

Name of your bankers.....

Branch.....

### ***Part 2(a) - Sole Proprietor***

Your name in full..... Age.....

Nationality..... Country of Origin.....

Citizenship details.....

### ***Part 2(b) - Partnership***

*Give details of partners as follows:*

*Name in full Nationality Citizenship Details Shares*

1 .....

2 .....

3 .....

### ***Part 2(c) - Registered Company***

Private or public .....

State the nominal and issued capital of the company-

Nominal Kshs .....

Issued Kshs .....

Give details of all the director as follows:

*Name in full Nationality Citizenship Details\* Shares*

1 .....

2 .....

3 .....

***Part 2(d) - Interest in the Firm:***

Is there any person/persons in ..... (*Name of Employer*) who has interest in this firm?

Yes/No.....

..... (Delete as necessary).

I certify that the above information is correct.

.....

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

· Attach proof of citizenship

**DETAILS OF SUB-CONTRACTORS**

If the Tenderer wishes to sublet any portion of the Works under any heading, he must give below details of the

sub-contractors he intends to employ for each portion.

Failure to comply with this requirement may invalidate the tender.

(1) Portion of works to be sublet: .....

(i) Full name of Sub-contractor

And address of head office: .....

.....

(ii) Sub-contractors experience of similar works carried out in the last 3 years with

Contract value: .....

.....

.....

(2) Portion of works to be sublet: .....

(i) Full name of sub-contractor

And address of head office: .....

.....

(ii) Sub-contractors experience

of similar works carried out

in the last 3 years with

Contract value .....

.....

\_\_\_\_\_  
[Signature of Tenderer] Date

PART A  
PRELIMINARIES  
AND  
GENERAL CONDITIONS

## PART A

### PRELIMINARIES AND GENERAL CONDITIONS

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## PART A

### PRELIMINARIES AND GENERAL CONDITIONS

#### Definition of Terms

Throughout this document, the following terms shall be interpreted as follows: -

Employer: - Mwito DT Sacco Ltd  
P O Box 56763 - 00200  
Nairobi

and shall include their legal personal representatives or successors.

Architect: - M&R Consult Architects  
P.O. Box 20111 - 00100,  
NAIROBI

and shall include their legal personal representatives or successors.

Quantity Surveyors: - Bills Partnership Ltd.  
P.O. Box 27090 - 00100  
NAIROBI

and shall include their legal personal representatives or successors.

Civil/Structural Engineers: - Mankan Consulting Engineers Ltd.  
P.O. Box 57866 - 00200,  
NAIROBI

and shall include their legal personal representatives or successors.

Electrical/Mechanical Services Engineers: -

Metrocom Consultants Ltd,  
P O Box 27090 – 00100,  
NAIROBI

and shall include their legal personal representatives or successors.

Sub-Contractor: - shall mean the person or persons, partnership, firm or company whose Tender for this work has been accepted and who has signed a Sub-Contract Agreement with the Main contractor of which this document is forming part and shall include his or their legal personal representative or successors.

Sub-Contract Works: - shall mean all or any portion of the work material and articles, whether the same are being manufactured or prepared, which are to be used in the execution of this Sub-Contract and whether the same may be on site or not.

1.02 Site

The site of the proposed works is **Desai Road, Nairobi County.**

1.03 Contract

The successful tenderer will be appointed as a nominated Sub-Contractor to the Main Contractor under the latest edition of the Agreement and Schedule of Conditions of Building Sub-Contract published by the Kenya Association of Building and Civil Engineering Contractors.

The Particular and 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 Bills and allow for all costs incurred.

Copies of the Main Contract Agreement, Conditions of Contract, Bills of Quantities for the main contract can be seen at the offices of the Project Quantity Surveyors.

1.04 Appendix to the Schedule of Conditions of Main Contract

The Appendix to the Conditions of Main Contract has been completed as follows: -

Defects Liability Period ) Clause 15, 16 and 30 )	6 months from the date of Practical Completion
Percentage to cover ) Professional fees for ) Insurance purposes )	Fourteen Percent Plus VAT (14%)
Date of Possession ) Clause 21 )	In accordance with the Main Contractor's Programme
Date of Practical ) Completion ) Clause 21 )	In accordance with the Main Contractor's Programme
Liquidated and Ascertained ) Damages ) Clause 22 )	In accordance with the Main Contract
Percentage of certified ) value retained ) Clause 30 (3) )	10%

Limit of retention Fund)	To be inserted at a sum
Clause 30 (3) )	equivalent of 5% of the
)	Contract Sum.

Period of Final )	6 Months from certified
Measurement and valuation)	Practical completion of
Clause 30 (5) )	the Works.

Amount of Surety for )	10% of contract sum
Contractor's Performance)	
Bond )	
Clause 31 (1) )	

Amount of Surety for )	Not Applicable
Employer's Performance)	
Bond )	
Clause 31 (2) )	

1.05 Performance Bond

All tenderers will submit the name of an approved Surety who will be willing to be bound to the Main Contractor in an amount equal to 10% of the Sub-Contract amount.

1.06 Stamp Charges

The tender shall be inclusive of payment of stamp charges in connection with the Surety Bond and Contract Agreement.

1.07 Firm Price Contract

The tenderers' attention is drawn to the fact that this is a firm price contract. No claim for increased costs will be entertained and the Sub-Contractor must allow in his tender price for any increase in the cost of labour, materials and plant which may occur during the currency of the sub-contract.

The tenderer's attention is also drawn to the fact that although the contract is a Firm Price Contract, premature delivery of materials shall not be entertained nor paid for. For the purposes of this clause, premature delivery of materials shall be taken as materials delivered one month before they are required on site. The tenderers should allow in their tender prices for this special condition.

1.08 VALUE ADDED TAX (VAT) ON CONSTRUCTION SERVICES

The tenderers' attention is drawn to the Finance Bill 1993 and the Kenya Governments' latest regulations on Value Added Tax (VAT) subjecting all construction services to a VAT rating of Sixteen Percent (16%).

Tenderers are therefore required to allow for this in their prices.

1.09 Trade Names

Where trade names or manufacturer's catalogue numbers are mentioned in the specification, the reference is deemed to be the type of article or quality of material required.

1.10 Water and Electricity for the Works

These will be made available by the Main Contractor free of Costs.

1.11 Time For Completion

There is need to complete the work in the time stated. The Sub-Contractor shall make all due preparations to safeguard against factors such as labour shifts, fluctuating weather patterns etc., that might slow his progress and no claims for extras will be considered on account of his failure to do so.

1.12 Warranty

The sub-contractor must furnish the Engineer with a general written warranty covering quality of workmanship, materials and equipment and be compelled thereby for a five year period after practical completion of the contract, except for latent defects which shall be warranted for ten years.

The Sub-Contractors must make good, at his own expense, such repairs and replacement as may be required as consequences of negligent workmanship or defective material. The Sub-Contractor must also procure such warrants and guarantees as described aforesaid from all manufacturers and/or suppliers of materials or equipment incorporated in the project under this contract.

1.13 Storage

Space and sheds for storage will be provided on the site by the Main Contractor. The Main Contractor will also be responsible for the provision of security on site. Security locking devices shall be the responsibility of the Sub-Contractor.

1.14 Samples

The Sub-Contractor shall furnish at his own cost any samples materials or workmanship that may be called for by the Engineer for his approval, and any further samples in the case of rejection until such samples are approved by the Engineer, and the Engineer may reject any materials or workmanship not in his opinion up to the approved samples.

1.15 Protection

The Sub-Contractor shall adequately cover up and protect his own work to prevent injury and also cover up and protect from damage all parts of the building or premises where work is being performed by him under the contract.

1.16 Handing Over

The Sub-Contract works shall be considered complete and the defects liability period shall commence only when the sub-contract works and supporting services have been tested, commissioned and operated to the satisfaction of the Engineer.

1.17 Defects After Completion

The Defects Liability Period will be six months from the date of completion of the Sub-Contract as certified by the Engineer.

1.18 Insurance Against Injury to Person and Property

The Sub-Contractor shall allow for maintaining insurance cover to the value of Shillings Three Million (KShs.3,000,000/=) for any one accident or series of accident arising out of any event (unlimited in aggregate).

1.19 Stamp Charges

The tenderer shall allow for the payment of all stamp charges in connection with the Surety Bond and Sub-Contract Agreement.

1.20 Payments

Payment will be made through certificates to the Main Contractor, unless he specifically agrees to forgo this right, in which case direct payment can be made to the Sub-Contractor. All payments will be less retention as specified in the Main Contract. No payment will become due until materials are delivered to the site.

1.21 Damages for Delay

Liquidated and Ascertained damages as stated in the Main Agreement will be claimed against the Sub-Contractor for any unauthorised delay in completion. The Sub-Contractor will be held liable for the whole or a portion of these damages should he cause delay in completion.

1.22 Clear Away on Completion

The Sub-Contractor shall, upon completion of the works, at his own expense remove and clear away all plant, equipment, rubbish and unused materials, and shall leave the whole of the works in a clean and tidy state, to the satisfaction of the Engineer.

1.23 Site Conditions

The Sub-Contractor shall be deemed to have visited the site to ascertain all conditions affecting his sub-contract.

1.24 No Workman to Be Housed on Site

No labourer with exception of a watchman may be housed on site.

The cost of transporting labour to and from site will be deemed to have been included in the tender.

1.25 Procedure

The Sub-Contractor shall proceed with works in such a manner and such order as the Architect may direct. The Sub-Contractor's procedure and programme must conform to the Main Contractor's programme for the Construction of Building works services.

1.26 Alternatives

Tenders are to be based strictly upon the specification attached but alternative prices for specifications of the same intent but differing in details, may be submitted in addition to this tender.

1.27 The Final Account

On completion of the work, the subcontractor shall agree with the Architect/Engineer the value of any variations outstanding as soon as possible thereafter submit to the Architect/Engineer his final statement of account showing the total sum claimed subdivided as follows: -

Statement A: Detailing the tender amount less the prime costs and the provisional sums.

Statement B: Detailing all the variations orders issued on the contract.

Statement C: Summarizing statement A and B and giving the next grand total due to the Sub-Contractor for execution of the contract.

1.28 Validity of Tender

The tender shall remain valid for acceptance within 90 days from the final date of submission of the tender, and this has to be confirmed by signing the bid bond. The Tenderer shall be exempted from this Bond if the tender was previously withdrawn in writing to the Employer before the official opening.

1.29 Variations

No alteration to the Sub-Contract Works shall be carried out until receipt by the Sub-Contractor of WRITTEN INSTRUCTIONS FROM THE ARCHITECT.

Any variation from the contract price in respect of any extra work, alteration or omission requested or sanctioned by the Architect or Engineer shall be agreed and confirmed in writing at the same time such variations are decided and shall not affect the validity of the Contract. Schedule of Unit Rates shall be used to assess the value of such variations. NO ALLOWANCE SHALL BE MADE FOR LOSS OF PROFIT ON OMITTED WORKS.

Where the Architect requires additional work to be performed, the Sub-Contractor, if he considers it necessary, will give notice within 7 days to the Main Contractor of the Length of time he (the Sub-Contractor) requires over and above that allotted for completion of the Sub-Contract. If the Sub-Contractor fails to give such notice, he will be deemed responsible for all claims arising from delay occasioned by reason of such extension of time.



1.30 Insurance Company Fees

The attention is drawn to the Tenderers to allow for all necessary fees, where known, that may be payable in respect of any fees imposed by Insurance Companies or statutory authorities for testing or inspection.

No allowance shall be made to the Sub-Contractor with respect to fees should these have been omitted by the Tenderer due to his negligence in this respect.

1.31 Suppliers

The Sub-Contractor shall submit the names of any approved suppliers for the materials to be incorporated, to the Engineer for approval. The information regarding the names of the suppliers may be submitted at different times, as may be convenient, but no sources of supply will be changed without prior approval.

Each supplier must be willing to admit the Engineer or his representative to his premises during working hours for the purpose of the materials in question.

1.32 Administrative Procedure and Contractual Responsibility

Wherever within the Specification it is mentioned or implied that the Sub-Contractor shall deal directly with the Employer, or Engineer it shall mean "through the Main Contractor" who is responsible to the Employer for the whole of the Works including the Sub-Contract Works.

1.33 Bills of Quantities

The Bills of Quantities have been prepared in accordance with the Standard Method of Measurement of Building Works for East Africa, First Edition, Metric, 1970 and other subsequent revisions. All the Quantities are based on the Contract Drawings and are provisional and they shall not be held to gauge or to limit the amount or description of the work to be executed by the Sub-Contractor but the value thereof shall be deducted from the Sub-Contract sum and the value of the work ordered by the Engineer and executed thereunder shall be measured and valued by the Engineer in accordance with the conditions of the Sub-contract.

All 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 Quantity Surveyor or Engineer. Immediately the work is ready for measuring the Sub-Contractor shall give notice to the Quantity Surveyor or Engineer to carry out measurements before covering up. If the Sub-Contractor shall make default in these respects he shall, if the Architect so directs, uncover the work to enable the necessary measurements to be taken and afterwards reinstate at his own expense.

