PROPOSED PROPERTY REDEVELOPMENT ON PLOT LR. NO. KISUMU/MUNICIPALITY/BLOCK 8/258, KISUMU

FOR

NATIONAL SOCIAL SECURITY FUND (NSSF)

TENDER REF NO: NSSF/ONT/KSM/19/2024/25

[redacted]

VOLUME 4 OF 5
SPECIFICATIONS & BILLS OF QUANTITIES

FOR

MECHANICAL SERVICES INSTALLATIONS

[redacted]

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MAY, 2025

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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 week's 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

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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 place 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.

Galvanised 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 X] 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 fitments shall not be used because of the risk of galvanic action.

If, as may occur in certain circumstances, it is not possible to make the connection in any 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 l, 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 Asbestos Cement Pressure Pipes

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

The classification of these pipes fall into classes:

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

Where cast iron detachable joints are used for connecting pipes, the material comply with the B.S. Specification, then the materials used shall be of a quality not less than that required by this standard.

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

2.1.9 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 l, 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.

2.1.10 Asbestos Cement Pressure Pipes

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

The Classification of these pipes falls into four classes:

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

Where cast iron detachable joints are used for connecting pipes, the material shall comply with B.S. Specifications, then the materials used shall be of a quality not less than that required by this standard.

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

2.1.11 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:-

Nom. Dia. (mm)	10	12	20	25	32	40	50	75	100
Thickness (mm)	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' 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	0.90mm	1.05m	1.20mm	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.

2.1.12 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)
11/4	32	1.8
11/2	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' 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)
11/4	32	500	1200
11/2	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 Practise 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.

2.1.13 A.B.S. Waste System

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

2.1.14 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. 45l4 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 on Drain Trap as indicated on the drawings.

2.1.15 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 or 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^{o}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.

2.1.16 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 75oC 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.

2.1.17 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 82oC when tested by the `Vicat` method 102D as described in British Standard 2782, and for fittings 79oC.

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 sidefilling. 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.

2.1.18 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 gates 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. 12l8.

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 upto 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. l4l5 from bronze or other corrosion resistant materials.

2.1.19 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".

2.1.20 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.

Size Nominal Bore	**Copper Tube To BS 659**	**Steel Tube To BS 1387**
15mm	1.25m	2.0m
20mm	2.0m	2.5m
25mm	2.0m	2.5m
32mm	2.5m	3.0m
40mm	2.5m	3.0m
50mm	2.5m	3.0m
65mm	3.0m	3.5m
80mm	3.0m	3.5m
100mm	3.0m	4.0m
125mm	3.5m	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 and Asbestos Cement Spigot and Socket Jointed Pipes

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

When holderbats are used, they shall conform to the requirements of B.S. 4l6. Suitable anchors shall be provided at all changes of pipe directions, junctions and tees, to counterpart the effect of end thrust loads.

(d) Asbestos Cement Pressure Pipes

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

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

Within building, asbestos pressure pipes shall be carried either on concrete support on rigidly fixed steel wall brackets.

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

(e) Concrete and Pitch Pipes

These pipes shall not be used for above ground application.

(f) Expansion Joints and Anchors

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

2.1.21 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.

2.1.22 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 fails 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 each 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 roding and inspection facilities within the draining system in position where easy accessibility is available.

Where a branch requires roding facilities in a position to which normal access in unobtainable, then that branch shall be extended so as to provide a suitable purpose made roding eye in the nearest adjacent wall or floor to which easy access 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 roding and testing shall be provided at the foot of each stack.

(c) Sanitary Appliances

All Sanitary appliances associated with the Sub-contract works shall be installed in accordance with the best standard of modern practice as described in 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 I : 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 I: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 l2mm 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 I:I 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 to1800	-	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

l00mm 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 which ever 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).

Depth Ground Of Outgoing Invert	**Internal Access Shaft Diameter**	**Size Main Channel Diameter**	**Chamber Diameter**	**Height Chamber Above Benching**
Up to 740	-	100 to 460	910	-
760 to 2410	-	100 to 460	1070	-
2440 to 4550	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 as 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 of 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 20ºC .

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 and 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 Duckfoot 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 to lay the pipes, valves or other materials examine them and ascertain that they are in perfectly sound condition and he shall be responsible for any 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 ill 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 coat of filling up to required levels.

(j) If a mechanical excavator is used by the Contractor, he shall indemnify the Employer against all claims for damage that in the opinion of the Engineer, may be caused by the used 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 relaid 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 3o 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 Clause B, C or D pipes, respectively.

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

(b) When a section of the 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 standing 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 lea shall be repaired.

To determine the rate if 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 Main

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

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

Emptying and washing out of the pipes shall be done in such a manner as not 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 side 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 remove with outmost 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 tithe 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

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

INDEX

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/$C0_2$ Fire Extinguishers

The portable 9-litre water filled CO_2 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

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^3/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 WET RISER INSTALLATION

PART F

PARTICULAR SPECIFICATION FOR WET RISER INSTALLATION

I N D E X

PART F

PARTICULAR SPECIFICATION FOR WET 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

WET 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 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 "WET 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 l: 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 passes 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 wet 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 clients staff shall be instructed in the operation and maintenance of the equipment.

PART G

PARTICULAR SPECIFICATION FOR

SPRINKLER SYSTEM

PART G

PARTICULAR SPECIFICATION FOR

SPRINKLER SYSTEM

PART G

PARTICULAR SPECIFICATION FOR SPRINKLER SYSTEM

7.00 General

The particular specification details the requirements for the supply, installation and commissioning of the Automatic Sprinkler installation. The sprinkler installation shall comply in all respects to the requirements set in the Fire Officers Committee Rules for Automatic Sprinkler Installation, 29th Edition for Ordinary Hazard Group III Installation.

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 claim for extra payments 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 exists a difference between the requirements of the specification and the Contract Drawings, he shall clarify these differences with the Engineer before tendering.

7.01 Climatic Conditions

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

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

Maximum Design Temperature	32^0C DB
Minimum Temperature	24^0C DB
Relative Humidity Range	69%
Altitude	1146 m
Longitude	36˚ 49’ E
Latitude	01˚ 00’ N
Rainfall	Extremely heavy at certain periods of the year.

The Sub-Contractor shall be deemed to have taken account of the above details in his prices and his planning of the execution of the Works.

7.02 Scope of Works

The Sub-Contractor shall supply, deliver, erect, test and commission all the automatic fire fighting sprinkler 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 Council water mains, supplying and laying metered service pipe, upto making connections to the Water tank.

The Sub-Contractor shall install all the electrical and diesel pumps called for in this Sub-Contract.

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

The sprinkler system shall be fed by two sources of water supply described below:-

From 100mm diameter water service main tapped off the site water reticulation.

From a 118,800 litre water storage tank through 2 No. automatic electric pumps.

7.03 Automatic Sprinkler Pumps

The automatic sprinkler pumps shall consist of 2 No. automatic horizontally mounted centrifugal electrically driven pumps. Both pumps shall be connected to the normal incoming electrical main and to the standby generator.

The pumps shall be capable of providing at the installation control valve a running pressure of at least 1.4 bar plus the pressure equivalent of the difference in height between the highest sprinkler and the valves when the water is being discharged from the valves at a rate of 725 dm^3/min (16.6 L/S).
The pumps shall be constructed of cast iron with impeller of cast iron and are to have mechanical seals.

The motor shall be three phase totally enclosed fan cooled squirrel cage continuously rated complying in general with B.S.2613/1970.

Provision shall be made for low level cut outs to the pumps to prevent dry pump run in the event of low level water conditions.

The pump shall be provided with a plate giving the output pressure at the nominal flow specified. Where the performance characteristic is achieved with an orifice plate not integral with the pump delivery, the pump name plate shall carry a reference to the fact that the performance given is that of the pump and orifice plate combination, and reference shall be made to the orifice K factor.

7.04 Installation Control Valves

The Sub-Contractor shall supply and install approved installation control valves called for on the Contract Drawings and in this Specification. The installation control valves set shall comprise of a main stop valve, wet pipe alarm valve, a water motor alarm and gong, and installation pressure gauges.

7.05 Spares

The Sub-Contractor shall supply and fix a cabinet with 24 spare sprinkler heads together with a set of sprinkler spanners.

7.06 Control Panel

The control panel is to be of mild steel construction or other approved material, moisture-proof and insect and rodent-proof and shall be provided complete with a wiring diagram that is moisture-proof.

Pump operation shall be controlled by pressure switch, the control panel is therefore to include the following: -

a) Manual Stop/Reset push button to No. 1 duty pump connected to Electrical Mains.
b) Manual Stop/Reset push button to No. 2 standby pump connected to Electrical Mains.
c) Test push button with green indicator light to No. 1 standby pump.
d) Test push button with green indicator light to No. 2 standby pump.
e) Electric Alarm bell provided for remote warning of systems operation during pump run.
f) Red warning for indication of no water in Storage Tank.

7.07 Sprinkler Heads

The sprinkler heads shall be of conventional pattern, designed with a universal deflector and similar to “GRINNEL” Type F, quartzoid bulb sprinkler heads as manufactured by Mather and Platt (UK) Limited.

All sprinkler heads shall comply with the following requirements:-

Nominal Size	15 mm
K Factor	80+/- 5%
Temperature rating	73/79.4^{0}C (Yellow colour)

7.08 Pipework

The pipework for the sprinkler systems shall be black medium quality, steel tubing, high frequency seam weld pipe to comply with B.S.1387 and suitable for screwing to B.S.21 tapered pipe threads.

7.09 Pipe Supports

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

Piping shall be secured in the normal manner with pipe clips.'U' bolts shall not be used as substitute for pipe clips.

Where the design of the structure is in reinforced concrete, pipe hangers and brackets shall be secured to the structure by means of redheads, rawlbolts or other approved means.

Where the structure is constructed of hollow clay pot and concrete fill the Sub-Contractor shall arrange for his pipe hangers and brackets to be supported from the concrete columns and beams. No rawlbolts and redheads shall be inserted in any clay pot construction unless specifically and exceptionally approved by the Engineer.