1.34 Builders' Work

All chasing, cutting away and making good will be done by the Main Contractor but the Sub-Contractor shall mark out in advance and shall be responsible for accuracy of size and position of all holes and chases required.

The Sub-Contractor shall drill and plug holes in floors, walls, ceilings and roof for securing services and equipment requiring screw or bolt fixings.

Any purpose made fixing brackets shall not constituting builders' Work and shall be provided and installed by the Sub-Contractor unless stated hereinafter to the contrary.

1.35 Position of Services, Plant, Equipment, Fittings and Apparatus

The Contract Drawings give a general indication of the intended layout. The positions of the equipment and application, and also the exact routes of the ducts, mains and distribution pipework shall be confirmed before installation is commenced. The exact siting of appliances, pipework, etc., may vary from that indicated.

The routes of services and positions of apparatus shall be determined by approved dimensions detailed in the Working Drawings or on Site by the Engineer in consultation with the Sub-Contractor or the Main Contractor.

Services throughout the ducts shall be arranged to allow maximum access along the ducts and the services shall be readily accessible for maintenance. Any work which has to be re-done due to negligence in this respect shall be the Sub-Contractor's responsibility.

The Sub-Contractor shall be deemed to have allowed in his Sub-Contract Sum for locating terminal points of services (e.g., lighting, switches, socket outlets, lighting points, control switches, thermostats and other initiating devices, taps, stop cocks) in positions plus or minus 20 mm horizontally and vertically from the locations shown on 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 and with the approval of the Engineer.

1.36 Identification of Plant and Components

The Sub-Contract shall supply and fix identification labels to all plant, starters, switches and items of control equipment including valves, with white triphylite or equal labels engraved in red lettering denoting its name, function and section controlled. The labels shall be mounted on equipment and in the most convenient positions. Care shall be taken to ensure the labels can be read without difficulty. This requirement shall be contained within equipment cubicles or plant.

Details of the lettering of the labels and the method of mounting or supporting shall be forwarded to the Engineer for approval prior to manufacture.

1.37 Contract Drawings

The Contract Drawings when read in conjunction with the text of the Specification, have been completed in such detail as was considered necessary to enable competitive tenders to be obtained for the execution and completion of the Sub-Contract Works.

The Contract Drawings are not intended to be Working Drawings and shall not be used as such unless exceptionally they are released for that purpose.

1.38 Working Drawings

The Sub-Contractor shall prepare such working drawings as may be necessary. The working drawings shall be complete in such detail not only that the Sub-Contract works can be executed on site but also that the Engineer can approve the Sub-Contractor's proposals, detailed designs and intentions in the execution of the Sub-Contract Works.

If the Sub-Contractor requires any further instructions, details, Contract Drawings or information drawings to enable him to prepare his working drawings or proposals, the Sub-Contractor shall apply in writing to the Engineer not unreasonably close to the date when it is needed.

All working drawings shall be submitted to the Engineer for approval. If not so submitted the Sub-Contractor shall accept at his own cost, the risk that any work commenced or which he intends to commence at site may be rejected.

The Engineer in giving his approval to the working drawings, will presume that any necessary action has been, or shall be taken by the Sub-Contractor to ensure that the installations shown on the working drawings have been cleared with the Main Contractor and any other Sub-Contractors whose installations and works might be affected.

If the Sub-Contractor submits his working drawings to the Engineer without first liaising and obtaining clearance for his installations from the Main Contractor and other Sub-Contractors whose installations and works might be affected, then he shall be liable to pay for any alterations or modification to his own, the Contractor's or other Sub-Contractor's installations and works, which are incurred, notwithstanding any technical or other approval received from the Engineer.

Working drawings to be prepared by the Sub-Contractor shall include but not be restricted to the following: -

- a) Any drawings required by the Main Contractor, or the Engineer to enable structural provision to be made including Builder's Work Drawings or Schedules and those for the detailing of holes, fixings, foundations, cables and pipework ducting below or above ground or in or outside or below buildings.
- b) General Arrangement drawings of all plant, control boards, fittings and apparatus or any part thereof and of installation layout arrangements of such plant and apparatus.
- c) Schematic layout drawings of services and of control equipment.
- d) Layout drawings of all embedded and non-embedded pipework ducts, electrical conduit.
- e) Complete circuit drawings of the equipment, together with associated circuit description.
- f) Such other drawings as are called for in the text of the Specification or schedules or as the Engineer may be reasonably require Three copies of all Working Drawings shall be submitted to the Engineer for approval.

Approved working drawings shall not be departed from except as may be approved or directed by the Engineer.

Approval by the Engineer of working drawings shall neither relieve the Sub-Contractor of any of his obligations under the Sub-Contract Agreement nor relieve him from correcting any errors found subsequently in the approved working drawings or other working drawings and in the Sub-Contract period and in a manner that would receive the approval of the Engineer.

1.39 Record Drawings (as installed) and Instructions

During the execution of the Sub-Contract Works the Sub-Contractor shall, in a manner approved by the Engineer record on working or other drawings at site all information necessary for preparing Record Drawings of the installed Sub-Contract Works. Marked-up working or other drawings and other documents shall be made available to the Engineer as he may require for inspection and checking.

Record Drawings may, subject to the approval of the Engineer include approved working drawings adjusted as necessary and certified by the Sub-Contractor as a correct record of the installation of the Sub-Contract Works.

They shall include but are not restricted to the following drawings or information: -

- a) Working Drawings amended as necessary but titled "record drawings" and certified as a true record of the "as installed" Sub-Contract Works. Subject to the approval of the Engineer such working drawings as may be inappropriate may be omitted.
- b) Fully dimension drawings of all plant and apparatus.
- c) General arrangement drawings of equipment, other areas containing plant forming part of the Sub-Contract Works and the like, indicating the accurate size and location of plant and apparatus suitably cross-referenced to the drawings mentioned in (b) above and hereinafter.
- d) Route, types, sizes and arrangement of all pipework and ductwork including date of installation of underground pipe.
- e) Relay adjustment charts and manuals.
- f) Routes, types, sizes and arrangements of all electric cables, conduits ducts and wiring including the date of installation of buried work.
- g) System Schematic and trunking diagrams showing all salient information relating to control and instrumentation.
- h) Grading Charts.
- i) Valves schedules and locations suitably cross-referenced.
- j) Wiring and piping diagrams of plant and apparatus.

- k) Schematic diagrams of individual plant, apparatus and switch and control boards.  
These diagrams to include those peculiar to individual plant or apparatus and also those applicable to system operation as a whole.

l) Operating Instruction

Schematic and wiring diagrams shall not be manufacturer's multi-purpose general issue drawings, they shall be prepared specially for the Sub-Contract Works and shall contain no spurious or irrelevant information.

Marked-up drawings of the installation of the Sub-Contract Works shall be kept up to date and completed by the date of practical or section completion. Two copies of the Record Drawings of Sub-Contract Works and two sets of the relay adjustment and grading charts and schematic diagrams of stiff backing shall be provided not later than one month later.

The Sub-Contractor shall supply for fixing in Sub-Stations switch rooms, boiler houses, plant rooms, pump houses, the office of the maintenance Engineer and other like places, suitable valve and instructions charts, schematic diagrams of instrumentation and of the electrical reticulation as may be requested by the Engineer providing that the charts, diagrams etc., related to installations forming part of the Sub-Contract Works. All such charts and diagrams shall be of suitable plastic material on a stiff backing and must be approved by the Engineer before final printing.

Notwithstanding the Sub-Contractor's obligations referred to above, if the Sub-Contractor fails to produce to the Engineer's approval, either: -

- a) the marked-up drawings during the execution of the Sub-Contract Works, or
- b) the record drawings, etc., within one month of Section or Practical Completion,

The Engineer shall have these drawings produced by others. The cost of obtaining the necessary information and preparing such drawings, etc., will be recovered from the Sub-Contractor.

#### 1.40 Maintenance Manual

Upon practical completion of the Sub-Contract Works, the Sub-Contractor shall furnish to the Engineer four copies of a Maintenance Manual relating to the installation forming part of all of the Sub-Contract Works.

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

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

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

- a) System Description
- b) Plant
- c) Valve or Duct Operation
- d) Switch Operation
- e) Procedure of Fault Finding
- f) Emergency Procedures
- g) Lubrication Requirements
- h) Maintenance and Servicing periods and procedures
- i) Colour Coding Legend for all Services
- j) Schematic and Wiring Diagrams of Plant and Apparatus
- k) Record Drawings, true to scale, folded to International A4 size
- l) Lists of Primary and Secondary spares

The manual is to be specially prepared for the Sub-Contract Works and manufacturer's standard descriptive literature and plant operating instruction cards will be accepted for inclusion unless exceptionally approved by the Engineer. The Sub-Contractor shall, however, affix such cards, if suitable, adjacent to plant and apparatus. One spare set of all such cards shall be furnished to the Engineer.

#### 1.41 Hand Over

The Sub-Contract Works shall be considered complete and the maintenance and defects liability period shall commence only when the Sub-Contract Works and supporting services have been tested, commissioned and operated to the satisfaction of the Engineer and Officially approved and accepted by the Employer, provided always that the handing over of the Main contract Works.

The procedure to be followed will be as follows: -

- a) On completion of the Sub-Contract Works to the satisfaction of the Engineer and the Employer, the Sub-Contractor shall request the Engineer to arrange for handing over.
- b) The Engineer shall arrange a Hand over Meeting or a series thereof, at site.

- c) The Sub-Contractor shall arrange with the Engineer and Employer for a complete demonstration of each and every service to be carried out and for instruction to be given to the relevant operation staff and other representatives of the Employer.
- d) The Sub-Contractor shall prepare approved Hand Over Certificates and full check list of all controls and items of equipment, tools, spares and the like.
- e) In the presence of the Employer and the Engineer, Hand Over will take place, subject to agreement of the Hand Over Certificates and associated check lists.

1.42 Painting

It will be deemed that the Sub-Contractor allowed for all protective and finish painting in the Sub-Contract Sum for the Sub-Contract Works, including colour coding of service pipework to the approval of the Engineer. Any special requirements are described in the text of the Specification.

1.43 Spares

The Sub-Contractor shall supply and deliver such spares suitably protected and boxed to the Engineer's approval as are called for in the Specification or in the Price Schedules.

1.44 Testing and Inspection - Manufactured Plant

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

The right of the Engineer relating to the inspection, examination and testing of plant manufacture shall be applicable to Insurance Companies and Inspection Authorities as nominated by the Engineer.

The Sub-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 certificates has been approved by the Engineer shall be shipped at the Sub-Contractor's own risk and should the test certificate not be approved; new tests may be ordered by the Engineer at the Sub-Contractor's expense.

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

1.45 Testing and Inspection - Installation

Allow for testing each section of the Sub-contract Works installation as described hereinafter to the satisfaction of the Engineer.

1.46 Initial Maintenance

The Sub-Contractor shall make routine maintenance once a month during the liability for the Defects Period and shall carry out all necessary adjustments and repairs, cleaning and oiling of moving parts. A monthly report of the inspection and any work done upon the installation shall be supplied to the Engineer.

The Sub-Contractor shall also provide a 24 hour break-down service to attend to faults on or malfunctioning of the installation between the routine visits of inspection.

The Sub-Contractor shall allow in the Sub-Contract Sum of the initial maintenance, inspection and break-down service and shall provide for all tools, instruments, plant and scaffolding and the transportation thereof, as required for the correct and full execution of these obligations and the provision, use or installation of all materials as oils, greases, sandpaper, etc., or parts which are periodically renewed such as brake linings etc., or parts which are faulty for any reason whatsoever excepting always Acts of God such as storm, tempest, flood, earthquake and civil revolt, acts of war and vandalism.

1.47 Maintenance and Servicing After Completion of the Initial Maintenance

The Sub-Contractor shall, if required, enter into a maintenance and service agreement with the Employer for the installation for a period of up to five years from the day following the last day of the liability for Defects Period which offers the same facilities as specified in Clause B (Initial Maintenance) above.

The terms of any such agreement shall not be less beneficial to the Employer than the terms of agreements for other similar installation.

The Sub-Contractor shall submit with his tender for the Works, a firm quotation for the maintenance and service of the installations as specified herein, which shall be based upon the present day costs and may be varied only to take into account increases in material and labour unit rate costs between the time of tendering and the signing of the formal maintenance and service agreement and which shall remain valid and open for acceptance by the Employer to and including the last day of the fifth complete calendar month following the end of the liability for Defects Period.

1.48 Supervision

During the progress of the works, the Sub-Contractor shall provide and keep constantly available for consultation on site and experienced English-Speaking Supervisor and shall provide reasonable office facilities, attendance, etc., for the Supervisor.

In addition, during the whole of the time the works are under construction, the Sub-Contractor shall maintain on site one experienced foreman or charge-hand and an adequate number of fitters, etc., for the work covered by the specification. The number of this staff shall not be reduced without the prior written approval of the Architect/Engineer.

Any instructions given to the Supervisor on site shall be deemed to have been given to the Sub-Contractor.



One copy of this specification and one copy of each of the contract Drawings (latest issue) must be retained on site at all times, and available for reference by the Engineer or Sub-Contractor.

1.49 Guarantee

The whole of the work will be guaranteed for a period of six months from the date of the Engineer's certification of completion and under such guarantee the Sub-Contractor shall remedy at his expense all defects in materials and apparatus due to faulty, design, construction or workmanship which may develop in that period.

**PART B1**

**GENERAL MECHANICAL SPECIFICATION**

## **PART B1**

### **GENERAL MECHANICAL SPECIFICATION**

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## **PART B1**

### **GENERAL MECHANICAL SPECIFICATION**

#### **1. GENERAL**

This section specifies the general requirements for plant, equipment and material forming part of the Sub-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 Sub-contract works shall be new and of first-class commercial quality, shall be free from defects and imperfections and where indicated shall be of grades and classifications designated herein.

All products or materials not manufactured by the Sub-contractor shall be 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 Sub-contractor.

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

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

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

#### **3. REGULATIONS AND STANDARDS**

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

- (a) The Kenya Government Regulations
- (b) The United Kingdom Institution of Electrical Engineering (IEE) Regulations for the electrical equipment of buildings.
- (c) The United Kingdom Chartered Institute of Building Services Engineers (CIBSE) Guides.
- (d) British Standards 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 Water Authority By-Laws.
- (h) The Kenya Building code of Regulations.

#### **4. ELECTRICAL REQUIREMENTS**

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

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

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

The starting current of all electric motors and equipment shall not exceed the maximum permissible starting currents described in the Kenya Power and Lighting Company's (KP & LC) By-Laws.

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

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

#### **5. TRANSPORT AND STORAGE**

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

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

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

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

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

#### **6. SITE SUPERVISION**

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

## 7. **INSTALLATION**

Installation of all special plant equipment shall be carried out by the Sub-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 Sub-Contractor's attention is drawn to Part "A", Sub-Clauses 1.44 and 1.45 Page A/13 of the "Preliminaries and General Conditions".

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

### 8.2 **Material Tests**

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

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

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

If stock material, which has not been specifically manufactured for the plant and equipment specified is used, then the Sub-Contractor shall submit satisfactory evidence to the Engineer that such materials conform to the requirements stated herein in which case 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 - Works Tests**

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

The Sub-Contractor shall give two weeks notice to the Engineer of the manufacturer's intention to carry out work tests and inspections.

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

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

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

#### **8.4 Pressure Testing**

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

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

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

#### **9. COLOUR CODING**

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

#### **10. WELDING**

##### **10.1 Preparation**

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

##### **10.2 Method**

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

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

##### **10.3 Welding codes and Construction**

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

###### **(a) Pipe Welding**

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

(b) General welding

All welding mild steel components other than pipework shall comply with the general requirements of B.S. 1856.

10.4 **Welders Qualifications**

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

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



PART B2

GENERAL PLUMBING AND DRAINAGE SPECIFICATIONS

## PART B.2

### GENERAL PLUMBING AND DRAINAGE SPECIFICATIONS

#### INDEX

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## SECTION B2

### GENERAL PLUMBING AND DRAINAGE SPECIFICATIONS

#### 2.1 MATERIALS AND STANDARDS

##### 2.1.1 GENERAL

This section specifies the general requirements for plant, equipment and materials forming part of the Plumbing and Drainage Installations.

##### PIPEWORK AND FITTINGS

Pipe materials are to be used as follows: -

##### 2.1.2 Cold Water Mains

Unplasticised PVC or galvanised steel medium or heavy grade, as specified on the drawings.

##### 2.1.3 Black steel Pipework

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

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

All black steel pipework, 80mm nominal bore up to 150mm nominal bore, shall be manufactured to comply in all respects with the specification for 65mm pipe, except that screwed and bolted flanges shall replace unions and couplings for the joining of pipes to valves and other items of plant.

All flanges shall comply with the requirements of BS 10 to the relevant classification contained hereinafter under section C of the Specification.

##### 2.1.4 Galvanised Steel Pipework

Galvanised steel pipework shall be manufactured to comply in all respects with the standards described for black steel pipework in paragraph 2.1.3 above.

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

##### 2.1.5 Copper Tubing

All copper tubing shall be manufactured in accordance with BS 2871 from C.160 "Phosphorus De-oxidized Non-Arsenical Copper" in accordance with BS 1172.

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

Short copper connections tubes between galvanised pipework and sanitary fittings 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 other way than by the use of copper tubing, then a brass straight connector shall be positioned between the galvanised pipe and the copper tube in order to prevent direct contact.

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

##### (b) External Services

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

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

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

#### 2.1.6 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 B.S. 2760. Pipes shall be connected by means of purpose tapered joints manufactured in accordance with B.S. 2760.

Until such 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 B.S. 2760.

### 2.1.7 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 requirement of B.S. 556, Class I, except where otherwise stated.

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

- (1) Flexible spigot and socket type.
- (2) Flexible rebated type (Storm water drainage only)
- (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 B.S. 2494 except where they are likely to be contaminated by oil products, in which case the gaskets shall be manufactured in accordance with B.S. 3514.

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

### 2.1.8 Concrete Pipe

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

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

- 1) Flexible spigot and socket type
- (2) Flexible rebated type (Storm water drainage only)
- (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 B.S. 2494 except where they are likely to be contaminated by oil products, which case the gaskets shall be manufactured in accordance with B.S. 3514.

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

#### 2.1.9 P.V.C. (Hard) Pressure Pipe and Fittings

All P.V.C. pipes and fittings shall be manufactured in accordance with B.S. 3505: 1968 or the relevant Kenya Standard.

Fittings shall comply in all respects with British Standard 4346 Part 1: 1969 or the relevant Kenya Standard. Pipes shall be supplied in plain-ended lengths.

##### Thickness

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

<b>Nom. Dia. (mm)</b>	10	12	20	25	32	40	50	75	100
<b>Thickness (mm)</b>	1.5	1.7	1.9	2.2	2.7	3.1	3.9	5.7	7.3

### Jointing

The method of jointing to be employed shall be that of Solvent welding, using the pipe and manufacturers 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 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.

### Workmanship

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

Pipe Diameter	10mm	15mm	20mm	25mm	32mm	40mm	50mm	75mm	100mm
Horizontal	0.75m	0.90m	1.05m	1.20m	1.35m	1.65m	1.80m	Do	do
Vertical	1.50m	1.80m	2.10m	2.40m	2.70m	3.30m	3.60m	Do	do

Pipes passing through walls or floors shall be sleeved to allow unrestricted movements.

The works shall be inspected and tested during installation.

All work, which will be concealed, shall be tested before it is finally enclosed and verified by the Clerk of Works.

Any other test may be demanded upon completion for soundness and performance to the satisfaction of the Local Water Authority.

### 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.

### Supports to Fittings

In underground installations 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 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 practicable after laying and when the pipeline is 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.

#### 2.1.10 MuPVC Waste Systems

All pipes and fittings shall be manufactured in accordance with B.S. 5255: 1968 or the relevant Kenya Standard.

Pipes 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)
1 1/4	32	1.8
1 1/2	40	1.9
2	50	2.0

### Jointing

The method of jointing to be employed shall be that of Solvent welding, using the pipe and manufacturers 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 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.

### Workmanship

The installation method of jointing shall be solvent welding; and both jointing and fixing shall comply in all respects 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)
1 1/4	32	500	1200
1 1/2	40	500	1200
2	50	900	1200
3	80	900	2000
4	100	1000	2000
6	150	1000	2000

Pipes shall be fixed in straight runs and horizontal runs shall be laid to gradients in conformity with BS 5572 Code of Practice for Sanitary Pipework and in any event not less than 18mm/m unless otherwise specified.

Pipes passing through walls or floors shall be sleeved to allow unrestricted movements.

The works shall be inspected and tested during installation at any stage in accordance with BS 5572. All work, which will be concealed, shall be tested before it is finally enclosed and verified by the Clerk of Works.

Any other test may be demanded upon completion for soundness and performance to the satisfaction of the Local Water Authority.

#### 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.

#### Supports to Fittings

In underground installations 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 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 practicable after laying and when the pipeline is 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.

### 2.1.11 A.B.S. Waste System

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

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

Jointing of pipe shall be carried out by means of solvent welding. The manufacturer's instructions, and B.S. 5572: 1978.

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

Standard brackets, as supplied for use with this system, shall be used wherever possible. Where the building structure renders this impracticable the Sub-contractor shall provide purpose made supports,

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

### 2.1.12 P.V.C. Soil System

The Sub-contractor shall supply and fix P.V.C soil pipe and fittings as indicated on the drawings and schedules.

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

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

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

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

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

#### 2.1.13 uPVC Square Rainwater System Pipe and Gutter

Gutters shall be a rectilinear section 116mm or 137mm wide.

Gutters shall be supplied in plain-ended lengths.

The minimum acceptable wall thickness of gutter shall be 2.20mm.

Rainwater pipes shall be square in section 58mm or 75 mm internal diameter.

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 B.S, 2782.

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

#### 2.1.14 uP.V.C. Rainwater Fittings

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

All gutters, pipe and fittings shall be colour grey to British Standard 5252, 10.A.07, or black, white or rustic.

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.

The minimum acceptable wall thickness of gutter shall be 2.20mm.

Rainwater pipes shall be circular in section, 65mm nominal diameter complying in all 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 B.S. 2782.

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

### 2.1.15 uP.V.C. Underground Drainage System

#### (a) Pipes and fittings

The pipes and fittings shall comply in all respects to British Standard 4660 & 5481 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 pipe shall have a minimum softening point of 82°C when tested by the 'Vicat' method 102D as described in British Standard 2782, and for fittings 79°C.

The pipe and fittings shall be of colour golden brown approximating to British Standard 381C:No.414. The seal retaining caps shall be black polypropylene.

The natural rubber for lip seal joints shall be to British Standard 2494:1976.

Holderbats shall be made of mild steel protected from corrosion by galvanising or search coating for optimum fit to pipe supports a special purpose made P.V.C. packing pieces 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 line 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 jointing shall conform 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. Trench width shall be not less than the outlet diameter of the pipe 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 for below and shall cover the full trench width and length and boned to gradient

(e) Laying and jointing

Pipes and fittings shall be laid true to gradient in straight lines and jointed in accordance with manufacturer's instructions. All pegs used for alignment and other purposes must be removed after use and before side filling. All joints shall be watertight complying with CP.301, Clauses 5:3.

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 filling 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

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

The material may be composed of crushed stone, clinker, quarry scalping, ballast, gravel, shingle or all-in aggregate to British Standard 882.

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

## 2.1.16 VALVES

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

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

### (b) Gate Valves

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

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

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 65 mm nominal bore shall be of bronze construction in accordance with the requirements of B.S. 3061.

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 B.S. 4090.

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

### (e) Ball Valves

All ball valves for use in connection with hot and cold water services shall be of the 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 follow: -

(i)	Low Pressure	3.52Bars maximum
(ii)	Medium Pressure	7.72Bars maximum
(iii)	High Pressure	12.62Bars 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 Sub-contractor Works shall be manufactured in accordance with the requirements of B.S. 1415 from bronze or other corrosion resistant materials.

2.1.17 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 B.S. 1184.

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

(b) Anti-Syphonic Traps

Where anti-syphon traps are specified, these shall be similar or equal to the range of traps manufactured by Greenwood and Hughes Ltd., Deacon Works Littlehampton, Sussex, England.

The trade name for traps manufactured by this company is "Grevak".

2.1.18 PIPE SUPPORTS

(a) General

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

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

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

(b) Steel and Copper Pipes and Tubes

Pipe runs shall be secured by pipe clips connected to pipe hangers, wall brackets, or trapeze type supports. 'U@ bolts shall not be used as a substitute for pipe clips without the prior approval of the Engineer.

An approximate guide to the maximum permissible support spacing in metres for steel and copper pipe and tube is given in the following table for horizontal runs.

<b>Size Nominal Bore</b>	<b>Copper Tube To BS 659</b>	<b>Steel Tube To BS 1387</b>
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	3.5m	4.5m
150mm	4.5m	5.5m

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 straps for attachment to rigid steel support brackets.

When holderbats are used, they shall conform to the requirements of B.S. 416.

Suitable anchors shall be provided at all changes of pipe directions, junctions and tees, to 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 B.S. specification.

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

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

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

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

2.1.19 SANITARY APPLIANCES

All Sanitary appliances supplied and installed as part of the Sub-Contract works shall comply with the general requirements of B.S. Specification.

### 2.1.20 PIPE SLEEVES

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

## 2.2 INSTALLATION

### 2.2.0 GENERAL

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

### 2.2.01 ABOVE GROUND INSTALLATION

#### (a) Water Services

Before any joint is made, the pipes shall be hung in their supports and adjusted ensure that the joining faces are parallel and any falls which all 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 line 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 use equipment shall be installed with adequate access for operation and maintenance. Where valves and other operational equipment are unavoidably installed beyond normal reach or in such position as to be difficult to reach from a short stepladder, extension spindles with floor or wall pedestals shall be provided.

Screwed piping shall be installed with sufficient number of unions of 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 allowance shall be made for the expansion and contraction of pipework, precautions being taken to ensure that any force produced by the pipe movement are not transmitted to valves, equipment or plant.

All screwed joints to piping and fitting shall be made with P.T.F.E. Tape.