An approximate guide to maximum permissible support spacings in feet for different classes of pipe and tube is given for horizontal runs in the following table.

Vertical pipe runs shall be supported at intervals not greater than 1 ½ times the distance shown in the table.

Size N/Bore (mm)	**Copper Tube** to B.S.659 (mm)	**Steel Tube** to B.S.1387 (mm)
15	1200	1800
20	1200	2000
25	1500	2500
32	1500	2500
40	1800	2700
50	1800	3000
65	1800	3400
80	2000	3400
100	2500	3700
125	2700	4000
150	2700	4300

The Sub-Contractor shall submit all pipe support designs for the Engineer's approval.

Positions and type of supports shall be shown on the working drawings and submitted to the Engineer for approval.

7.10 Pipe Fittings

The pipe fittings for sprinkler systems shall comply with medium quality steel pipe fittings to B.S.1740 Part 1 with B.S.21 tapered pipe threads.

7.11 Flanges

The flanges shall comply with B.S.4504:1969. All flanges shall comply to a nominal pressure rating of 16 Bar (PN 16) and shall be either grey cast iron or steel with raised faces.

7.12 Gaskets

The gaskets for use with flanges to B.S.4504:1969 shall comply with B.S.4865 Part 1 1972 for pressure up to 64 Bar.

7.13 Footvalves

The footvalves shall be as Glenfield check valve No. 5803 to B.S.5153:1974 incorporating strainer, with flanges to B.S.4504 PN 16.

The strainer shall be of Machined Cast iron with strainer area not less than twice the suction pipe area.

7.14 Non-Return Valves

The non-return valves shall be as Glenfield No. 5003 conforming to B.S.5153: 1974 with flanges to B.S. 4504 PN. 16.

The body, door and cover are to be of Meehanite Cast iron construction with gun metal seat to B.S.1400.

7.15 Gate Valves

The gate valves up to and including 150mm diameter shall be as Glenfield R.S. Gate Valve 3500 series to B.S. 5163 with flanges to B.S. 4504 PN. 16 with raised faces. The valve shall be double flanged cast-iron wedge gate valve for water work purposes with Meehanite cast iron body to V.S.1452 Gr.14 with rubber covered meehanite cast iron gate. The stem is to be of forged stainless steel to B.S. 970 with Meehanite cast iron hand wheel.

7.16 Finish Painting

Upon completion of testing and commissioning, the sprinkler installation shall be primed with 1 No. coat of primer and 2 No. coats of appropriate red shade of paint to the Architect's requirements.

7.17 Approval of Automatic Sprinkler Systems

After the tender contract has been let, the Sub-Contractor shall prepare complete detailed working drawings of the protection with plans of floor, details of water supplies upto the installation control valve and any pressure reducing valves, water meters, water locks and any orifice plates. The drawings shall be on an indicated scale not less than 1:100. A key of any symbol used is to be included. A summary schedule should be included stating:-

i) Total number of sprinkler heads on each installation.
ii) Height of highest sprinkler head in each installation
iii) Type of installation, in this case to be wet pipe system and the size of main control valves to be indicated.

7.18 Instruction Period

The Sub-Contractor shall allow in his contract sum of 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 H:

PARTICULAR SPECIFICATIONS

FOR

AIR-CONDITIONING SYSTEM

PARTICULAR SPECIFICATIONS

FOR

AIR-CONDITIONING SYSTEM

CONTENTS

PARTICULAR SPECIFICATIONS

FOR

AIR-CONDITIONING SYSTEM

1. Scope of Works

The works shall comprise of the supply, delivery and installation, setting to work, testing and commissioning of all the materials and equipment called for in this specification. The works shall be executed at **Kisumu - Kenya**

The amount quoted shall include for all materials and items not particularly called for in this specification but which are necessary for the completion and satisfactory functioning of the works.

2. Climatic Conditions

The following climatic conditions apply at the various sites and all the materials and equipment used shall be suitable for these conditions:

CLIMATIC CONDITIONS	Kisumu town
Maximum Design Temperature	32.0˚C
Minimum Temperature	24˚C
Relative Humidity	69%
Altitude	1146M ASL
Longitude	36˚ 49’ E
Latitude	01˚ 00’ N

3. Air-conditioning System

The air-conditioning system shall be designed to maintain room inside temperature of 22±1º C and relative humidity of 50±10%.

The Air-Conditioning shall be a Single Split system comprising of indoor high wall mounted units and outdoor condensing units. The whole system shall be complete with the following:

- Indoor units
- Direct expansion cooling coil with copper tubes and aluminium fins
- Refrigeration pipework with flared connections
- Refrigerant (R410a) charge
- Air-cooled condensing unit
- Fixing brackets/wall and wall mounting kit/slab mounting kit
- Thermostat to control room temperature
- High and low pressure control units
- Condensate discharge pipe work
- Service access valves
- Voltage Surge Protector
- Phase failure protection

The system shall be suitable for 240V, 1 – Phase, 50Hz power supply

4. Electrical Works

The Sub-Contractor shall include for supply, installation and commissioning of all starters, control apparatus, control panels and interconnecting wiring and conduits for equipment that the Sub-Contractor is supplying.

The Electrical Sub-Contractor will only provide power points positioned within 2 meters of the equipment supplied and the Air Conditioning Sub-Contractor shall connect his equipment from this point.

PART I

GENERAL SPECIFICATIONS

FOR

SWIMMING POOLS

&

POOL ACCESSORIES

CONTENTS

GENERAL SPECIFICATION FOR SWIMMING POOLS AND POOL ACCESSORIES

PARTICULAR SPECIFICATION FOR SWIMMING POOLS AND POOL ACCESSORIES

GENERAL SPECIFICATION FOR SWIMMING POOLS AND POOLS ACCESSORIES

1.0 Preamble

Swimming is becoming an increasingly popular leisure activity and demand for swimming pools is on the rise. The facilities may be located in private or public premises. "Public swimming pool" shall mean a bathing place of artificial or partly artificial construction located either indoor or outdoor and provided with controlled water supply, where the water is sufficiently deep for complete immersion of the body and is used collectively by numbers of persons for swimming or re-creative bathing. The definition of public swimming pool shall also include the surrounding area, buildings, equipment and accessories pertaining to such a bathing area, but shall not include a bathing place accessory to a single- or double-family dwelling which is intended only for use of the residents and friends. The latter is deemed private. Care should be taken during design to encompass adequate safety, health and aesthetic standards. This specification is a broad guideline to ensure proper standards are achieved. They in no way substitute the legal requirements or obligations as provided by various government regulatory agencies such as Directorate Of Occupational Health And Safety Services, Kenya Bureau Of Standards among others.

1.1 Guiding regulations and standards

The works executed under these specifications shall comply with the following regulations and standards:

a) The Kenya Government Regulations as stipulated by directorate of occupational health and safety and published time to time.
b) The Kenya Bureau of Standards regulations under relevant sections for each facility and equipment
c) Local Authority By-laws
d) The United Kingdom Chartered Institute of Building Services Engineers (CIBSE) Guides.
e) The United Kingdom Institution of Electrical Engineers (IEE) Regulations for the Electrical Equipment of Buildings.
f) American National Standards Institute ANSI
g) Rules and regulations emanating from the Electricity Regulatory Commission of Kenya.
h) The American National Electrical Code (NEC).
i) American Society for Testing and Materials (ASTM)
j) NEMA

1.2 Design objectives

Swimming pool projects require enormous funding levels and designers must ensure that the investor obtains a safe, secure, risk free, healthy and aesthetically appealing finished facility.

This specification defines some critical requirements for safety, health and ergonomics. This is reflected by choice of pool design, design standards, material and equipment choice, workmanship, water quality and circulation, maintenance procedures among others.

1.3 Location of swimming pools

A pool is a utility that should be well harmonized with the rest of the infrastructure. Pools shall be segregated from other areas but not in entirely isolated places. A fence, wall, building, or other enclosure should protect pools. Fences or walls shall be at least 1500 mm high and afford no external handholds or footholds. The entrances to the enclosure should be equipped with self-closing, self-latching closure mechanisms, located at least 120mm above the ground and provided with locking hardware. Pools should preferably be in open-to-sky locations with ample sunlight. As most people swim between 10.00am and 5.30 pm, it should be located in such a way that there is direct sunlight within these hours. At no time should pools be located under trees, near storm water or foul water drains.

Most pool arrangements have incorporated baby pools. These should be located near adults' leisure places adjacent to the pools for ease of monitoring and the occasional attention required by the minors. Some designers prefer to incorporate a fountain at the baby pool as this enhances minors' entertainment.

1.4 Types of Swimming Pools:

There are two popular types that may be specified namely the deck-level and the free board arrangement.

The deck-level uses a channel around the pool and water from the pool drains into it. Water is then collected into a balance tank. It is then sucked via a line strainer by pumps located in the plant room. The pumps force the water into appropriately design filters. The water is the chlorinated and pumped back to the pool via specially designed inlets. The engineer must pay special attention to those design details as well as in channel design, balance tank design, pump and filter design, chlorinating facilities design and plumbing considerations. These details have to be provided for every particular site and the data supplied to pool builders.

The **free board arrangement** has approximately 200 mm of space between the water surface and the top of the pool. Skimmers are incorporated for trapping debris from the water surface. Designers must pay special attention to drain pipe sizing and skimmer design. Except for the balance tank which is not normally used in this free board design, all the other considerations made for deck-level must be taken into account and the details supplied to pool builders. Special design data forms are incorporated in this specification for specific sites in section two.

Designers can generally specify two types of pools namely **hot** and **cold** water pools. Though cold water pools are popular because of the low running and maintenance cost, they remain generally unused during cold and rainy seasons. Designers can specify hot water pools which incorporate auxiliary heating equipment. The specifications for this equipment are provided in latter sections of this specification.

1.5 General Criteria for Pool design:

1.5.1 Shapes Of Pools

The most popular is the rectangular pools with length to breadth ratio of 2:1. The corners may be right angled or rounded to improve on aesthetics and cleanliness. Rounded corners are considered stronger and easier to maintain. Increasingly, free-form shapes are being specified. These include figure-8 profile, kidney profile, rectangular but with chamfers, oval, rounded

end or other geometric shapes as the designer prefers. The major consideration is aesthetic and safety. The shallow end should have stairs and the descent must be gradual. Sharp corners must be avoided as they pose injurious hazards. Pools with parallel sides are considered more suitable for exercises and gymnastics.