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 in that time. A general leakage of one gallon per 25mm of diameter, per 1.6 kilometres per 24 hours per 30 metres head, may be considered reasonable but any visible individual leak shall be repaired.

(b) Sanitary Services

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

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

The Sub-contractor shall provide all necessary rodding and inspection facilities within the draining system in position 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 Sub-contractor shall be responsible for sealing the roof after installation of the stacks.

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

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

(c) Sanitary Appliances

All Sanitary appliances associated with the Sub-contract works shall be installed in accordance with the best standard of modern practice as described in B.S. 5572 to the approval of the Engineer.

2.2.02 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 C.P. 301 AND C.P. 310 respectively and the following clause.

(b) Sequence of Operation for Underground Service Installation

(1) Setting out

As described in B.S. Code of Practice 301 Cause 502.

(2) Breaking Up Surface (If in Roads)

As described in B.S. code of practice 301 Clause 503.

(3) Excavation and Timbering

As described in B.S. code or practice 301 Clause 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 construction shall be commenced on any bottom until the excavation to the correct level with concrete 1: 4: 8 to 38 mm maximum aggregate sizes.

The Sub-contractor's price 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 Sub-contractor shall keep the whole of the trenches or other excavation 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 be discharged into the sewage system without written permission of the Engineer.

(4) Laying of Concrete Beds or Other Support for Pipes (if required)

As described in B.S. code or practice 301 clauses 504 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.

(5) Pipe Laying and Jointing

Drainpipe shall be laid and jointed as described under B.S. code of practice 301 Clause 505.

Pitch fibre drain pipe shall be laid, jointed and cut in accordance with the requirement or the Note contained under Appendix C of B.S. 2760.

Water pipes shall be laid and jointed as described under B.S. code of practice 310, clause 401, 402, 403 and 404.

(6) Manholes

(1) General

All manholes provided under the Sub-contract works shall be constructed or approved materials and in an approved manner.

All manholes shall be watertight and if constructed of brickwork, solid blockwork or stonework, they shall be rendered internally with a cement mortar of at least 12mm thickness and finished with a smooth surface.

The sides of all channels in every manhole shall be brought up vertically to a height of not less than the diameter of the drain and shall be benched in good concrete from the top of the channels at an angle of 30 degree to the horizontal and floated to a smooth hard surface with a coat of 1:1 cement mortar.

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

(ii) Rectangular and Square Manholes

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

Depth below Ground of Outgoing Invert	Internal Access Shaft Dimensions L X W	Size of Main Shaft Diameter	Internal Chamber Dimensions L 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 dimensions of the chamber shall be increased as follow: -

### Length

#### Branch Diameter

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

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

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

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

### Width

#### Branch Diameter

100mm to 300mm for each side with branches plug

160mm 460mm or the diameter of the main drain whichever is the greater.

#### (iii) Precast Concrete Circular Manholes

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

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

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

#### (iv) Step Irons and Covers

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

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

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

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

(v) 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 or practice 301.

(vi) 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.

(7) Testing of Pipelines

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

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

(8) Concrete Bedding, Hunching and Surround

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

(9) Backfilling

Backfilling of trenches, heading and around manholes shall be carried out in accordance with the methods described in B.S. code of practice 301, clause 508.

(10) 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 Sub-Contractor shall be deemed to have allowed in his price for all charges associated with the temporary and final reinstatement requirements of the local highway Authority, whether this is carried out by the Sub-contractor or by the Authority concerned.

No Claims for extra in this respect will be accepted.

(11) Sewer Connection

The Sub-contractor shall pay all charges associated with the connection by the local Authority of the drainage to the Main sewer, including necessary reinstatement.

2.3 TESTING AND INSPECTION

2.3.01 SITE TESTS - PIPEWORK SYSTEMS

(a) Underground Water Mains

After laying, jointly 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 section as the work of laying proceeds and all joints shall be exposed for inspection during the testing.

The open end of the main may be temporarily closed for testing under moderate pressure by fitting a water pipe expanding plug, of which several types are available. The end of the main and the plug should be secured by struts or otherwise, 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 Sub-contractor shall provide suitable end support to withstand the end thrust of the water pressure in the main.

(b) 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 the design working pressure.

If preferred, the Sub-contractor may test the pipelines in section. 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 Sub-contractor and the section re-tested.

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



(c) 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.

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

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

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

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

Testing of manholes shall be carried out in accordance with the methods described under B.S. code of Practise 301, clause 601 (f).

(d) 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 B.S. 5572 1972.

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 other respects, tests shall comply with the requirements of B.S. 5572.

2.3.02 SITE TEST - PERFORMANCE

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

All hot water pipework shall be installed with preformed fibre glass lagging to a thickness of 25mm where the pipe runs above a false ceiling or in areas where the ambient temperature is higher than normal with the result that pipe "seating", 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 a painting as follows: -

- (i) Apply a coating of suitable filler until the canvas weave disappears and allow drying.
- (ii) Apply two undercoats 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 and banded in colours to be approved 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 and described in C.P. 342 and C.P. 310 respectively to the approval of the Engineer.

The test pressure shall be applied by means of a manually operated test pump or, in the case of long main or mains or large diameter, by a power driven test pump or, in the case of long main or mains or 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 Sub-contractor shall be deemed to have included in his price for all test pumps, and other equipment required under this clause of the specification.

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

## 2.4.0 STERILIZATION OF HOT AND COLD WATER SYSTEMS

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

The sterilization procedures shall be carried out by the Sub-Contractor in accordance with the requirements of B.S. code of practice 310, clause 409, to the approval of the Engineer.

## 2.5.0 WATER MAINS

### 2.5.1 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 B.S. 534 - Galvanised Steel Pipes for distribution system shall comply with B.S. 1387 - 1967 medium tubes and be supplied with flanges on pipes 75mm diameter and over.

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

#### 2.5.2 uP.V.C. Pipes

uPVC piping shall be in accordance with B.S. 3505:1968.

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 Clause 2 'Material' and Clause 8.5 'Opacity' of B.S. 3505.

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 end of the pipe with same nominal diameter.

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

The pipes of 75mm diameter and over shall consider 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 on to the outside of the socket area as 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 joint shall take 10% deformation of the spigot at the point 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 lineal deflection up to 30o

The sealing ring shall be of first grade natural rubber and the physical properties of the mix shall meet the requirements of B.S. 2494.

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 as for the pipes to be used. The Contractor shall submit full details 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 out strictly in accordance with the manufacturer's instructions.

#### 2.5.3 Manufacturer's Instructions

The Contractor shall be responsible for obtaining copies of any manufacturer's instructions for pipe jointing and shall familiarise himself and his employees with these instructions.

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

#### 2.5.4 Fittings and Specials for Galvanised Steel Pipes.

All special shall be of such dimensions will mate with piping supplied. Screw down stop valves shall comply with B.S. 1010. Specials shall comply with B.S. 1740.

#### 2.5.5 Flanged Adaptors and Flanges

Flanged adaptors shall be piece suitable for connecting a flanged sluice valve to the type of piping supplied. All flanges or special shall conform to B.S. 10 part 1 and shall be drilled to Table 'C' and machined across the faces. The flanged adaptors shall comply with B.S. 78 and B.S. 3961:1965. All P.V.C. flanges shall be supplied with metal backing rings, jointing of flanges shall be carried out using the joint rings, bolts and washers as necessary.

#### 2.5.6 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 B.S. 10 Table 'C'.

#### 2.5.7 Hydrants

The hydrants shall comprise a 75mm sluice valve and a 75mm Duck foot bend with gunmetal screw connection to details shown on the detailed drawings. These specials shall comply with the requirements of B.S. 750: 1964.

#### 2.5.8 Gate Valves

All gate valves 80mm nominal bore above, other than those required for fitting to buried water mains shall be of cast iron construction in accordance with the requirements of B.S. 3463. All gate valves required for fitting to buried water mains shall be of cast iron construction in accordance with the requirements of B.S. 1218.

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

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

#### 2.5.9 Air Valves

Air valves shall be of cast iron conforming to B.S. 1452 Grade 14. They shall be suitable for working pressures not less than that specified for the class of pipe to which they are connected.

#### 2.5.10 Ball Float Valves

Ball float valves shall be to B.S. 1212 Parts 1 and 2 shall be suitable for a working pressure not than the working pressure for the class of pipe specified for connection to the ball float valve.

#### 2.5.11 Non-Return Valves

Non-return valves shall be of cast iron with flanges and shall conform to B.S. 4090:1966.

#### 2.5.12 Stop Cocks

Stopcocks up to 50mm diameter shall be brass and shall conform to B.S. 1010 Part 1 : 1959 Part 2 : 1973.

#### 2.5.13 Rubber and Insertion Jointing

Rubber and Insertion Jointing for flange joints shall comply with B.S. 2494 Part 1 and no jointing rings shall be used in the Contract, which have not been supplied by manufacturers approved by the Engineer.

#### 2.5.14 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.

#### 2.5.15 Steel Pipe and Fittings for Rising Main

All piping shall be plain ended and suitable for used with flexible mechanical couplings (e.g.viking johnson, Dresser). The grade of steal used shall comply with the requirements of B.S. 3601: 1964. Pipes shall be welded or seamless and shall conform to B.S. 534: 1966 or an equivalent acceptable standard.

All pipes shall be externally and internally protected with bitumen in accordance with clauses 5.4 and 5.5 of B.S. 534:1966.

The external protection shall be reinforced with oven glass cloth glass tissue wrapping or by other approved material. All sheathed or wrapped pipes, fittings and specials shall be protected during transit by straw, wood wool 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.

#### 2.5.16 Drain-Off Taps, Stop Valves for Water Services

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

#### 2.5.17 Storage of Plants and Materials

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

#### 2.5.18 Loading, Handling and Conveying of Pipes

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

#### 2.5.19 Interference with Fences, Drains, Pipes, Property etc

The Contractor shall ensure the proper reinstatement of fences, drains, telephone lines, K P & L. cables etc. where affected by his work. All services shall be adequately protected and propped to the satisfaction of the Engineer. The Contractor shall be liable for any damage caused to the services due to his failure to provide adequate protection.

#### 2.5.20 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 directed by the Engineer, it is intended that the trench shall be excavated to such a depth as will allow of a minimum cover of 500mm 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 trench passes through grassland, arable land or garden, whether enclosed or otherwise, the turf, if any, shall be pared off and stacked, 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 properly trimmed off, and all low places or irregularities shall be levelled up with fine material. 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 dimensions as will 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, wherever 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 rates for excavation. In case the Contractor is instructed by the Engineer to leave any portion of such timber in position, he will be paid for if accordingly.
- (g) The clear width inside the timbering in the case of single pipes shall be at least 320mm in excess of the external diameter of the pipe being 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 excess of the combined external diameters of the pipes.
- (i) Should the excavation 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 cost 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 damage 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.

#### 2.5.21 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 slung and sounded with hand hammer for flaws before they are lowered into the 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 there is a continuous rise from each washout to air valve.

#### 2.5.22 Temporary Bench Marks and Sight Rails.

The Contractor shall fix Sight Rails for use with boning rods at intervals of not more than 65 metres and temporary Bench Marks related to the Survey of Kenya Datum shall be provided at intervals as directed by the Engineer.

#### 2.5.23 Curves and Bends

Large diameter curves of main shall wherever possible be formed by giving a set not exceeding 3° to each joint, bends being used only where large diameter curves are not possible.

#### 2.5.24 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 with the axis. Cuts should be made with an approved from the rotary cutting machine, but the Engineer may approve cutting by oxyacetylene cutters.

#### 2.5.25 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 a full flange width ring.

The bolts shall be tightened up gradually and equally in the customary manner in order to distribute the stress evenly over the flange. If it is found necessary to slightly from the normal run of the flange piping, the deflection shall be obtained by means of bevelled gunmetal ring washer between the flanges.

#### 2.5.26 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.

#### 2.5.27 Fixing of Valves, Air Valves and Washout Pipes.

The Contractor shall fix the sluice valves, air valves, washout 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.

#### 2.5.28 Support and Anchor Blocks

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

#### 2.5.29 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.



### 2.5.30 Lettering

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

Untreated water: White lettering on green background

Drinking water: White on blue background

Fire Hydrant: White lettering on yellow background

### 2.5.31 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 B.S. Specification designates a maximum test pressure should not exceed 120, 180 and 240 metre/head for Class 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 main has been jointed, the ends shall be closed with caps, plugs, or flanges, which must be strongly strutted against a solid surface to the satisfaction of the Engineer. The trench shall be properly backfilled and rammed as hereinafter specified and as shown on the Drawings, for its whole length so as to cover the main to a depth of not less than 500mm, except at the joint holes which shall be kept clear of all backfilling, if necessary, by the use of timbering, so that each joint is left fully exposed for inspection. No backfilling 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 the 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 stand under moderate pressure for several days' final airing.

The leakage from the mains and connections from each section tested shall not exceed 4 litres of water per 25mm diameter of main, per 2 km. length each 24 hours, every 30 metres head of pressure, and any visible individual leak shall be repaired.

To determine the rate of leakage, the Contractor shall furnish a suitable hydraulic test pump, pressure gauge, connections 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 couplings 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 the Engineer only shall authorise the operation of all valves, but the Contractor shall provide all the necessary labour to assist in the opening and closing of the valves to the Engineer's instructions, and he shall allow in his prices for all his expenses in connection with testing on completion.