1.5.2 Sizes

The maximum number of people allowed in the pool area should be limited to number calculated using the criteria outlined in the following table:

	Shallow, Instructional, or Wading Areas	Deep Area (not including the diving area)
Pools with deck area less than the water surface area	1.5 square meter per user	1.8 square meter per user
Pools with deck area at least equal to the water surface area	1.2 square meter per user	1.5 square meter per user
Pools with deck area at least twice the water surface area	0.8 square meter per user	0.9 square meter per user

1.5.3 Decks

There should be at least 2 meters of unobstructed deck space surrounding the pool. Pool decks shall be sloped away from pools and free of depressions that could accumulate standing water. The surface shall be rough concrete or another non-slip surface.

1.5.4 Wading Pools

If wading pools or spas are present, they shall be separated from the main pool by at least 2 meters. Wading pools should be no deeper than 0.9 meter. The depth at the perimeter shall be 0.4 meters or less. If the wading pool is located adjacent to the deep area of the main pool, a wall or fence at least 1.2 meter high should separate the two pool areas.

1.5.5 Depth Specifications

The areas of the pool shall be defined as follows:

• Beginner's (Wading) Area - portions of the pool with a water depth of 0.9 meter or less.

• Shallow Swimming Areas - portions of the pool with a water depth of 0.9 meters to less than 1.5 meters.

• Deep Swimming Areas - portions of the pool with a water depth in excess of 1.5 meters.

• Diving Areas - depth and surface area requirements are determined by the type of diving equipment and the height of the equipment above the water surface. Design calculations shall be provided for depth of diving areas for particular site and equipment specifications. A detailed design specification is given in section 1.9.9 of this specification.

- The Beginner's Area may not adjoin the Deep Area of the pool.
- Racing pools should have a minimum depth of 1.1 meters if starting blocks are used.

1.5.6 Floor Slopes and Transition Point Demarcation

Floor slopes shall be constant in each area of the pool and not exceed 300 mm vertically in 3600 mm horizontally. The slope of the floor at the transition between pool areas shall not exceed one meter in three meters. The different areas of the pool shall be set apart with a rope and float line, depth markers, and a hundred millimeter minimum width row of floor tile, a painted line, or similar means of color contrasting on the pool bottom.

If there is a change in slope at the transition between the shallow and deep areas of the pool, the rope and float line shall be positioned between 0.3 and 0.6 meters from the change in slope, on the shallow side of the change.

The depth of the water shall be marked at or above the water surface on the wall (vertical surface) of the pool and on the top of the coping or edge of the deck or walk (horizontal surface) next to the pool. The markings on the pool deck shall be within 0.5 meters of the edge of the water, positioned so they can be read while standing on the deck facing the water, and made of non-slip material. The markers shall be at least 100 mm tall and a contrasting color to the background. Depth markers shall be installed at the minimum and maximum water depths and at all points of slope change. Markers shall also be installed at intermediate increments of water depth not to exceed 0.6 meters, and spaced at intervals not greater than 7.5 meters. Markers should be arranged uniformly on all sides of the pool. Depth markings should feature the spelled out unit of measurement, i.e. feet, meters, etc

1.5.7 Pool Entry and Exit

The pool shall have a minimum of two entry and exit points, located so as to serve both ends of the pool. They may consist of ladders, stairs, or recessed treads. All treads must have slip resisting surfaces. In addition, the following criteria for entry/exit points should be met:

- If the deep area of the pool is more than 9 meter wide, both sides of the deep area shall have a means of entry/exit.
- A means of entry/exit shall be provided at a minimum of every 20 linear meter of pool wall.
- If the pool has an area with a water depth at the wall of 0.5 meters or less, such area provides its own natural mode of entry/exit.
- Stairs, ladders and recessed treads shall not interfere with racing lanes.
- Stairs, ladders and treads should conform to the criteria outlined in articles 5.3, 5.4, and 5.5 of ANSI.

1.5.8 Pool Surfaces

All surfaces within the pool intended to provide footing shall be slip-resistant. Pool floors and walls shall be lightly colored. The colors, patterns, or finishes of the pool interior should not obscure the existence or presence of objects or surfaces within the pool. There should be no protrusions or other obstructions in the swimming area that can cause entrapment or injury. All interior surfaces should have uniform slopes.

1.5.9 Water Velocity Specification

The maximum velocity in any suction pipe must not exceed 1.52 meter per second. The maximum velocity in any pressure pipe must not exceed 2.74 meter per second. The Filtration

Rate is the speed or velocity of the water through the filtration media. The slower the Filtration Rate, the more effective the filtration

1.5.10 Drain Sump Design

Pools shall have at least two drains located at the bottom of the pool. All drains and suction fittings shall be guarded by anti-vortex covers or other means to prevent entrapment. In addition, circulating system designs shall conform to Consumer Products Safety Commission (CPSC) of U.S. or its equivalent KEBS standard for reducing entrapment hazards in pools.

1.5.11 Balance Tank Specification

Systems using deck-level water circulation arrangement shall incorporate a balance tank. The balance tank is suitably sized by consideration of volume of water displaced at peak usage hours. It shall be equipped with a suitably sized water supply inlet, overflow, drain pipe and a protective high pressure ball valve.

1.6 Safety standards

While unsafe acts are frequently the cause of accidents, pool design and equipment can be a contributing factor. All particular designs shall meet the minimum specifications outlined herein for the following: Perimeter protection, Depth markings, Diving area design, Deck drains and covers, Pool bottom markings, Pool coatings, Electric pool lights, poles, or machinery, Obstructions on pool and deck surfaces, Chlorine dispensing equipment, Drains and suction fittings.

In particular the following shall be stated for each particular design:

1.6.1 Flow Rate: Shall conform to standards set in section 1.5.9 above

1.6.2 Anti-Vortex Drain: Shall conform to standards set in section 1.5.10 above

1.6.3 Hand Rail: Shall conform to standards set in section 1.9.5 below

1.6.4 Guard Against Electrical Hazards: Shall conform to standards set in sections 1.10, 1.10.1 and 1.10.2 below

1.6.5 Slope Profile (standards): Shall conform to standards set in section 1.5.6 above

1.6.6 Lifeguard Chairs: Shall conform to standards set in section 1.9.4 below

1.6.7 Guard against Drowning (Depth requirements): Shall conform to standards set in section 5.1.5. above

1.6.8 Ladder: Shall conform to standards set in section 1.9.6 below

1.6.9 Pool Surfaces: Shall conform to standards set in section 1.5.8 above

1.6.10 Springing Boards and Diving Accessories: Shall conform to standards set in sections 1.9.1, 1.9.2, 1.9.3 below.

1.6.11 Emergency Shutdown

An emergency shutdown station shall be provided. This station shall disable all pool circulation, mechanical, chemical feed and electrical devices.

1.6.12 Pool Safety Equipment

All pools shall be equipped with Pool safety equipment as specified in the particular specification, including signs, first aid equipment, and emergency procedures.

1.7 Health, Safety and Cleanliness specification

1.7.1 Health and Safety requirements

During operation, it shall be ensured that:

(a) *Safety; lifeguards.* Appropriate facilities shall be provided for the safety of bathers. Competent lifeguards shall be on duty during all swimming periods.

(b) *Access.* When the swimming pool is not open for use, access to such pool shall be prevented, and such prevention shall be the responsibility of the pool owner or his agent, or the pool constructor if site in possession of the site.

(c) *Emergency instructions.* Instructions regarding emergency calls shall be posted in a conspicuous place in the pool area.

1.7.2 Cleaning Equipment

The engineer may specify any or all of the following equipment depending on the particular site. Performance standard must be clearly stated in the particular specification of this document or in the proposed supplier's manual.

1.7.2.1 Leaf Skimmer

This shall be made of light weight net with a long arm for the removal of leaves and debris from the water surface.

1.7.2.2 Leaf Rake

This equipment is suitable for scooping debris from the pool floor. It is of similar construction to leaf skimmer.

1.7.2.3 Vacuum-Operated Accessories

These are connected to vacuum points and are designed to remove debris and dirt from pool floor. They are attached to pool pump through a flexible hose which is normally 38mm in diameter and 10 meter long. Another configuration has a brush at its head that facilitates removal of algae and other dirt stuck to pool floor. The 'baracuda' is an automatic pool cleaner that removes debris as it automatically moves on the pool floor.

1.7.2.4 Wall Brush

These shall be constructed from hard plastic material and shall effectively remove algae on pool walls. There are different sizes ranging from 300 mm to 750 mm.

1.7.2.5 Test Kits

These are specified for effective measurement of pH, residual chlorine and acidic levels.

1.7.2.6 Thermometer:

These measure water temperature. A suitable pool thermometer shall have a scoop for accurate display. It shall be marked in degrees centigrade with maximum 0.25 graduations.

1.7.3 Water quality

Water is deemed unsuitable for swimming if

a) There is presence of debris, floating or sunk dirt and other foreign particles.
b) If pool has algae and/or bacteria.
c) If there is turbidity (water not clear).
d) If pH level is below 7.2 or above 7.6.

The objective of this section is to specify how a suitable balance may be achieved.

1.7.3.1 Removal Of Debris Dirt and Turbidity: Filtration And Flocculation.

This is primarily removed through filtration by sand filters. The particular specification shall be provided in section two of this document. Once the pool has been filled with water all the equipment should be turned on. Chemicals such as chlorine, muratic acid, and stabilizer will

need to be added. The filter system should be run continuously the first 24 hours until the water reaches the desired level of clarity. This typically represents the time required for 99% of the pool water to pass through the filter. Usually, once this level is reached the pool can run as little as six hours a day to maintain a healthy environment. The surface of the water usually contains the most pollutants (i.e., body oils, grease, sweat, and skin debris). To keep the pool clean, a skimmer/channel (filtering device) should draw at least 70% of the pool water from the surface for filtration and treatment. Occasionally solids may be removed by flocculation. The amount of flocculants depends on amount of dirt. 50 ppm shall be the minimum.

1.7.3.2 Algae And/Or Bacteria

The pool is green or has black growth between tiles if algae are present. It is harmful to human health if bacteria are present. It shall be removed by chlorination or application of algaecides. The normal chlorine dosage shall be 1.5 if applied in the evening and 3.0 ppm if during the day. Chlorine is oxidized by sunlight. Calcium hypochlorite (with 65% available chlorine) or trichloro-isocyanuric acid (with 90% available chlorine) shall be specified.

To remove algae organic algaecides or copper-based algaecides shall be specified. The normal dosage shall be 55 liters of organic algaecides or 105 liters for trichloro-isocyanuric acid for an Olympic size pool (say 25 M X 50M). Dead algae shall be brushed and vacuumed after 24 hours on application.

1.7.3.3 pH level

Normal pH shall be between 7.2 and 7.6 as determined using a test kit. If it is high it shall be reduced by liquid HCl. The normal dosage for reducing ph by 0.1 shall be stated by chemical supplier. If it is low it shall be reduced by liquid sodium carbonate. The normal dosage for increasing ph by 0.1 shall also be stated by the chemical supplier.

1.8 Water Circulation: Mechanical Equipment Design Objective.

Pools shall be equipped with water circulation, filtration, and disinfection equipment. This equipment shall comply with the American NSF Standard 50 for, *Circulation System Components for Swimming Pools, Spas, or Hot Tubs* or its equivalent KEBS standard. All equipment should be installed and operated according to the manufacturer's instructions.

1.8.1 Recirculation and Turnover Period.

The objective of recirculation is to ensure that dirty water is continuously and efficiently removed from the pool at the required rate. The turnover period for public pools shall be a maximum of 6 hours while that of domestic pools shall be 8 hours. Water shall be delivered to the filtration plant, chlorinated and then returned to the pool as clean water suitable for healthy swimming. Prior to water entering filtration pumps it shall be filterd by line strainers.

1.8.2 Filtration Equipment

The filtration plant shall be by pressure sand filters. The filters shall be designed for high performance in a normal media charging. The media shall consist of clean, finely grade chemically inert and long lasting silica sand. The sand shall be charged inside the container in layers of different media grades. The filtration plant shall have a capacity to be specified in the particular specification, but capable of handling the required water circulation rate, as specified in section 1.8.1 above. The filter container shall be able to withstand a working pressure of at least 3.5 bars and a test pressure of at least 5 bars. Filters shall be made of non-corroding

material. Polyester or fiber glass laminated ones may be specified. Maximum flow rate and maximum operating pressure shall be specified in particular specifications. Filters shall be multi-port with normal, backwash, rinse, re-circulate, waste and closed positions clearly marked.

1.8.3 Disinfection Equipment: The Chlorinator

Disinfection shall be achieved via a chlorinator equipment with a chlorine production rate specified in the particular specification herein. 26gm/hr shall be considered normal, however the output unit is to be designed so as to be adjustable and have indication to show rate of chlorine production taking place. It shall also have a control unit and an electrolysis cell. There shall be a pH monitor that will regularly monitor and control the pH levels of water and also be fitted with flow control valve. Display shall be digital and shall have suitable LED indicators. The indicators shall show among others low salt and overload indicators as well as a water flow detector and indicator system. The timing clock shall have a battery backup. Cell terminal connectors shall be of high quality brass. The chlorinator assembly shall also have chemical dosage pumps as specified in section two of this document. The chlorine dosage equipment shall comprise chemical tank(s) of a capacity to be specified in section two of this document.

1.9 Accessories:

1.9.1 Spring Boards

Spring board shall be propped on two n-shaped, well anchored sturdy metal bars of non corroding material. The board shall be fixed on these and made to protrude above the pool. The distance above the water surface shall be determined on the basis of pool size and use. Generally, for institutional pools the height shall be approximately 1 meter and in residential pools be between 0.5 to 0.75 meters. The projection length of board into the water shall be determined by the length of diving well and by the space available at the back of the board. The distance between the front of the board and the farthest end of the deepened well shall not be less than 3 meters. The minimum acceptable projection length shall be 300mm.for pools with sufficient diving well, the projection shall be half the length of distance between the pool and the front footing of the board.

To ensure safety, water depth for the deepened well shall not be less than 3.0 meters for boards set above 1 meter above pool water surface and 2.5 meters for those set up to 750 mm. the board shall be set at least 2.5 meters from the nearest sidewall. The rear support block shall have an anchor support of at least 1000 Kg. The front supports shall be cast in a well founded concrete strip with a footing not less than 300mm.

1.9.2 Diving Structures

Diving structures used for competitive diving shall comply with American standard ANSI, or other equivalent international or KEBS standard.

1.9.3 Slides

Slides shall comply with the CPSC *Safety Standard for Pool Slides*. Stairs, ladders and treads shall conform to the criteria outlined in articles 5.3, 5.4, and 5.5 of ANSI

1.9.4 Life Guard Chair

Pools with surface area greater than 160 square meter shall have at least one elevated lifeguard chair. The pool should have one additional chair for every 270 square meter or fraction thereof. If the pool has more than one chair and is wider than 13.5 meter, the chairs should be located on opposite sides of the pool.

1.9.5 Hand Rail

Suitable handholds should be provided around the perimeter of the pool in areas where the depth exceeds 1.1 meter. At a minimum the handholds should be no more than 1.2 meter apart, and consist of any one or a combination of the following: Coping ledge, or deck along the immediate top edge of the pool that provides a slip resisting surface of at least 100mm, not more than 1 meter above the waterline; Ladders, stairs, or seat ledges; or A secured rope or railing placed at not more than 1 meter above the waterline.

1.9.6 Ladders

Ladders shall be manufactured entirely from well polished AISI 304 stainless steel. They shall have a minimum diameter of 38 mm. They shall have an n- shape profile (side elevation) at the top end. Ladders should conform to the criteria outlined in articles 5.3, 5.4, and 5.5 of ANSI

1.10 Electrical Systems

All electrical wiring and equipment in or adjacent to swimming pools should comply with Rules and regulations emanating from the Electricity Regulatory Commission of Kenya and any other local electrical safety codes. In particular it shall comply with current general electrical specifications promulgated by the Chief Electrical and Mechanical Engineer (BS), Ministry of Roads and public Works. In addition, the primary requirements for pools as published by IEEE, “Swimming Pools, Fountains, and Similar Installations” shall be applicable. These requirements shall include but not limited to separation distances for electrical conductors, requirements for underwater lighting and audio equipment, earthing requirements for certain electrical equipment; and mandatory bonding of metallic pool structural elements, lighting systems, and electrical equipment associated with pool water circulating systems and zero tolerance on electric shock hazards in swimming pools.

1.10.1 Lighting

All lighting over swimming pools shall comply with current general electrical specifications promulgated by the Chief Electrical and Mechanical Engineer (BS), Ministry of Roads and public Works. In addition, the primary requirements for pools as published by IEEE shall be applicable. Further, all light fittings shall be heavy-duty fittings, encased in sleeves, or otherwise protected from breakage.

Area lighting shall provide at least 0.6 watts per square foot of deck area. If such lighting is used for night swimming, area and swimming pool lighting combined should provide at least 2 watts per square foot of pool area with 2 foot-candles of illumination.

1.10.2 Underwater Lights

Underwater lighting, if provided, shall comply with provisions of section 1.10 of this document. It shall provide a minimum of 0.5 watts per square foot of pool surface area. The lights shall be spaced to provide illumination so that all portions of the pool, including the bottom, may be readily seen without glare. The power supply shall be a safe 12 V. A step down transformer shall be inclusive of the underwater lighting system.

1.10.3 Pool Heating Equipment

Water temperature shall be carefully monitored between 80.6-100°F (27-38°C). At no time shall heating exceed this limit because of human risks involved and may cause cracks in the pool structure or cause vinyl liners to expand and lose their elasticity. The higher temperatures may also destroy the polymers leaving the liner dry and brittle. Pools for use by a physically handicapped person shall be set at 91° F(32 C) while those for exercise lap swimming shall be set at 78° F temperature(26 C). The equipment shall have standard control panel. They shall be in-line plumbing systems and provide a high thermal efficiency.

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1.10.4 Floating Covers

Since most heat loss is by evaporation, floating covers shall be specified for the particular pool. However the covers shall be sturdy and effective. They shall be easy to remove and replace

1.11 Material Specification

1.11.1 Guiding Theme

Material used for swimming pools shall generally be corrosion resisting and shall be safe to human health. They shall be able to sustain loads and/or pressures as specified.

1.11.2 Pool Construction Material

Three types of material may be specified for pool and spa construction: concrete, fiberglass, and vinyl-type.

Concrete pools represent 60% of pools being built world-wide today and offer limitless options for shape, configuration, and spa features. The excavation site is reinforced with steel and provides a sturdy support for pools of any shape or size.

Fiberglass pools are manufactured in a factory and the prefabricated pool arrives at its destination and is set in a previously excavated site.

Vinyl-lined pools arrive in a kit with construction being completed at the site. A custom fit vinyl liner is installed after the decking is completed and the structure is then filled with water. Previously limited to geometric designs only, free form options are now available. Pool designs shall be availed for approval prior to construction. Fiber glass and vinyl designs shall be accompanied by manufacturer’s catalogues. They shall conform to an internationally recognized specification and subject to interpretation by KEBS.

1.11.3 General Design Requirements For Monolithic Formed Reinforced Concrete Or “Gunite"

Pool shells shall conform to BS 8007. They shall have a minimum of 10 year warranty.

1.11.4 Plumbing Works

- Poly-Vinyl Chloride Standards(PVC): Pipe-work shall be done using pressure pipes class "E" to BS 3505. All pipe-work crossing structural walls shall be fitted with paddle flanges. The flanges shall conform to BS 143. Pipe fittings shall conform to BS 143. Where Bronze fittings are used, they shall conform to BS 1952. Where equivalent KEBS standards are available they shall be used in place of the stated BS standards. They shall be in accordance with general guide on plumbing

- Fiber Glass Reinforced Plastic (FRP) Standards : A complete line of Corrosion Resistant FRP Pipe and Fittings may be specified for use in swimming pools. Where this is the case the pipes and associated fittings must conform to ASTM D5421 standards or KEBS equivalent. The fittings which include and not limited to FRP Stub flanges & manholes, flanges, FRP Elbows, couplings, FRP U-Vents, butt joint kits shall be laminated with resin-rich liner. Pipes shall be produced in one piece construction without seam.