The Engineer shall be the sole judge of water tightness.

#### 2.5.32 Cleansing and Sterilizing the Mains

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 20 p.p.m. of free available Chlorine 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 damage the trench or cause undue flooding of the 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 main is put into use a bacteriological sample or samples will be taken by the Engineer's Representative and only on 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 the taking of samples shall be included in the Contractor's tendered rates and the Engineer will specify and shall be the sole judge as to the number of samples required and the 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.

#### 2.5.33 Clearance of Site

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

#### 2.5.34 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 fitting is 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 Architect. Where not required to be removed, seal off with concrete or grout solid as directed. Seal off connection to manholes, demolish walls to 500mm below surrounding ground level and fill remainder of manhole with consolidated approved rubber and cover to level of surrounding ground as directed.

#### 2.6.0 COLD WATER STORAGE TANKS

Cold-water storage tanks shall include the ball valves and connectors for inlet, supply, washout, and overflow and may also include fire reel system supply pipe. The Sub-Contractor shall 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 Sub-Contractor shall use the paint, which will not be toxic.

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

- (a) Galvanised 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.

## 2.7.0 WATER HEATERS

### Electrically Heated

Non-pressure and low-pressure types domestic electric water heaters shall comply with B.S. 843: 1964, high-pressure types shall be of a Standard not less than the appropriate B.S.

Domestic heaters shall, if nothing else is pacified, be supplied with 25mm thick fibre glass 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 B.S. 3456: Section A8:1963 and C.P. 324. 202:1948.

Purpose made storage water heaters of the specified sizes shall comply with B.S. 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 galvanised after manufacture. Insulation shall, if nothing else is specified, be fibreglass to the specified thickness with finish suitable for painting.

Domestic heaters for floor 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 galvanising. Wall mounted heaters shall be supplied with all necessary brackets.

**PART C**  
**PARTICULAR SPECIFICATIONS**  
**FOR**  
**PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS**

**PART C**

**PARTICULAR SPECIFICATIONS**

**FOR**

**PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS**

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## **PART C**

### **PARTICULAR SPECIFICATIONS**

#### **FOR**

### **PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS**

#### **3.1 INTRODUCTION**

These specifications cover the execution of Plumbing, Drainage and Fire Fighting 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.

#### **3.2 INCLUDED IN THE SUB-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 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 works, including such elements as: -

- Cold Water supply pipework and fittings to the water storage tanks from the existing water mains,
- Water storage tanks complete with all necessary covers, fittings, washout and overflow pipes and supports. The Sub-Contractor is expected to take the overflow and washout pipes to a reasonable discharge point,
- the water supply pipework to the functional and sanitary fittings as shown on the drawing plus the necessary fixing, supporting and jointing materials from the water storage tanks,
- The sanitary and operational fittings together with the fixing, supports and jointing to the supply and discharge pipes.
- The waste and soil pipework from the sanitary and operational fittings to the first manholes including all fixing, supports and jointing materials.
- All cutting away and all making good will, if nothing else is specified, be carried out by the Main Contractor but it will be the responsibility of the Sub-Contractor to ensure that this work is kept to a minimum, be responsible for the correct marking out of all chases and holes; and will provide all necessary details to the Main Contractor.
- The Sub-Contractor shall also be responsible for ensuring that runs for floor or wall chases, holes to be cut or left will be marked out at the appropriate stage of the structural work.

- The sub-contractor shall undertake all notifications demanded by the Authorities in order to comply with current regulations and produce all certificates, if any, from the authorities without extra charge.
- The Sub-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 materials, labour, tools, instruments, scaffolding, etc. which are necessary for final completion in a first class manner of the plants to the Engineers satisfaction. Excluded are only materials and workmanship especially mentioned herein as "Excluded from this Sub-Contract".
- The Sub-Contractor shall include for cables, pipes, etc from central facilities to working area.
- Provide the Engineer for his approval complete working and manufacturing drawings 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 Sub-Contractor shall include for full maintenance during initial maintenance period as specified.

### 3.3 **EXCLUDED FROM THE SUB-CONTRACT**

- All concrete works, inclusive of necessary holes, plinths, etc.
- All block work inclusive of necessary holes (to be marked by the Sub-Contractor) etc.
- All electrical wiring up to and inclusive of isolators and switchboards.
- The Main Contractor will provide central located facilities for supply of water and power during the construction period.

### 3.4 **EXTENT OF THE SUB-CONTRACTOR'S DUTIES**

At the commencement of the work, the Sub-Contractor shall investigate and report to the Engineer if all materials and equipment to be used in the work, and not specified as supplied by others, are available locally. If not available, the Sub-Contractor shall at this stage place orders for the materials in question and copy the orders to Architect and/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 Sub-Contractor within seven days of his being notified and any result of defective workmanship shall be repaired including supply of new parts if necessary, immediately upon being notified.

The Sub-Contractor shall furnish at his own cost any samples of materials or workmanship required for the Sub-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 for such samples.

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

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

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

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

The Sub-Contractor shall collaborate with the Engineer and the 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-Contractor's when installing services.

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

The Sub-Contractor shall allow for all reasonable access to the works for this purpose.

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

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

### 3.5 **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.

**PART D**  
**PARTICULAR SPECIFICATIONS**  
**FOR**  
**PORTABLE FIRE EXTINGUISHERS**

**PART D**  
**PARTICULAR SPECIFICATIONS**  
**FOR**  
**PORTABLE FIRE EXTINGUISHERS**  
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## **PART D**

### **PARTICULAR SPECIFICATION FOR THE SUPPLY AND INSTALLATION OF PORTABLE FIRE EXTINGUISHERS**

#### **4.00 General**

The Particular specifications details the requirements for the supply and installation and commissioning of the Portable Fire Extinguishers which shall conform to BS 5423 : 1977. The Sub-Contractor shall include for all appurtenances and appliances not necessarily called for in this specification or shown on the Contract Drawings but which are necessary for the completion and satisfactory functioning of the equipment.

#### **4.01 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 these Bills of Quantities.

#### **4.02 Water/CO<sub>2</sub> Fire Extinguishers**

The portable 9-litre water filled CO<sub>2</sub> cartridge operated portable fire extinguishers shall comply with BS 1382 : 1977. Unless manufactured with stainless steel, bodies shall have all internal surfaces completely coated with either a lead tin, lead alloy or zinc applied by hot dipping. There shall be no visibly uncoated areas.

The extinguishers shall be clearly marked with the following:-

- a) Method of operation
- b) The words 'WATER TYPE' (GAS PRESSURE) in prominent letters
- c) Name and address of the manufacturers or responsible vendor.
- d) The nominal charge of the liquid in imperial gallons and litres
- e) The liquid level to which the extinguisher is to be charged
- f) The year of manufacture
- g) A declaration to the effect that the extinguisher has been tested to a pressure of 350 lb/sq in (24.1 Bar).
- h) The number of the British Standard "BS 1382" or "BS 5423".

#### 4.03 **Portable Carbon Dioxide Fire Extinguishers**

The portable carbon dioxide fire extinguishers shall comply with BS 3326 : 1960 and BS 5423 : 1977

The body of the extinguishers shall be a seamless steel cylinder manufactured to one of the following British Standards, BS 401, BS 1287 or BS 1288.

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

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

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

The extinguishers shall be clearly marked with the following:-

- a) The words 5 kg carbon dioxide fire extinguishers and to include the appropriate nominal gas content.
- b) Method of operation
- c) The words "Re-charge immediately after use"
- d) Instructions for periodical checking
- e) The number of the British Standard BS 3326 : 1960
- f) The manufacturers name or identification markings.

#### 4.04 **Dry Powder Portable Fire Extinguishers**

The portable dry powder fire extinguishers shall comply with BS 3465 : 1962 and BS 5423. The body shall be constructed of steel not less than the requirements of BS 1449 or aluminium to BS 1470 : 1972 and shall be suitably protected against corrosion.

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

The discharge tube and gas tube if either is fitted shall be made of steel, brass, copper or other not less suitable material. Where a hose is provided it shall not exceed 1.060 m and shall be acid and alkali resistant. Provision shall be made for securing the nozzle when not in use.

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

- a) The words "Dry Powder Fire Extinguisher".
- b) Method of operation in prominent letters
- c) The working pressure and the weight of the powder charge in kilogrammes
- d) Manufacturers name or identification mark
- e) The words "RECHARGE AFTER USE" if rechargeable type.
- f) Instructions to regularly check the weight of the pressure container (gas cartridge) or inspect the pressure indicator on stored pressure types when fitted, and remedy any loss indicated by either.
- g) The year of manufacture
- h) The pressure to which the extinguisher was tested.
- i) The number of this British Standard BS 3465 or BS 5423 : 1977.
- j) When appropriate complete instructions for charging the extinguisher shall be clearly marked on the extinguisher or otherwise be supplied with the refill.

#### 4.05 **Foam Spray Portable Fire Extinguishers**

The portable foam spray fire extinguishers shall comply with BS 3465 : 1962 and BS 5423. The body shall be constructed of steel not less than the requirements of BS 1449 or aluminium to BS 1470 : 1972 and shall be suitably protected against corrosion.

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

The discharge nozzle and gas tube if either is fitted shall be made of steel, brass, copper or other not less suitable material. Provision shall be made for securing the nozzle when not in use.

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

- a) The words "Foam Spray Fire Extinguisher".
- b) Method of operation in prominent letters
- c) The working pressure and the capacity of the foam charge in litres
- d) Manufacturers name or identification mark
- e) The words "RECHARGE AFTER USE" if rechargeable type.

- f) Instructions to regularly check the weight of the pressure container or inspect the pressure indicator on stored pressure types when fitted, and remedy any loss indicated by either.
- g) The year of manufacture
- h) The pressure to which the extinguisher was tested.
- i) The number of this British Standard BS 3465 or BS 5423 : 1977.
- j) When appropriate complete instructions for recharging the extinguisher shall be clearly marked on the extinguisher or otherwise be supplied with the refill.

#### 4.06 **Fire Blanket**

The fire blanket shall be made from cloth woven with pre-asbestos yarn or any other fire proof material and to measure 1210 x 1800 mm and shall be fitted with Special tapes folded so as to offer instantaneous single action release blanket from storing jacket.

**PART E**  
**PARTICULAR SPECIFICATIONS FOR**  
**HOSE REEL SYSTEM**



**PART E**  
**PARTICULAR SPECIFICATIONS FOR**  
**HOSE REEL SYSTEM**

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5.14	Hose Reels	E/5
5.15	Earthing	E/5
5.16	Finish Painting	E/5
5.17	Testing and Commissioning	E/5
5.18	Instruction Period	E/6

**PART E**  
**PARTICULAR SPECIFICATIONS**  
**FOR**  
**FIRE FIGHTING HOSE REEL SYSTEM**

5.01 **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: Lower Floors.

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

No claims for extra payment shall be accepted from the Sub-Contractor because of his non-compliance with the above requirements.

If in the opinion of the Sub-Contractor there is a difference between the requirements of the specifications and the Contract Drawings, he shall clarify these differences with the Engineer before tendering.

5.02 **Commencement of Works**

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

5.03 **Ordering**

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

5.04 **Spares**

Spares shall be presented to the client at hand over.

5.05 **Scope of Works**

The Sub-Contractor shall supply, deliver, erect, test and commission all the automatic fire fighting hose reel installation which is called for in this specification and shown on the Contract Drawings.

In connection with the above works the Sub-Contractor shall liaise fully with the plumbing Sub-Contractor who will be responsible for making a new connection to the existing water mains, supplying and laying a metered service pipe, up to the connections to the water tank.

The Sub-Contract shall handover to the Electrical Sub-Contractor all the electrical control gear for the installation. The Electrical Sub-Contractor shall supply electrical power, interconnecting cabling and wiring to the hose reel installation.

The Sub-Contractor shall supply and handover all the wiring and control diagrams necessary for the Works when required to do so.

Though the Electrical Sub-Contractor shall install the isolator and be responsible for the electrical connections in compliance with electrical regulations, the Sub-Contractor for the Works contained in this document shall supply and instal the starting and stopping gears, indication equipment and retain full responsibility for the correct functioning of the installation.

#### 5.06 **Fire Hose Reel Pumps**

The fire hose reels pumps shall consist of a duplicate set of multi-line centrifugal pumps as Lowara Sphere Unit Model CEM 80/5 or similar approved. The pumps shall be capable of delivering 2.3 l/s (8.3 m<sup>3</sup>/hr) against a head of 25 m (2.5 bar). The complete specification of the packaged pump set to be as follows: -

a) **Pumps**

High Efficiency single impeller pump, enclosed type motor, enclosed in a stainless steel shell.

b) **Pump Materials**

Suction and Discharge Casing to be made from Grey Cast Iron. Pump body, back plate, shaft, conveyor, diffuser and impeller made from Stainless Steel AISI 304.

c) **Motors**

T.E.F.C. Squirrel Cage Motors conforming to metric standards suitable for 240 volts (+/- 6%), single phase, 50 Hz supply. Windings insulated to Class "F", Speed 2800 RPM, permanent split capacitor, built-in thermal overload and IP 44 protection.

d) **Mechanical Seal**

Self-adjusting type with carbon/ceramic with elastomer made of NBR and other components in stainless steel.

e) **Base Frame**

Welded fabrication from Mild Steel sections with facility for lifting unit.

f) **Flexible Connections**

Flexible connections to be affixed to suction and discharge connections of the pump.

g) **Valves**

Pump Isolating Valves shall be Butterfly Valves to B.S. 5155 with Cast Iron nylon coated disc and black nitrile liner. Non-Return Valves shall be vertical lift type to be manufactured from Cast Iron with nitrile seal.

h) **Control Panel**

The control panel is to be located in the position indicated on the contract drawings.