1.12 Workmanship standards

Swimming pool maintenance is expensive and errors during construction must be minimized. Persons charged with supervision must be present at all times during construction and installation of equipment. Quality of work shall be high, thus only qualified personnel shall be allowed to work on site. The engineer shall be allowed to peruse certificates held by workers or review their workmanship experience. If unqualified or workers achieve low standard of workmanship they shall be disallowed from further work.

1.13 Drawings

These shall include design, working and as built drawings. They shall be of an approved Kenyan standard.

1.13.1 Design Drawings

Design drawings shall be availed and approved by the engineer before commencement of works. The scope of coverage shall be as listed in section 1.13.2 below, though this may be varied.

1.13.2 Working drawings

Before commencement of construction, plans shall be drawn to scale and accompanied by proper specifications (or as per manufacturer's manuals and catalogues) so as to permit a comprehensive engineering review of the plans including the plumbing and hydraulic details. These shall include but not limited to:

a. Plan and sectional views with all necessary dimensions of both the pool and surrounding area.

b. A piping diagram showing all accessories including treatment facilities in sufficient detail, as well as pertinent elevation data, to permit a hydraulic analysis of the system.

c. Details on all treatment equipment, including catalog identification of pumps, chlorinators, chemical feeders, filter, strainers, interceptors, and related equipment.

d. Water supply, sewer and waste connections.

e. Materials of construction.

f. Walls, markings and slopes.

g. Overflow gutters and skimmers or drain channels.
h. Inlets and outlets.
i. Separation, zoning and control of users.
j. Recirculation equipment, piping and accessories.
k. Bathhouse and accessories, including plumbing fixtures.
l. Ladders, stairs, decks and walkways, diving equipment.
m. Diving, swimming, and bathing areas accessories.
n. Where applicable lighting and electrical facilities and wiring drawings.
o. Safety and lifesaving equipment.
p. Water quality, supervision and cleaning.
q. Operation and pool cleaning and maintenance manuals

1.13.3 As-Built-Drawings and maintenance manuals

Once the pool has been tested and commissioned, drawings and maintenance manuals shall be provided. They shall be a true and accurate representation of what has been commissioned.

1.14 Testing and Commissioning standards

As soon as the ditches are dug and the piping in place, the pipes are capped and filled with pressurized water to check for stress (leaks). Electrical wiring shall be inspected. Concrete decks and any surfaces using gunite are checked for smoothness and integrity. Since the gunite is customized to the design specifications the concrete is inspected visually on each site. The steel reinforcing material is checked after installation looking for any stress or weakness in the material. All accessories/equipment have to tested for capacity, efficiency, leakages and other human errors and shall meet standards and specifications.

1.15 Maintenance and Record during operation

(a) *Maintenance.* Pumps, filters, disinfectant and chemical feeders, and related accessories, shall be kept in operation at all times the swimming pool is in use and for such additional periods as needed to keep the pool water clear and of satisfactory bacterial quality such as when the pool is generally not in use. Continuous operation of the recirculation system shall be maintained in every swimming pool during seasons of regular use.

(b) *Records.* The operator of each pool shall keep a daily record of information regarding operation, including disinfectant residuals, pH, maintenance procedure, recirculation, together with the other data as may be required a government regulating agency or the client. These data shall be kept on file by the operator for six (6) months and periodically thereafter as may be required. Pool water samples shall be submitted to agency as required from time to time

1.16 Training

Adequate personnel shall be trained to perform normal operations and routine maintenance of the pool. The number of personnel to be trained shall be specified for particular pool.

PART J

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 PROPERTY RE-DEVELOPMENT ON PLOT LR. No. KISUMU/MUNICIPALITY/BLOCK 8/258 IN KISUMU
MECHANICAL INSTALLATIONS - INTERNAL PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

SECTION I: BILLS OF QUANTITIES FOR SHARED MECHANICAL INSTALLATIONS

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1	**BILL No. 1: INCOMING MAINS WATER AND WATER RESERVOIR TANK INSTALLATIONS**				
1.1	**Incoming Mains Council Water to Reservoir Tank** Supply, deliver, install, test and commission the following high density polyethene pressure pipe **"HDPE PN16"** (16kg/sq.cm), with a wall thickness of 10mm, SDR 11 in accordance to ISO 4427-2:2007, black in colour and UV protected. All pipes should be permanently and legibly marked as **"Danco"** using a hot embossed foil stamp printing. The pipes shall contain three equi-spaced blue longitudinal stripes indicating water as the medium transported within the pipes. Tenderers must allow in their pipework prices for all the couplings, connectors, unions, joints etc as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holderbats plugged and screwed, pipe sleeves through the roads and laid in trench. **Note: The jointing method for the pipes and fittings shall be butt fusion.**				
a	HDPE Straight Run Pipe				
a.1	Ø50mm straight run pipe	120	lm		
b	Extra over pipes				
b.1	Bends				
i	Ø50mm*90 deg. bend	6	no.		
ii	Ø50mm*45 deg. bend	2	no.		
b.2	Tee				
i	Ø50mm equal tee	1	no.		
b.3	Inlets				
i	Ø50mm galvanised mild steel, flanged water bar for underground water tank.	3	no.		
b.4	Air Release Valve				
i	Ø15mm air release valve as "Kinetic"	1	no.		
c	Control Valves				
i	Ø50mm Gate valve as "Pegler".	3	no.		
ii	Ø50mm Non-Return valve as "Pegler".	1	no.		
iii	Ø50mm high pressure float valve with Ø200mm float ball as "Pegler"	2	no.		
d	Water Pipe Caution Tape				
i	Supply and install 150mm wide, 100 micron thick caution tape, blue in colour with clear warning words "caution, water pipe below" and buried 200mm above pipe surface after backfill.	4	no.		
e	Testing, Commissioning & Sterilisation Allow for butt fusion of the joints, pre and post hydrostatic pressure testing not exceeding 6 Bars minimum of 48hrs and to Engineers approval.	1	item		

Sub-total C/F to next page

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
1.2	**Reinforced Concrete Water Reservoir Tank**				
a	Reinforced underground water storage tank of capacity 350m³ in two compartments for potable, raw water and plant room to Project QS measurements, construction by main contractor.	1	item		
b	Provisions to the water reservoir tank.				
b.1	Suction				
i	Ø150mm galvanised mild steel water bar with flange for fire fighting pump suction.	1	no.		
ii	Ø100mm ditto' for domestic pump suction.	2	no.		
b.2	Vents				
i	Ø100mm G.I pipe, double side goose neck vents c/w a mesh and flanges.	2	no.		
ii	Ø100mm overflow G.I pipe c/w aluminium mosquito mesh	2	no.		
c	Control Valves				
i	Ø150mm flanged type, cast iron sluice valve as Spirax.	1	no.		
ii	Ø100mm ditto"	2	no.		
iii	Ø150mm flange type, cast iron strainer as Spirax.	1	no.		
iv	Ø100mm ditto"	2	no.		
d	Sterilisation				
i	Allow for disinfection/sterilisation and flushing out of the water tank of capacity: 350,000 litres and pipework with water containing 0.05g/l granular calcium hypochlorite for a minimum period of 24hrs.	1	item		
	Sub-Total for Bill No. 1: Incoming Mains Water and Reservoir Tank Installations to Summary Page No.12				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2	**BILL No .2: SOIL AND WASTE WATER DRAINAGE INSTALLATIONS**				
	Supply & install the following soil & waste water drainage pipework as described and shown in the drawing.				
	All pipes and fittings shall be uPVC and MuPVC to BS5572:1978 and BS5750 as manufactured by 'Key Terrain' or equal and approved.				
	All joining's and fixtures shall be in accordance with the manufacturers instructions and as described.				
	Tenderers must allow for joining's, couplings, holderbats, reducers, clippings, spacers etc, necessary for the proper functioning of the installation when pricing.				
	The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures.				
a	Vertical discharge pipes in Golden brown heavy duty PVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø150mm Straight Run Pipe	92	lm		
ii	Ø100mm ditto"	52	lm		
b	Horizontal discharge pipes in Golden brown heavy duty PVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø150mm Straight Run Pipe	234	lm		
ii	Ø100mm ditto"	240	lm		
c	Extra fittings over pipes				
i	Ø150mm sweep bend	14	no.		
ii	Ø150mm equal tee	54	no.		
iii	Ø150mm Y- tee	14	no.		
iv	Ø150mm access cap	24	no.		
v	Ø150x100mm reducing bush	48	no.		
vi	Ø100mm sweep bend	12	no.		
vii	Ø100mm equal tee	50	no.		
viii	Ø100mm Y - tee	38	no.		
ix	Ø100mm access cap	84	no.		
d	Gulley trap				
i	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 murram and making good.	16	no.		
e	PVC Sleeves				
	Allow for PVC sleeves on the walls and beams.	1	item		
f	Mounting brackets				
i	Allow for adjustable M.S pipe mounting brackets c/w all accessories as approved by the project architect/engineer.	1	sum		
	Sub-Total for Bill No. 2: Soil and Waste Water Drainage Installations to Summary Page No.12				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
3	**BILL No. 3: RAIN AND STORM WATER DRAINAGE INSTALLATIONS**				
3.1	**Rainwater Drainage (Podium)**				
a	Vertical discharge heavy duty pipes in grey or white colour as 'Metro' or equal and approved.				
i	Ø100mm ditto''	96	lm		
b	Horizontal discharge heavy duty pipes in grey or white colour as 'Metro' or equal and approved.				
i	Ø100mm ditto''	12	lm		
c	Extra fittings over pipes				
i	Ø100mm sweep bend	22	no.		
ii	Ø100mm shoe	14	no.		
iii	Ø100mm water bars	14	no.		
d	Trapless Gulleys				
i	Rain water catch pit measuring 200*200mm complete with heavy duty m.s grating cover and frame.	14	no.		
	Sub-Total for Bill No. 3: Rain and Storm Water Drainage Installations to Summary Page No.12				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
4	**BILL No. 4: FIRE SPRINKLER SYSTEM INSTALLATIONS**				
4.1	**Fire Sprinkler Pumpset**				
a	Supply, install, set to work, test and commission the following fire pumpset comprising of electric duty, diesel engine standby pump and a jockey pump for pressure sustenance, pressure vessel, integral control panel, DC battery charging system, maintenance free batteries, manifolds, valves all assembled in a common skid. The automatic operation pumping set shall be in accordance with European Norm EN12845 covering automatic fire sprinkler systems in the car basements. The unit will also be fitted with a remote alarm device for indication of power failure, phase failure, start-up of duty pumps. The device will be complete with audible and visual alarm signals, and equipped with a 30 hour buffer battery (according to UNI 9490) and installed in a manned area. To allow for required regular testing of fire pump, the set shall be supplied with a flow meter and required piping to return water to the source tank. For the negative suction installation, the duty and standby pump shall be supplied each with a priming tank arrangement as **"Make: Dayliff, Model: FLA 120/10 Fire Sets" with DE50-32H/285 Pump and DLY80 Engine**				
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
a.1	Electric Pump Electric driven duty pump as DE50-32H/285 single stage, end suction automatic start/manual stop centrifugal pumpset with a flow rate of 120m³/hr against a static head of 10 bars.	1	no.		
a.2	Diesel Pump Automatic diesel driven engine standby fire pump with a flow rate of 120m³/hr against a s static head of 10 bars. All pumps shall be of back pull out design with space coupling allowing for removal of hydraulic parts without having to remove motor or pipe connections. All pumps shall be PN 16 rated with stable curves per EN12845. The engine shall be capable of delivering 10% more power than required by the pump at any of the performance values within the recommended fields of use, and have a twin-belt drive of the cooling fan and/or pump to guarantee smooth operation even if one should fail. The diesel tank shall be sized to ensure at least 6 hours of continuous operation and be equipped with containment basin and vent connection in accordance with UNI 11292 standard for fire set compartments. The engine pump will also be equipped with an industrial silencer.	1	no.		
a.3	Jockey Pump Jockey pump as Grundfos CM3-14 multistage, electrically powered pump with a flow rate of 3m³/hr against 5.5 bars . To ensure correct operation of the jockey pump, the unit will be equipped with a 100 litre, PN-16 diaphragm tank. There shall be one separate control panel for each pump. In order to prevent damage caused by overheating due to possible operation against closed isolating valve, the pumps shall be equipped with connection for a bypass. Separate suction lines to each pump will be required to avoid drawing air into standby pump in case of gland packing/seal failure on main pump.	1	no.		
a.4	Control Panel The electrically powered duty pump and the jockey pump will be controlled via separate control panels allowing easy reading of gauges and signals from their front doors. The starting method for motor will be Star-Delta to avoid line overload, stress on rotating parts and wear of system components Control panel shall be complete with mains isolator; pumps overload protection; power on, pump run and trip indicator lights; ammeter; Voltmeter, relays pressure gauge; phase failure relay with over and under voltage protection, cyclic pump controller float switch for low water level cut-out, pressure switches easily adjustable for differential operating pressures and sequential operation. The control panel of the diesel powered duty pump will also house two battery chargers (one for each 12V battery), with indicators for operation of battery charger. Panel will allow for 6 alternating start attempts on the engine in case of failed battery.	1	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
b	Pressure Regulating Valve (PRV) Ø150 mm installation pressure reducing valve for automatically reducing the higher pressure inlet to a steady lower outlet pressure regardless of changing flow rate and/or varying inlet pressure to the system as "Tyco".	2	no.		
c	Header pipe Ø150*150mm header pipe.	1	no.		
d i	Pressure Assembly Ø100mm installation control valve comprising of; Main stop valve, alarm valve, water alarm gong, drain valve, test valve, strain valve, pressure gauges, pressure valves, non-return valve, suction and discharge manifold all as manufactured by "Angus Fire" or equal and approved.	2	item		
e	Exhaust pipe Extension of the exhaust pipe to ground floor c/w with filters and silencer.	1	no.		
f	Maintenance tools & training Allow for supply of a wrench and other tools necessary for carrying out maintenance and routine testing of the wet hydrant system and for training of maintenance staff on use of the same.	1	sum		
g	Electrical Works Allow for electrical works wiring in armoured cable and fitting to pumps, control panel and the switches from Isolator provided by others.	1	item		
h	Fuel Allow for supplying the initial charge and enough testing fuel.	1	Item		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
4.2	**Fire Sprinkler System Installations** Supply and install the following fire fighting installation and equipment as described and shown on the drawings. **Important Note** The tenderer is to deliver a complete automatic sprinkler system. The tenderer should include in his unit rates for any accessories or items which are not stated but are necessary for the complete and satisfactory operation of the system to the requirements of the current edition of NFPA. All the valves in this section so be UL listed and to have provision for locking the valve in open or closed position.				
a	Straight pipes				
i	Ø100mm Black Steel tubing to BS 1387 Class "B" ditto'	654	lm		
ii	Ø75mm ditto'	351	lm		
iii	Ø40mm ditto'	172	lm		
iv	Ø32mm ditto'	380	lm		
v	Ø25mm ditto'	902	lm		
b	Extras over tubing;				
b.1	Bends/elbows				
i	Ø100mm Elbow	28	no.		
ii	Ø75mm ditto'	12	no.		
iii	Ø25mm ditto'	168	no.		
b.2	Fittings				
	Equal tees				
i	Ø100mm Tee	19	no.		
ii	Ø75mm ditto'	88	no.		
iii	Ø40mm ditto'	165	no.		
iv	Ø32mm ditto'	165	no.		
v	Ø25mm ditto'	170	no.		
	Reducing tees				
i	Ø40x25mm Reducing tee	138	no.		
ii	Ø32x25mm ditto'	138	no.		
iii	Ø25x25mm ditto'	138	no.		
b.3	Reducer Bushes				
i	Ø100x75mm Reducing Bush	18	no.		
ii	Ø75*40mm ditto'	12	no.		
iii	Ø40*32mm ditto'	152	no.		
iv	Ø32*25mm ditto'	138	no.		
v	Ø25*20mm ditto'	486	no.		
c	Sprinkler heads				
i	Ø15mm diameter automatic sprinkler heads:- pendant convention pattern with a universal deflector and red bulb for 68deg C operating temperature as manufactured by Firekit international or equal and approved.	525	no.		
d	Allow a sum for painting of the whole installation with two coats of super gloss paint on a primer coat to the approval of the Engineer.	1	item		
e	Testing & Commissioning				
i	Allow for butt fusion of the joints, pre and post hydrostatic pressure testing not exceeding 6 Bars minimum of 24hrs, cleaning, flushing out and drying to Engineers approval.	1	item		
	Sub-Total for Bill No. 4: Fire Sprinkler Pumpset and Associated Piping to Summary Page No.12				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
5	**BILL No. 5: WET RISER RETICULATION PIPE INSTALLATIONS**				
5.1	**Wet Riser Reticulation Pipe**				
	Supply, deliver, install, test and commission pipes, tubing and fittings as described and shown on the drawings.				
	The pipes shall be galvanised mild steel pipes to **BS1387, 'Class B'.**				
	Tenderers must allow in their pricing of pipework for all couplings, connectors, joints, unions, etc. as required in running lengths of pipework. Also, where necessary for pipe fixing clips, holder brats, plugged or screwed. The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures.				
	Important Note The tenderer is to deliver a complete fire hydrant system. The tenderer should include in his unit rates for any accessories or items which are not stated but are necessary for the complete and satisfactory operation of the system to the requirements of the current edition of NFPA. ***All the valves in this section to be UL listed and to have provision for locking the valve in open or closed position.***				
a	Straight pipes				
i	Ø150mm galvanised mild steel tubing .	86	lm		
	Extras over tubing				
b	Bends				
i	Ø150mm bends	8	no.		
c	Tees				
i	Ø150mm equal tee	2	no.		
ii	Ø100mm ditto"	12	no.		
d	Reducers				
i	Ø150x100mm Reducing Bushes	7	no.		
e	Four way breeching valve				
i	Inlet breechings manufactured to BS 5041-3. Ø65mm inlets male instantaneous to BS 336 with integral non-return valves, Ø25mm drain valve, rubber blank caps and chains suitable for use with a Ø150mm rising main as **"Bristol"** or equal and approved.	1	no.		
f	Testing & Commissioning				
i	Allow for butt fusion of the joints, pre and post hydrostatic pressure testing not exceeding 6 Bars minimum of 24hrs, cleaning, flushing out and drying to Engineers approval.	1	item		
	Sub-Total for Bill No. 5: Dry Riser Reticulation Pipe to Summary Page No.12				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
6	**BILL No. 6: IRRIGATION PUMP & ASSOCIATED PLUMBING INSTALLATIONS**				
6.1	**Site Irrigation Pumpset** Supply, deliver, install, set to work, test and commission the following irrigation pumpset. Domestic water booster pump set to operate as "1No. Duty and 1No. Auto Assist" with a flow rate of 6m³/hr at a static pressure of 4.0 bars, power rating of 1.1kW, single phase as **"Make: Pedrollo, Model: PP1-09/25"** or equal and approved. The pumps to be assembled in a common base plate and manifold with control and non-return valves, pressure switch, float switches in the underground tank for dry run protection. The pump shall have over and under voltage protection from unstable power conditions, overload and high temperature conditions. The pump set to have weather proof smart 2 evo control panel and associated wiring for automatic operation as duty & auto assist 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 etc.	1	set		