The control panel shall be constructed of mild steel with auto lacquer finish, be moisture, insect and rodent proof and shall be provided complete with spare fuses and a wiring diagram enclosed in plastic laminate.

Standard panel cubicle to be manufactured to IP. 55 standards, containing Direct-On Line Starters or Star Delta Starters above 4.0 kW.

Safety features to include 240 volts low voltage controls except for starter coils. Panel shall be mounted on vibration isolators to minimise vibration to electrical equipment.

The panel shall incorporate HRC main fuses and thermal overloads for the pump motors, time control unit for minimum run period, start relay incorporating timing element for standby pump delay, and one set of voltage free changeover contacts to give remote alarm/indication for the indicator lights mentioned.

The pump shall be controlled by a pressure switch and the control panel shall include the following facilities to IP 54 protection:-

- i) "On" push button for setting control panel to live
- ii) Green indicator light for indicating control panel live
- iii) Duty/stand by pump auto-change over
- iv) Duty pump, pump run green indicator light
- v) Stand by pump, pump run green indicator light
- vi) Duty pump fail red indicator light
- vii) Stand by pump fail red indicator light
- viii) Hand/Off/Auto Switches
- ix) Line and control circuit fuses
- x) Low water condition pump cut out with red indicator light

i) **Pressure Switch**

It shall be of Differential adjustment type switch manufactured to IP. 44 standards.

Multi-pump sequencing control to be effected from a single pressure instrument, utilising control circuitry specially for pressure boosting applications.

j) **Pressure Gauge**

4" Dial Bottom Connection to B.S 1780 calibrated in Bars and KPa.

k) **Membrane Tank** - (24 litre Hydrosphere)

Fabricated Steel Construction housing a neutral rubber diaphragm ideally suited for drinking water applications. Precharged with Nitrogen to correct pressure at test stage.

l) **Low Level Water Cut-out**

The pumps shall be protected by a low level cut out switch to prevent dry pump run when low level water conditions occur.

5.07 **Pipework**

The pipework for the hose reel installation shall be galvanised wrought steel tubing "Medium" Grade Class "B" to B.S. 1387: 1967 with pipe threads to B.S.21.

5.08 **Pipe Fitting**

The pipe fittings shall be galvanised wrought steel pipe fittings welded or seamless fittings conforming to B.S.1740 Part 1971 or malleable iron fittings to B.S.143/1256.

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

5.09 **Flanges**

The flanges shall comply with B.S.4504:1969. All flanges shall comply to a nominal pressure rating of 16 bar (P.N.16)

5.10 **Gaskets**

The gaskets for use with flanges to B.S. 4304:1969 shall comply with B.S. 4865 Part 1: 1072 for pressure up to and not exceeding 64 Bar.

5.11 **Non-return Valves**

The non-return valves up to and including 80 mm diameter shall be as Pegler to B.S.5153: 1974 with flanges to B.S. 4504 P.N.16.

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

#### 5.12 **Gate Valves**

The gate valves up to and including 80 mm shall be as Pegler non-rising stem and wedge disc to B.S.1952.: 1964 (B.S. 5154:1974) with screwed threads to B.S. 21 taper thread.

#### 5.13 **Sleeves**

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

#### 5.14 **Hose Reels**

The hose reels to the installation shall consist of recessed automatic hose reels as Mather & Platt Model 1065 standard swinging hose reel (recessed).

All the above hose reels shall comply with B.S.: 1976 and B.S. 3169: 1970 and is to be installed to the requirements of C.P. 5306 Part 1 1976.

The hose reels shall be supplied and installed complete with first-aid non-kicking hose 30 metres long, with nylon spray jet/Shut-off nozzle. A screw down chrome plate globe valve to B.S. 1010 to the inlet of the reel shall be fitted. The orifice to the nozzle is to be not less than 4.8 mm to maintain a minimum flow of 0.4 l/s to the jet.

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

#### 5.15 **Earthing**

The hose reel installation shall be electrically earthed by a direct earth connection.

The installation of the earthing to be carried out by the Electrical Sub-Contractor.

#### 5.16 **Finish Painting**

Upon completion of testing and commissioning of the hose reel installation the pipework shall be primed and finish painted with 2 No. coats of red paint to the Architects requirements.

#### 5.17 **Testing and Commissioning**

The hose reel installation is to be flushed out before testing to ensure that no builders debris has entered the system. The installation is to be then tested to one and a half times the working pressure of the installation to the approval of the Engineer.

Simulated fault condition of the pumping equipment, is to be carried out before acceptance of the system by the Engineer and Architect.

5.18 **Instruction Period**

The Sub-Contractor shall allow in his contract sum for instructing of the use of the equipment to the Clients 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 clients staff shall be instructed in the operation and maintenance of the equipment.

**PART F**

**PARTICULAR SPECIFICATION FOR DRY RISER INSTALLATION**



## **PART F**

### **PARTICULAR SPECIFICATION FOR DRY RISER INSTALLATION**

#### **I N D E X**

<b><u>CLAUSE NO.</u></b>	<b><u>DESCRIPTION</u></b>	<b><u>PAGE NO.</u></b>
6.1	General	F/1
6.2	Regulations	F/1
6.3	Scope of Works	F/1
6.4	Inlet Boxes	F/1
6.5	Inlet Breeching	F/2
6.6	Drain Valves	F/2
6.7	Outlet Landing Valves	F/2
6.8	Automatic Air Valve	F/3
6.9	Pipework and Installation	F/3
6.10	Pipe Fittings	F/3
6.11	Flanges	F/3
6.12	Gaskets	F/3
6.13	Non- Return Valves	F/4
6.14	Gate Valves	F/4
6.15	Sleeves	F/4
6.16	Floor and Ceiling Plates	F/4
6.17	Earthing	F/4
6.18	Finish Painting	F/4
6.19	Testing and Commissioning	F/4
6.20	Instruction Period	F/4

## **PART F**

### **PARTICULAR SPECIFICATION FOR DRY RISER SYSTEM**

#### **6.1 General**

The particular specification details the requirements for the supply, delivery, installation, testing and commissioning of the wet riser system.

The wet riser system shall comply in all respects to the requirements set out in C.O.P. BS 5306 Part I 1976 and BS 5041.

The Sub-Contractor shall include for all appurtenances and appliances not necessary called for in this specification or shown on the contract drawings but which are necessary for the completion and satisfactory functioning of the works. No claims for extra payments shall be accepted from the sub-contractor because of his non-compliance with the above requirements.

If in the pinion of the sub-contractor, there exists a difference between the requirements of the specification and the contract drawings, he shall clarify these differences with the Engineer before tendering.

#### **6.2 Regulations**

The wet riser installation shall comply with all applicable clauses in this specification and the following codes of Practice and Standards:-

- 1) F.O.C. Rules 29th Edition and subsequent revisions issued by Fire Officer's Committee.
- 2) BS 5041, 5 parts. Fire Hydrant System equipments
- 3) BS 5306, 2 parts. Fire extinguishing installations and equipment on premises.
- 4) Together with standards stated against each clause.

#### **6.3 Scope of Works**

The sub-contractor shall supply, deliver, erect, test and commission the Wet Riser Installation which is called for in this specification and as shown on the contract drawings.

#### **6.4 Inlet Boxes**

An inlet box shall be provided at the position indicated on the drawings, such that the centre of the box is 760 mm above ground level.

The box shall be constructed of sheet metal with Georgian wired glass doors, with a spring cylinder lock with key.

The size of the box shall be sufficient to allow easy access for maintenance and inspection purposes and to operate the drain valve.

The inside face of the glass shall be suitably lettered with 50 mm high letters so that it reads from the outside as follows: -

## **FIRE BRIGADE**

### **DRY RISER INLET**

#### **6.5 Inlet Breeching**

A 100 mm diameter riser shall be fitted with two inlets and 150mm diameter riser shall be fitted with four inlets.

Each inlet shall consist of a 65 mm diameter male instantaneous inlets to BS 366 with a non-return valve, a blank cap with chain and a 25 mm drain valve. The inlet shall be connected to the riser main by a breeching piece.

The breeching body shall have a wall thickness not less than 3.5 mm and shall be tested to a pressure of 20 bar after the fitting of the inlet drain valve. The breeching piece shall be marked in accordance with BS 5041 upon successful completion of this test, and screwed or flanged to the riser pipework.

#### **6.6 Drain Valves**

Each Breeching piece shall be fitted with a 25mm wedge gate drain valve.

A 50 mm drain valve shall be fitted at the lowest point of the riser. This should normally be at the inlet box but the pipework may fall below the box, in either case due regard shall be paid to facilitate for conducting the water to a suitable drain. Where a low level drain is fitted there must be a permanent notice near the drain valve "DRY RISING MAIN - DRAIN VALVE" and also a notice in the inlet box "LOW LEVEL DRAIN VALVE IN .....(state location)".

Low level drain valves must be kept closed and secured with a leather (or similar material) strap and padlock.

#### **6.7 Outlet Landing Valves**

Outlet Landing Valves shall be installed 1000 mm above floor level and must not project in a manner likely to cause obstruction.

When required by the performance specification, the valve shall be enclosed in a box in accordance with BS 5041: Part 4.

Each outlet shall comprise a wedge gate pattern valve 65 mm bore constructed in good gunmetal, screwed or flanged to the dry riser, and fitted with a standard 65 mm instantaneous female outlet to BS 336, blank cap and chain, strap and padlock.

The valve spindle shall not be less than 20 mm diameter which should be marked "OPEN" and "SHUT". The valve shall open in an anti-clockwise direction and shut in a clockwise direction.

The whole fitting shall be of sound construction and hydraulically tested to a pressure of 10 bar before being connected to the rising main.

The valve on each outlet shall be kept strapped shut and secured by a padlock and the strap must be of leather or similar material which can be quickly cut in an emergency.

#### 6.8 **Automatic Air Valve**

An automatic air valve shall be fitted at the top of the riser to release air when the riser is charged with water or admit air when draining off.

It will be screwed with 1" BSP male.

#### 6.9 **Pipework and Installation**

Wet riser pipework shall be installed using heavy weight quality galvanised steel to BS 1387 and shall be flanged as necessary using screw on flanges and be complete with all necessary supports.

Where one outlet per floor is screwed from a single riser, the pipe diameter shall be 100 mm. When two outlets per floor are screwed from a single riser, the pipe diameter shall be 150 mm.

Wet riser pipework should be installed progressively as the building is constructed, so as to provide fire protection during building operations. In buildings taller than 30.5 m in height, the riser must be installed when the building exceeds 18.3 m in height.

#### 6.10 **Pipe Fittings**

The pipe fittings shall be wrought steel pipe fittings welded or seamless fittings conforming to BS 1740: 1971 or malleable iron fittings to BS 143.

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

#### 6.11 **Flanges**

The flanges shall comply with BS 4504: 1969. All flanges shall comply to a normal pressure rating of 16 bar (P.N. 16) and shall be of either cast iron or steel.

#### 6.12 **Gaskets**

The gaskets for use with flanges to BS 4504: 1969 shall comply with BS 4865 Part 1: 1972 for pressure up to and not exceeding 64 bar.

6.13 **Non-Return Valves**

Non-return valves up to and including 100 mm diameter shall be as Pegler to BS 5153: 1974 with flanges to BS 4503 P.N. 16. The valves shall be of cast iron construction with gunmetal seat and bronze hinge pin.

6.14 **Gate Valves**

The gate valves up to and including 100 mm shall be as Pegler non-rising stem and wedge disc to BS 5154: 1974 with screwed threads to BS 21 taper threads.

6.15 **Sleeves**

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

6.16 **Floor and Ceiling Plates**

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

6.17 **Earthing**

The wet riser pipework is to be electrically earthed.

This shall be achieved by a separate rod and not via the electrical power earth. A test clamp shall be provided in the connection between the dry riser and the earthing rod. Connection shall be made at the lowest point of the pipework.

6.18 **Finish Painting**

Upon completion of testing and commissioning of the wet riser installation, the pipework shall be primed and finish painted with 2 coats of an appropriate red shade of paint to the Architects requirements.

6.19 **Testing and Commissioning**

The dry riser installation is to be flushed out before testing to ensure that no builder's debris has entered the system. The installation is to be then tested to one and half times the working pressure of the installation to the approval of the Engineer.

6.20 **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 in the operation and maintenance of the equipment.