Sub-total C/F to next page

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
6.2	**Irrigation Reticulation Pipe** Supply, deliver, install, test and commission the following high density polyethene pressure pipe **"HDPE PN16"** (16kg/sq.cm), with a wall thickness of 10mm, SDR 11 in accordance to ISO 4427-2:2007, black in colour and UV protected. All pipes should be permanently and legibly marked as **"Danco"** using a hot embossed foil stamp printing. The pipes shall contain three Equi spaced blue longitudinal stripes indicating water as the medium transported within the pipes. Tenderers must allow in their pipework prices for all the couplings, connectors, unions, joints etc as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holderbats plugged and screwed, pipe sleeves through the roads and laid in trench. **Note: The jointing method for the pipes and fittings shall be electrical fusion.**				
a	Straight run pipes				
i	Ø50mm	400	lm		
b	Extra over pipes				
b.1	Bends				
i	Ø50mm x 90° mm bend	24	no.		
b.2	Equal Tee				
i	Ø50mm tee	2	no.		
b.3	Saddle Clamps				
i	Ø50mm x 3/4" clamp	19	no.		
b.4	Adaptors				
i	Ø50mm x 2" male adaptor	12	no.		
c	Control Valves				
i	Ø50mm Brass ball valves as Pegler	3	no.		
d	Stand pipes				
i	Ø25mm GMS Pipe complete with Ø20mm Aluminium hose taps/stop corks	24	no.		
	Sub-total for Bill No. 6: Irrigation Pumpset and Plumbing Installations to Summary Page No.12				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	SECTION I: SUMMARY TO SHARED MECHANICAL INSTALLATIONS				
1	Bill No.1: Incoming Mains Water Pipe and Water Reservoir Tank Installations B/F from Page No.2				
2	Bill No.2: Soil and Waste Water Drainage Installations B/F from Page No.3				
3	Bill No.3: Rain Water Drainage Installations B/F from Page No.4				
4	Bill No.4: Fire Sprinkler Installations B/F from Page No.8				
5	Bill No.5: Dry Riser Reticulation Pipe Installations B/F from Page No.9				
6	Bill No.6: Site Irrigation Installations B/F from Page No.11				
	Total for Shared Mechanical Installations C/F to Main Summary Page No.98				

PROPOSED PROPERTY RE-DEVELOPMENT ON PLOT LR. No. KISUMU/MUNICIPALITY/BLOCK 8/258 IN KISUMU
MECHANICAL INSTALLATIONS - INTERNAL PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

SECTION II: BILLS OF QUANTITIES FOR MECHANICAL INSTALLATIONS TO BLOCK A, 2B.R + DSQ (G+15)