**PART G**

**BILLS OF QUANTITIES**

## **SCHEDULE OF PRICES**

### **GENERAL NOTE**

1. The total of price in the summary of prices shall include for the whole of the Sub-Contract Works in accordance with the specification as defined before and shall be carried forward to the Form of Tender.
2. Any prices omitted from any item, section or part of the price schedule shall be deemed to have been included in another item, section or part.
3. The prices shall include for all obligations under the Sub-Contract including and not limited to: -
  - a) Supply of all materials, equipment, apparatus, fittings, spares and tools
  - b) Insurance
  - c) Clearing and forwarding
  - d) Delivery and storage at site
  - e) Packing for storage
  - f) Replace any defective or damaged item
  - g) Installation
  - h) Testing
  - i) Painting
  - j) Commissioning
  - k) Maintenance during the defects liability period
4. The unit rates shall include **Import Duty, Sales Tax, and VAT** where applicable, and shall be expressed in Kenya Shillings.

**PROPOSED COMMERCIAL DEVELOPMENT ON PLOT LR NO. NAIROBI/BLOCK 40/15 DESAI ROAD, NAIROBI COUNTY FOR MWITO DT SACCO LTD**
**MECHANICAL INSTALLATIONS - PLUMBING, DRAINAGE & FIRE FIGHTING SERVICES**
**SECTION 1: BILLS OF QUANTITIES FOR PLUMBING AND DRAINAGE INSTALLATIONS - PHASE 1**

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
<b>1</b>	<b>BILL NO.1: WATER STORAGE TANKS, PUMPS &amp; ASSOCIATED PLUMBING</b>				
<b>1.1</b>	<b>Water metre chamber</b> 400*400*300(d) mm water isolation valve chamber complete with Water meter	1	no.		
<b>1.2</b>	<b>Lower Ground Floor Plastic Water storage tanks</b> Rotary moulded cylindrical tanks as "KENTANK" or equal and approved with a capacity of 16,000Ltrs, dimensions; Ø2,860*2770(h)mm. The tank to have a Ø40mm inlet connection & Ø100mm outlet connection, Ø75mm overflow Ø50mm washout and gate valve, backnuts, lid and a Ø40mm high pressure cast brass ball valve and high pressure polypropylene plastic float..	2	no.		
<b>1.3</b>	<b>Roof Storage Water storage tanks</b> Rotary moulded cylindrical tanks as "KENTANK" or equal and approved with a capacity of 4000Ltrs, dimensions; Ø1730*1970(h)mm. The tank to have a Ø40mm inlet connection & Ø75mm outlet connection, Ø65mm overflow Ø50mm washout and gate valve, backnuts, lid and a Ø40mm high pressure cast brass ball valve and high pressure polypropylene plastic float..	2	no.		
<b>1.4</b>	<b>Sterilisation</b> Allow for sterilisation including flushing out of the system to the satisfaction of the Engineer	1	sum		
<b>1.5</b>	<b>Extension of mains water supply to site:</b> Incoming mains water supply to under ground water tank with connections to the concrete tanks in paddle flanges:				
a	PVC Class E straight pipe at 600mm excavated channel				
i	Ø 40mm connecting to council water metre	70	lm		
ii	Ø100mm bowser line	30	lm		
b	Extra over pipes				
	<u>Elbow/bend</u>				
i	Ø 40mm	30	no.		
ii	Ø 100mm	9	no.		
c	<u>Brass work as Pegler</u>				
i	Ø40mm gate valve	10	no.		
ii	Ø 100mm gate valve	5	no.		
d	<u>Fittings</u>				
i	Ø 40mm male threaded joints	20	no.		
ii	Ø 100mm male threaded joints	10	no.		
	C/F to next page				



Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	B/f from previous page				
1.6	<b>Surface Domestic Water Booster pumps &amp; Control Panel</b> Supply, install and commission the following: Surface Domestic water booster pump comprising of 1No. Set as "Duty & Standby" with a capacity of 5m <sup>3</sup> /hr at a static pressure of 2.0 bars, Power rating of 0.55kW. The pump to be as Pedrollo 3CRm100X pumps, complete with 1No. Float valve in the reservoir tank for run dry protection and PM1 Controller for automatic operation. The pump shall be complete manifold with NR, Gate Valves 24 litre pressure vessel and other accessories. The pump shall have over and under voltage protection from unstable power conditions, overload and high temperature conditions. The pump set to have control panel and associated wiring for automatic operation as duty & standby mode. The control panel to have a pre-selector switch for auto/manual positions, contact relay arrangement for alternate running, Thermal overload relays, display lamps and level control.	1	set		
1.8	<b>Site water reticulation to roof water storage tanks</b> Supply & install PVC Class E pipes of 12454 per ASTM D1784 compliance with ASTM D1785 cell classification as flowguard or equal and approved and Grade 1 Polyvinyl Chloride compounds with a test pressure of 6 bars through ducts provided to roof tanks. Tenderers must allow in their prices for all couplings, connectors, unions, expansion loops, jointing materials etc as required in the running lengths of pipework and where necessary for piping clips, holderbats plugged and screwed, and pipe sleeves through structural members.				
a	<u>Supply to roof storage tanks</u>				
a.1	Straight run pipes				
i	Ø40mm	30	lm		
b	<u>Supply to Stand pipes</u>				
i	Ø25mm pipes with water bars	20	lm		
	C/F to next page				

[illegible]

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
<b>2</b>	<b>BILL NO.2: INTERNAL PLUMBING AND DRAINAGE SERVICES</b> Supply, deliver and install PPR-C PN 25 pipes & fittings as per AGROFLOW or equal and approved . Tenderers must allow in their pipework prices for all the couplings, connectors, unions, expansion loops, jointing materials etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holderbats plugged and screwed, and pipe sleeves through structural members. The entire plumbing installation should withstand a test pressure of 10 bars.				
<b>2.1.1</b>	<b>PIPEWORK ON ROOF FLOOR</b>				
<b>a</b>	<b><u>Cold water pipes</u></b>				
<b>a.1</b>	<b>Straight run pipes</b>				
i	Ø75mm	5	lm		
ii	Ø 65mm	10	lm		
iii	Ø 50mm	14	lm		
iv	Ø 40mm	10	lm		
<b>a.2</b>	<b>Extra fittings to pipe</b>				
	<b><u>Elbow/bend</u></b>				
i	Ø75mm	2	no.		
ii	Ø 65mm	3	no.		
iii	Ø 50mm	5	no.		
iv	Ø 40mm	2	no.		
	<b><u>Tee fittings</u></b>				
i	Ø75mm	2	no.		
ii	Ø 65mm	2	no.		
iii	Ø 50mm	5	no.		
iv	Ø 40mm	3	no.		
	<b><u>Reducers</u></b>				
i	Ø75-65mm	1	no.		
ii	Ø65-50mm	1	no.		
	<b><u>Threaded joints</u></b>				
i	Ø 75mm male threaded joints	2	no.		
ii	Ø 65mm ditto	4	no.		
iii	Ø 50mm ditto	5	no.		
	<b><u>Control valves</u></b>				
i	75mm gate valve as Pegler	1	no.		
ii	65mm gate valve as Pegler	2	no.		
	C/F to next page				

[illegible]

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	B/f from previous page				
<b>2.1.3</b>	<b>SOIL AND WASTE WATER DRAINAGE</b> Supply & install the following soil & waste water drainage pipework as described and shown in the drawing. All pipes and fittings shall be UPVC and PVC to BS5572:1978 and BS5750 as manufactured by 'Key Terrain' or equal and approved. All joinings and fixtures shall be in accordance with the manufacturers instructions and as described. Tenderers must allow for joinings, couplings, holderbats, reducers,clippings,spacers etc, necessary for the proper functioning of the installation when pricing				
a	Vertical discharge pipes in Grey Heavy duty PVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø 150mm	50	lm		
ii	Ø 100mm	85	lm		
b	Horizontal discharge pipes in Grey heavy duty PVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø 150mm	26	lm		
i	Ø 100mm	45	lm		
ii	Ø 50mm	60	lm		
iii	Ø 40mm	65	lm		
c	<u>Extra fittings over pipes</u>				
i	Ø 100mm WC Turned connector ref 102.4.5	20	no.		
ii	Ø 100mm vent cowl ref:150.4	5	no.		
iii	Ø 100mm weathering slates ref:149.18.22	5	no.		
iv	Ø 50mm sweep tee ref:206.2.91	45	no.		
v	Ø 50mm sweep bend ref: 201.2.91	65	no.		
vi	Ø 40mm sweep tee ref:206.15.91	53	no.		
vii	Ø 40mm sweep bend ref:201.15.91	50	no.		
viii	Ø 50mm access plug ref:237.2	45	no.		
ix	Ø 40mm access plug ref 227.15	35	no.		
x	Seal ring adaptor ref. 109.4	20	no.		
d	<u>Water traps/Trapped gulleys</u>				
i	Trapped floor gulleys ref:281.2 and all interconnecting accessories and PVC cover grating or equal & approved	65	no.		
	C/F to next page				

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	B/f from previous page				
<b>2.1.4</b>	<b>RAINWATER DRAINAGE (FLAT ROOFS)</b> Supply and install heavy duty PVC Pipe work				
a	PVC Pipes				
i	150 mm Ø	350	lm		
ii	100 mm Ø	45	lm		
b	Fittings:				
i	150 mm Ø shoe	20	no.		
ii	150 mm Ø bend	40	no.		
iii	Terrace outlets ref:2170.3	20	no.		
iv	150mm diameter coned fulbora outlet	40	no.		
<b>2.1.5</b>	<b>Testing &amp; Commissioning</b> Allow for setting to work, testing and commissioning of the installations to the satisfaction of the Engineer/Architect.	1	item		
	Totals for bill no.2: Internal Plumbing & Drainage Service to Summary page				

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
<b>3</b>	<b>BILL NO.3: EXTERNAL RAINWATER &amp; SOIL WASTE DRAINAGE SERVICES</b> Supply & install the following soil & waste water drainage pipework as described and shown in the drawing. All pipes and fittings shall be UPVC and PVC to BS5572:1978 and BS5750 as manufactured by 'Key Terrain' or equal and approved. All joinings and fixtures shall be in accordance with the manufacturers instructions and as described. Tenderers must allow for joinings, couplings, holderbats, reducers,clippings,spacers etc, necessary for the proper functioning of the installation when pricing				
<b>3.1</b>	<b>Soil waste drainage</b>				
a	Horizontal discharge pipes in Golden brown heavy duty PVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø 150mm	50	lm		
ii	Ø 100mm	75	lm		
b	Gulley trap chamber ref:1844.4.25 size 350*350*450(d) mm in masonry p.c.c cover with vent hole etc and allow for excavation in soil or murrum and making good.	10	no.		
c	Manholes Excavate for, construct manhole of average invert 1.5m, concrete mix 1:3:6 slab, 100mm slab, 150mm thick solid block wall in cement mortar, screed, bed in cement mortar (1:3) cover in grease and sand, backfill and remove surplus materials.				
i	Type 'B' manholes measuring 650*450mm upto a maximum depth of up to 800mm inclusive of a heavy duty double seal manhole covers.	5	no.		
ii	Type 'C' manholes measuring 1000 x 800 mm up to a maximum depth of 1.5 meters inclusive of heavy duty double seal manhole covers	1	no.		
<b>3.2</b>	<b>Rainwater drainage</b>				
a	Horizontal discharge heavy duty pipes as 'Metro' or equal and approved.				
i	Ø 150mm	124	lm		
i	Ø 100mm	56	lm		
<b>3.3</b>	<b>Testing &amp; Commissioning</b> Allow for setting to work, testing and commissioning of the installations to the satisfaction of the Engineer/Architect.	1	item		
	C/F to next page				

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	B/f from previous page				
<b>2.40</b>	<b>BASEMENT DRAINAGE</b>				
i	<b>Catch Pits</b> Allow 1:3 mortar and plastering to 1:2, 450 x 450 x 150 mm to 250 mm deep drainage catch pits complete with galvanized mild steel gratings to the civil/structural engineers details	10	No.		
i	<b>Drainage Pipes</b> Ø 150mm Heavy duty pipes as 'Metro' or equal and approved.	150	Im		
ii	<b>Painting</b> 1 No coat of red lead oxide primer for the frames and bars for the above catch pits	1	Item		
	2 No coats of aluminium Paint for the frames and bars for the above drainage channels	1	Item		
iii	<b>Sediment Gully</b>  Allow for excavation, masonry 150 mm concrete block wall, 1:3 mortar and plastering to 1:2, 400 x 400 x 700 mm deep sediment Gully complete with:- 50 x 50 x 5mm angle section, 400 x 400 mm wide frame complete with 15 mm diameter steel bars spaced at 30 mm between centres 300 x 300 x 600 mm deep perforated galvanised steel sediment pan Gauge 14	1	Item		
iv	<b>Petrol Interceptor</b> Allow for excavation, concreting to Class 1:3:6, walling 150mm thick solid concrete block walls with 1:3 mortar and plastering to 1:2 and water proofing for a three chamber petrol interceptor of overall size of 3050 x 1300 x 1350 mm deep complete with: - 3 No. Heavy Duty Rectangular cover and frame 6 No. 100 mm diameter uPVC bends 3 LM of 100 mm diameter uPVC Pipe 11 LM of 50 mm diameter GMS Class "C" Pipe 4 No. 50 mm diameter GCI Bend 2 No. 50 mm diameter GCI Equal Tee 6 No. 3 mm thick 50 mm diameter Black Steel paddle flange with BSP thread 2 No. 100 mm diameter uPVC paddle flange	1	Item		
v	<b>Oil Collection Tank</b> Allow for excavation, concreting to Class 1:3:6, walling 150 mm thick solid concrete block walls with 1:3 mortar and plastering to 1:2 and water proofing for a one chamber Oil Collection tank of overall size of 2000 x 1200 x 2000 mm deep complete with:- 1 No. Heavy Duty Rectangular cover and frame 6 LM of 50 mm diameter GMS Class "C" Pipe 2No. 50 mm diameter GCI Bend 3 No. 3 mm thick 50 mm diameter Black Steel paddle flange with BSP thread 1 No. 100 mm diameter uPVC paddle flange	1	Item		
vi	<b>Pumps</b> Grundfos Model No. DWK.O.10.80.37.5.0D or equal and approved with a discharge of 40 m³/hr against a head of 18.0m with a power supply of 3.7kW 315V 50Hz complete with the following features: - Cast iron pump casing, inlet strainer, discharge chamber, impeller, bearing plate, motor casing rotor can and shaft in stainless steel Self adjusting bellows type mechanical seals with carbon rotating face running against stationary ceramic seat Canned rotor AC induction motor with liquid filled rotor chamber	1	Set		
b	3.7kW 315V 50 Hz control panel, auto lacquer finish, gauge 16 mildsteel control panel cubicle complete with power on light, run and trip lights over and under voltage protection, water level relays, automatic operation via float switch control, manual selector switch, disconnect switch, fuses, MCB, and all other associated accessories	1	No.		
c	1No. Set of 4no. Pump control float switch to be fixed in the sump inclusive of cable and laying from the pump to the control float switch.	1	No.		
d	Low water level cut-out switch and the connecting cable and trunking	1	No.		
	<b>Totals for bill no.3: External rainwater &amp; soil waste drainage services to Summary page</b>				



Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
<b>4</b>	<b>BILL NO. 4: SANITARY &amp; TAPWARE FITTINGS</b> Supply,Install,test and commission the following sanitary fittings including all necessary joints to services,Overflow and waste pipes jointing materials,mortices,plugs,screws,bolts and making good as described and shown on the drawing.  <b>NOTE: TRADE NAMES</b> Where Trade names are mentioned below, it is only intended to indicate the level of quality anticipated. The contractor <b>MAY</b> supply alternatives which must be approved by the Engineer/Architect.				
<b>4.1</b>	<b>SANITARY WARE/TAPWARE</b> <b>SANITARY FITTINGS</b>				
<b>a</b>	<b>Water closets</b>				
a.1	Close coupled W.C suite, size 652x 375mm in vitreous China comprising of W.C. wash down bowl complete with connector, heavy duty matching soft close plastic seat and cover with metal top fixed (Stainless Steel) hinges.These to be flushed by 6 and 3 litres dual flush Cistern of integrated angle stop valve with connecting fittings from Cistern to bowl, and chrome plated Push buttons. as <b>"Miran" Model: 506/6605</b> or its equivalent	2	no.		
a.2	Floor standing, back-to-wall water closet suite in vitreous China comprising a back to wall WC bowl complete with WC Connector, heavy duty matching plastic soft close cover & seat in white colour, stainless steel hinges, fixing bolts and nuts.as <b>'Miran'</b> , Model: <b>506/6605</b> or its equivalent	8	no.		
a.3	W.C Concealed flush valve with integral vacuum breaker, non-hold open feature,11/4" butterfly control inlet, chrome plated wall flange with recommended working pressure between 15-150Kpa complete with piston assembly, plunger assembly,flush pipe coupling nut,washer kit and handle seal. These to be as <b>"Plumber low pressure flush"</b> valve or equal and approved.	8	no.		
<b>b</b>	<b>Wash hand basin</b>				
b.1	Counter Top wash hand basin size '600*480', integrated 1 tap hole configuration Colour: White complete with Ø40mm PVC Bottle 'P trap', with pop up waste, Ø75mm water seal and Ø63mm flange as <b>"Miran"Model: 337/A211</b> or its equivalent	7	no.		
b.2	Chrome plated WHB non-corrosive time delay press action pillar taps with 6 seconds delay as <b>'Plumber'</b> or its equivalent, c/w flexible connector and 1/2" angle valve as Pex or its equivalent for cold water.	7	no.		
<b>c.1</b>	<b>Kitchen Sink</b> Associated Steel Ltd single bowl, single drainer sink made out of 18/8 stainless steel of size 1070 x 530 mm with 420 x 355 x 150 mm deep bowl with bright machine polish finish. Bricon Ref. No. 316 chrome plated heavy cast 1 1/2" sink grid waste, 70 mm diameter flange, 45 mm long shank, unslotted with plug, chain and backnut.	1	no.		
<b>c.2</b>	<b>Kitchen Sink Accessories</b> EUROBATH' wall type pillar ap with swivel spout outlet, inlet connections complete with all fittings such as backnuts, washers, compression fittings etc.	1	no.		
<b>d</b>	<b>Cleaners Sink</b> Wall mounted Cleaners sink size 600mm x 500 x 240mm made out of grade 304 (18/8) polished stainless steel c/w stainless steel grating complete with; a long neck bib tap, grid waste fitting 11/2" and plastic bottle trap 40mm P trap and wall brackets to fit.	2	no.		
<b>e</b>	<b>Angle Regulating Valves</b> 15 mm diameter angle regulating valve complete with a 300 mm long non kinking flexible tubing as pegler or approved equivalent.	10	no.		
	C/F to next page				

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	B/f from previous page				
f	<b>Urinals</b>				
i	Urinal bowl Urinal bowl in white vitreous china size 410 x 315 x 665mm high with back inlet spreader and waste outlet including wall mounting brackets and connected to water supply, sealed with silicone sealant where urinal meets wall. concealed pipework complete with '1 ½' diameter domed outlet plated urinal grating Ref No. WF 9370 XX. As " <b>Miran</b> " or its equivalent	1	no.		
ii	Urinal bowl accessories Chrome plated, push button ¾' flush master junior concealed urinal flush valve, top entry with intergral ball-o-stop valve and wall plate complete with; exposed chrome plated urinal flush and tall pipe with inlet adaptor and backmount spary rose/spreader as ' <b>Plumber Low pressure</b> ' or its equivalent	1	no.		
iii	1½' diameter plastic bottle P-Trap with plastic extension pipe to wall and wall flange	1	no.		
iv	Urinal Divider as Lecico or its equivalent	1	no.		
g	<b>Disabled Suite</b> Disabled Water closet suite as " <b>Doc.M Rimless Super Pack</b> " with white grab rails and seat PK8146WH, comprising of Avalon Rimless Horizontal Outlet pan and fittings, 4Litres Avalon Rimless Cistern, Fittings and Spatula Lever, Avalon Rimless Seat ring, stainless steel hinges with stability buffers. <b>Hand Rinse wash hand basin</b> with 1 Centre Tap hole and Chrome Plated Overflow trim pillar tap TMV3 <b>5No. avalon support rails</b> with concealed fixing, Avalon Hinged support rail and toilet roll holder, complete with wall bolts, grid waste, cistern cover clips and any other necessary fitting. <b>1800 Watts sensor type fully automatic hand driers as "Vortice"</b> Model:DJ0030C or equal and approved <b>0.7 litre capacity soap dispenser</b> as 'Mediclinic' CP or equal <b>6mm Wall mirror with bevel edges</b> 500*700mm The installations to be done as per the manufacturers instructions and Engineers approval.	3	no.		
h	<b><u>BATHROOM ACCESSORIES AS UNDER:</u></b>				
	Mirrors				
i	6mm thick polished plate glass, silver backed mirror with bevelled edges, size 900x600mm plugged and screwed to wall with 4No.Chrome plated chrome capped screws and 5mm thick foam back rest.	7	no.		
ii	Toilet roll holder Toilet roll holders as "Mediclinics Jumbo" CP or equal and approved.	10	no.		
iii	Robe hook Robe hook in vitreous china and in white colour mounted onto a concealed screw to wall wedges, to be as Twyfords OC 6858 1998 or approved equivalent.	10	no.		
iv	1/2" Chrome plated brass shattaf handset with hose pipe and wall bracket 1.0 bar M.P complete with 1/2" angle valve as Pex or its equivalent	10	no.		
v	Soap dispenser 1.0 litre capacity soap dispenser as 'Mediclinic' CP or equal and approved.	5	no.		
vi	Hand drier Electric STARMIX automatic touch free hand drier for electirical supply compatible with 220/240, 50Hz single phase supply and to be complete with a mounting plate, centrifugal fan and motor 2700rpm with thermal overload relay aand radio suppression and 2100W spirally wound element with automatic re-setting thermal cut-out and wiring from local isolator.	5	no.		
	<b>Totals for bill no.4: Sanitary &amp; tapware fittings to Summary page</b>				

## SECTION 2: BILLS OF QUANTITIES FOR FIRE FIGHTING INSTALLATIONS - PHASE 1

Metrocom Consultants Ltd

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
<b>2.00</b>	<b>BILL NO.2 : PORTABLE FIRE EXTINGUISHERS AND FIRE BARRIERS</b>				
2.1	<b><u>PORTABLE FIRE EXTINGUISHERS</u></b> Supply, install and commission the following portable fire extinguishers complete with initial discharge and mounting brackets as per Specifications All Extinguishers must be from approved manufacturers by the Fire Protection Association of Kenya.				
a	5kg CO2 gas fire extinguishers conforming to BS 5423 as "Angus" or equal and approved complete with charge and fixing brackets, pictorial instructions, colour code, visual discharge indicator and serviceable on site.	4	no.		
b	9 Litre water CO2 gas fire extinguisher manufactured to BS 5423 and the cylinder manufactured to BS 5045 as "Angus" or equal and approved complete with charge and fixing bracket, pictorial instructions, discharge horn and hose, Brass hot stamping operating valve, local fire brigade approval and serviceable on site	4	no.		
c	9 Litre dry powder fire extinguisher gas cartridge type in metal casing and fixed to wall surface. Unit as 'Angus' ABC all purpose powder or equivalent and approved with content gauge.	4	no.		
d	15kg Automatic dry powder fire extinguisher gas cartridge type in metal casing and fixed to ceiling/roof slab unit as Eversafe' or equal and approved with contents gauge sprinkler head and discharge nozzle for the Genset and switch room.	4	no.		
2.2	<b><u>FIRE BARRIERS</u></b> Fire barred to be in accordance with BS 476				
a	Supply and install fire rated boards measuring 1200 x 500mm with a FR of 2 hours to floor openings including provisions for fire rated acrylic intumescent mastic to cover pipe surround to service pipes of OD 75mm, 50mm and power cables to penetrate through each floor.	4	no.		
b	Pipe collars to be carried out in accordance with BS 476 part 20 Supply and install pipe collars containing heat reactive intumescant material to provide up to 2 hours of fire resistance.	4	Item		
c	Allow for painting on electrical cables / busbars across fire zones with intumescent material to provide up to 2 hours of fire resistance.	1	item		
	<b>Totals for Bills No.2: Portable Fire Extinguishers &amp; Fire barriers to Summary page</b>				

**PROPOSED COMMERCIAL DEVELOPMENT ON PLOT LR NO. NAIROBI/BLOCK 40/15 DESAI ROAD, NAIROBI  
COUNTY FOR MWITO DT SACCO LIMITED**  
MECHANICAL INSTALLATIONS - PLUMBING, DRAINAGE & FIRE FIGHTING SERVICES  
**SUMMARY OF BILLS OF QUANTITIES - PHASE 1**

Item ref.	Description	Amount (Kshs)
<b>1.00</b>	<b>SECTION I : PLUMBING AND DRAINAGE SERVICES</b>	
i	Bill No.1: Water storage, pumps and associated plumbing	
ii	Bill No.2: Internal Plumbing & Drainage Installations	
iii	Bill No.3: External rainwater and soil waste drainage Installations	
iv	Bill No.4: Sanitary ware & tap fittings Installations	
v	Water & sewer board connection fee	
	<b>Sub-totals for Section I: Plumbing, Drainage and Sanitary Fittings Installation</b>	
<b>2.00</b>	<b>SECTION 2 : FIRE FIGHTING SERVICES</b>	
i	Bill No.1: Fire Hosereel Installations	
ii	Bill No.2: Portable Fire Extinguishers & Fire Barriers Installations	
	<b>Sub-totals for Section II: Fire Fighting Installations</b>	
	Contingency	350,000.00
	Preliminaries	
	<b>GROSS TOTALS FOR PLUMBING, DRAINAGE &amp; FIRE FIGHTING INSTALLATIONS - PHASE 2 C/F TO FORM OF TENDER</b>	

Amount in Figures: Kshs.....

Amount in Words: Kenya Shillings.....

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Contract Period:..... Weeks

Official Stamp & Address:.....

.....

**PIN No.:**..... **VAT No.:**.....

Tenderer's Signature:.....Date:.....

Witness' Name:.....Witness' Signature:.....

Address:.....

Date:.....