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1	**BILL No. 1: COMMONS SHARED SERVICES**				
1.1	**Domestic Water Booster Pumpset** Supply, deliver, install, set to work, test and commission the following domestic water pumpset:				
a	Variable speed domestic water booster pumpset assembled in a skid, **Ref: "Pedrollo VHT2 20/60**", comprising of 2No. Pumps as **"Make; Pedrollo, Model: HT 10/7",** and will operate as "1No. Duty & 1No. Auto Assist" in parallel connection with a flow rate of 10m³/hr at a static pressure of 6.0 bars, power rating of 3.0kWx2No., three phase and 24 litre pressure vessel as **"GWS24".** The pumps to be assembled in a common skid and manifold with control and non-return valves, pressure switch, VFD Controllers, float switch in the underground tank for automatic operation and dry run protection. The pump shall have over and under voltage protection from unstable power conditions, overload and high temperature conditions. The pump set to have weather proof smart 2 evo control panel and associated wiring for automatic operation as duty & assist mode. The VFD control panel to have a pre-selector switch for auto/manual positions, contact relay arrangement for alternate running, thermal overload relays, display lamps etc.	1	set		
b	Float Switch Allow for a float switch cable and float switch between the underground water storage tank and the pump set for dry-run protection.	1	item		
	Sub-Total for Domestic Booster Pumpset to Collection Page No.24				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.2	**Mains Rising Pipe to Roof Water Storage Tank** Supply, deliver, install, test and commission pipes, tubing and fittings as described and shown on the drawings. The pipes shall be galvanised mild steel pipes to **BS1387, 'Class B'.** Tenderers must allow in their pricing of pipework for all couplings, connectors, joints, unions, etc. as required in running lengths of pipework. Also, where necessary for pipe fixing clips, holder brats, plugged or screwed. The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures.				
a	Straight run pipes				
i	Ø50mm GMS class "B"	194	lm		
b	Extra over pipes				
b.1	Elbows/Bends				
i	Ø50mm Bend	16	no.		
b.2	Unions				
i	Ø50mm Union	4	no.		
c	Gate Valves				
i	Ø50mm approved medium pressure screw down full way non rising wedge gate valve to BS1952 with wheel and head joints to steel tubing as "Peglar".	1	no.		
	Sub-Total for Mains Rising Water Pipe to Roof Tanks Installations to Collection Page No.24				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.3	**Sectional Roof Water Storage Tanks**				
a	Supply deliver, erect, test and commission the following tank, including pipework and equipment as described; Tenderers must allow all labour, materials, appetences, mortices, couplers, jointing's and plugging's necessary for complete and proper functioning of the installations. Fiber glass reinforced plastic (GRP) water storage tank with UV protection, stable thermal transition, zero light penetration to BS 13121-1:2021, tank size 6000*5000*2000mm, nominal capacity of 60,000 litres complete with 74No., 10mm tank panels, and flanges, cleats, stays, jointing compound, bolts, washers, nuts, 1No. Access hole with hinges & lock, internal & external stainless steel ladders, bracings, connections and PVC air vents. The tank shall be erected on bearers provided by others on the roof slab of the building. The following provisions will be required in the tank are described as follows; □ 1No x 2" inlet pipe connection. □ 2No x 2 1/2" outlet pipe connection □ 1No x 3" overflow Pipe. □ 1No x 2" washout. □ 1No. vent with mosquito netting.	1	no.		
b	<u>Accessories</u>				
b.1	Ball Valves				
i	2" Inlet brass female ball valve as Pegler.	1	no.		
ii	2 1/2" Outlet brass female ball valve as Pegler.	3	no.		
iii	2" Washout brass female ball valve as Pegler.	1	no.		
b.2	Ball Float Bricon 10" diameter high pressure polypropylene plastic float as Ref No. 753T.	1	no.		
b.3	Level Indicator	1	no.		
b.4	Ladders				
i	Internal & External S/S Ladders	1	lot		
b.5	Water level float switch	1	item		
c	100 x 8mm thick and 5000mm long G I bearer plate	6	no.		
d	Shop drawings				
i	Allow for submission of two sets of hard copies and soft copies of detailed shop drawings from a recognised fabricator including galvanising certificate for the tank panels. **<u>Note</u>** **Tenderers will submit written warranties for the tank panels with a minimum of 10 years and internal bracings with a minimum of 2 years.**	1	item		
e	<u>Sterilisation</u>				
i	Allow for disinfection/sterilisation and flushing out of the water tank of capacity: 60,000 litres and pipework with water containing 0.05g/l granular calcium hypochlorite for a minimum period of 24hrs.	1	item		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
f	Meter Manifold				
f.1	Straight run pipes				
i	Ø63mm GMS class "B"	18	lm		
f.2	Extra over pipes				
i	Ø63mm GMS Tee	57	no.		
ii	Ø63mm GMS elbows	4	no.		
iii	Ø63mm GMS end caps	4	no.		
iv	Ø63x25mm GMS Hex. Nipples	61	no.		
	Sub-Total for Sectional Roof Water Storage Tanks Installations to Collection Page No.24				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.4	**Soil and Waste Water Drainage Installations**				
	Supply & install the following soil & waste water drainage pipework as described and shown in the drawing.				
	All pipes and fittings shall be uPVC and MuPVC to BS5572:1978 and BS5750 as manufactured by 'Key Terrain' or equal and approved.				
	All joining's and fixtures shall be in accordance with the manufacturers instructions and as described.				
	Tenderers must allow for joining's, couplings, holderbats, reducers, clippings, spacers etc, necessary for the proper functioning of the installation when pricing.				
	The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures.				
a	Vertical discharge pipes in Golden brown heavy duty PVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø100mm straight run pipes	1066	lm		
b	<u>Extra fittings over pipes</u>				
i	Ø100mm vent cowl	20	no.		
	Sub-Total for Soil and Waste Water Drainage Installations to Summary Page No.24				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.5	**Rainwater drainage Installations**				
a	Vertical discharge heavy duty pipes in grey or white colour as 'Metro' or equal and approved.				
i	Ø100mm straight run pipes	574	lm		
ii	Ø50mm ditto'	18	lm		
b	Extra fittings over pipes				
i	Ø100mm shoe bend	14	no.		
ii	Ø100mm sweep bend	28	no.		
iii	Ø100mm paddle flange	20	no.		
iv	Ø100x50mm boss connector	30	no.		
v	150x150 Roof grating c/w frame in mild steel and painted in rust free paint as rain water full Bora.	10	no.		
vi	Ø50mm Aluminium grating cover	30	no.		
	Sub-Total for Rain Water Drainage Pipe Installations to Collection Page No.24				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.6	**Fire Hose Reels Installations**				
a	Fire Hose Reel Pumpset Supply and install the following fire fighting installation and equipment as described and shown on the drawings. Tenderers should allow for all fittings, jointing's couplings including unions and clamps necessary for the proper functioning of the installation when pricing.				
a.1	Fire hose reel pump set to operate as "1No. Duty and 1No. Standby" with a flow rate of 4m³/hr at a static pressure of 5.0 bars, power rating of 1.3kW, single phase as **"Grundfos, CM5-6A"** or equal and approved. The pumps to be assembled in a common base plate and manifold with control and non-return valves, pressure switch, float switch in the ground tank for dry run protection. The pump shall have over and under voltage protection from unstable power conditions, overload and high temperature conditions. The pump set to have weather proof smart 2 evo 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 etc.	1	set		
a.2	Pressure vessel tanks as "VT24".	1	no.		
b	Fire Hose Pipework Supply and install the following fire fighting installation and equipment as described and shown on the drawings. Tenderers should allow for all fittings, jointing's couplings including unions and clamps necessary for the proper functioning of the installation when pricing.				
b.1	Straight Run pipes				
i	Ø50mm tubing to BS 1387 Class "B"	70	lm		
ii	Ø32mm ditto'	13	lm		
iii	Ø25mmditto'	13	lm		
b.2	Extra over tubing for: -				
i	Ø50mm bend	8	no.		
ii	Ø32mm ditto'	17	no.		
iii	Ø25mm ditto'	17	no.		
b.3	Reducers				
i	Ø50x32mm GI reducer	17	no.		
ii	Ø32x25mm ditto'	17	no.		
b.4	Unions				
i	Ø25mm Union	17	no.		
b.5	BRASSWORK				
i	Ø50mm approved medium pressure screw down full way non-rising stem wedge gate valve to BS5154 with wheel head and two joints to steel tubing, brass work to be as Pegler or equal and approved.	1	no.		
ii	Ø25mm ditto'	17	no.		
b.6	Non Kinking Ø20mmx30m long swinging type wall mounted hose reels complete with fixing brackets as manufactured by **"Bristol"** or equal and approved.	17	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
c	Allow a sum for painting of the whole installation with two coats of super gloss paint on a primer coat to the approval of the Engineer.	1	item		
d	Printed fire signage to Engineers approval and as follows;				
i	Fire action signs c/w instructions and emergency number display in blue colour.	17	no.		
ii	Fire extinguisher signage in red colour.	17	no.		
iii	Fire hose reel signage in red colour.	17	no.		
iv	Fire assembly signage.	1	no.		
	Sub-Total for Fire Hose Reel Installations to Collection Page No.24				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.7	**Portable Fire Extinguishers Installations** 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	9 kg dry powder fire extinguisher gas cartridge type in metal casing and fixed to wall surface, unit as **'Bristol'** ABC all purpose powder or equivalent and approved with content gauge and initial fill..	24	no.		
b	15kg automatic dry powder fire extinguisher gas cartridge type in metal casing and fixed to ceiling/roof slab unit as **"Bristol"** or equal and approved with contents gauge sprinkler head and discharge nozzle for the switch room.	3	no.		
c	9 Litre water type fire extinguisher e in metal casing and fixed to wall surface, unit as 'Bristol' A water carbon dioxide or equivalent and approved with content gauge and initial fill.	16	no.		
d	9 Kg carbon dioxide gas fire extinguisher gas cartridge type in metal casing and fixed to wall surface, unit as **'Bristol'** B all purpose gas r or equivalent and approved with content gauge and initial fill..	16	no.		
c	9" diameter(22.5mm) Manual Alarm Bell c/w fixing screws	16	no.		
	Sub-Total for Portable Fire Extinguishers Installations to Collection Page No.24				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.8	**Dry Riser Fire System Installations** Supply, deliver, install, test and commission pipes, tubing and fittings as described and shown on the drawings. The pipes shall be galvanised mild steel pipes to **BS1387, 'Class B'.** Fire fighting equipment to be UL/FM Listed as **"Bristol"** of equal and approved. Tenderers must allow in their pricing of pipework for all couplings, connectors, joints, unions, etc. as required in running lengths of pipework. Also, where necessary for pipe fixing clips, holder brats, plugged or screwed. The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures. <u>Important Note</u> The tenderer is to deliver a complete fire hydrant system. The tenderer should include in his unit rates for any accessories or items which are not stated but are necessary for the complete and satisfactory operation of the system to the requirements of the current edition of NFPA. ***All the valves in this section to be UL listed and to have provision for locking the valve in open or closed position.***				
a	Straight pipes				
i	Ø100mm tubing to BS 1387 Class "B"	56	lm		
	<u>Extras over piping;</u>				
b	Bends/elbows				
i	Ø100mm	2	no.		
c	Equal tees				
i	Ø100mm Equal Tee	16	no.		
d	<u>Landing valves</u> Gate pattern outlet valves manufactured to BS 5041-2 in Gunmetal, body and internal designed for low working pressure, flanged inlets to BS 4504, straps and padlocks, blank plugs and chains provided.	16	no.		
e	<u>Hose Reel and Accessories</u>				
i	Ø65mm canvas hose, 30m long designed for a bursting pressure of 250 p.s.i for coupling into fire hydrant, 65mm hose coupling branch pipe and nozzle to BS 336.	16	no.		
ii	Swing Hose cradle for the above canvas hose, manufactured in aluminium, complete with wall bracket.	16	no.		
f	Automatic air release valves as angus	1	no.		
g	Allow a sum for painting of the whole installation with two coats of super gloss paint on a primer coat to the approval of the Engineer.	1	item		
	Sub-Total for Dry Riser Fire System Installations to Collection Page No.24				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.9	**Common Cleaning Areas**				
	Supply, deliver and install **CPVC 4120, SDR 13.5** Plastic pipes and fittings as per ASTM D-2846 As **"Astral Technologies".**				
	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 6 bars.				
a	Internal Plumbing				
a.1	Straight run pipes				
i	Ø32mm	64	lm		
	Extra fittings to pipe				
a.2	Elbow/bend				
i	Ø32mm	16	no.		
b	Fittings				
b.1	Tee				
i	Ø32*25*32mm tee	15	no.		
b.2	Brass threaded joints				
i	Ø25x15mm adaptor	32	no.		
c	Control valves				
i	Ø32mm brass ball cocks as "Pegler"	6	no.		
d	Hose Taps				
i	Ø15mm lockable aluminium type garden hose tap as "Plumber" complete with a polished G.I stand pipe, female threaded elbow and wall clips.	16	no.		
e	Cleaners Sink				
e.1	Stainless steel grade 304 dhobi sink as single bowl finished in bright machine polish as **"Miran"**, complete with chain waste, 40mm dia. Waste and heavy duty plastic P-trap, 75mm deep seal or equal and approved.	15	no.		
	Sub-Total for Common Cleaning Installations to Collection Page No.24				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	COLLECTION PAGE **Bill No.1: Common Shared Services In Block A**				
1	Sub-Totals for Domestic Water Booster Pump Installations from Page No.13				
2	Sub-Totals for Mains Rising Water Pipe Installations from Page No.14				
3	Sub-Totals for Roof Water Storage Tank Installations from Page No.16				
4	Sub-Totals for Soil & Waste Water Drainage Installations from Page No.17				
5	Sub-Totals for Rain Water Drainage Installations from Page No. 18				
6	Sub-Totals for Fire Hose Reel System Installations from Page No.20				
7	Sub-Totals for Portable Fire Extinguishers Installations from Page No.21				
8	Sub-Totals for Dry Riser Fire System Installations from Page No.22				
9	Sub-Totals for Janitors Cleaning Installations from Page No.23				
	Total for Common Shared Services in Block A C/F Summary Page No.33				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2	**BILL No. 2: TWO BEDROOMED + DSQ UNITS**				
2.1	**Internal Plumbing Installations**				
	Supply, deliver and install **CPVC 4120, SDR 13.5** Plastic pipes and fittings as per ASTM D-2846 As **"Astral Technologies".**				
	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 6 bars.				
a	Water Meter				
i	Supply, deliver and install a Ø25mm single jet, mechanical smart meter with an in-built valve control, non-return valve, dry dial resolution of 4dp, pre-strainer, anti magnetic transmission and eight digit configuration reading, rotating indicator disc, pre-strainer, sealed totalizer made in brass material as "Maji Smart" or equal and approved.	1	no.		
b	Control valves				
i	Ø32mm gate valve as "Pegler"	1	no.		
c	Brass Threaded Adaptors				
i	Ø32mm x 1" male bush	2	no.		
ii	Ø32mm x 1" female bush	2	no.		
d	Cold water pipes				
d.1	Vertical and Roof pipe work				
i	Ø32mm	78	lm		
d.2	Horizontal pipe work				
i	Ø25mm	56	lm		
d.3	Extra over pipes				
	Elbow/bend				
i	Ø32mm	9	no.		
ii	Ø25mm	26	no.		
	Fittings				
d.4	Equal Tee fittings				
i	Ø32*25mm reducing tee	6	no.		
ii	Ø25*25mm equal tee	28	no.		
d.5	Brass threaded adaptors				
i	Ø25mm*1/2" female elbow	23	no.		
ii	Ø25mm*1/2" female tee	16	no.		
iii	Ø25mm*1/2" female threaded bush	12	no.		
iv	Ø32mm*1" male threaded bush	4	no.		
d.6	Control Valves				
i	Ø32mm gate valve as Pegler	2	no.		
e	Hot water pipes				
e.1	Horizontal pipe work				
i	Ø25mm	44	lm		
e.2	Extra over pipes				
	Elbow/bend				
i	Ø25mm	16	no.		
	Fittings				
e.3	Equal Tee fittings				
i	Ø25x20x25mm equal tee	11	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
	Fittings				
e.3	Equal Tee fittings				
i	Ø25x20x25mm equal tee	11	no.		
b.5	Brass threaded adaptors				
i	Ø25mm*1/2" female elbow	12	no.		
ii	Ø25mm*1/2" female tee	6	no.		
iii	Ø25mm*1/2" female threaded bush	8	no.		
b.6	Control Valves				
i	Ø25mm gate valve as Pegler	1	no.		
	Sub-Total for Internal Plumbing Installations to Collection Page No.32				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2.2	**Internal Soil & Waste Water Drainage**				
	Supply & install the following soil & waste water drainage pipework as described and shown in the drawing.				
	All pipes and fittings shall be uPVC and MuPVC to BS5572:1978 and BS5750 as manufactured by 'Key Terrain' or equal and approved.				
	All joining's and fixtures shall be in accordance with the manufacturers instructions and as described.				
	Tenderers must allow for joining's, couplings, holderbats, reducers, clippings, spacers etc, necessary for the proper functioning of the installation when pricing.				
a	Horizontal discharge pipes in Golden brown heavy duty PVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø100mm straight run pipe	9	lm		
ii	Ø50mm ditto"	16	lm		
iii	Ø40mm ditto"	16	lm		
b	Extra fittings over pipes				
i	Ø100mm WC connector c/w rubber seal	4	no.		
ii	Ø100mm sweep bend	4	no.		
iii	Ø100mm sweep tee	4	no.		
iv	Ø100x50mm boss connector	6	no.		
v	Ø100x40mm boss connector	2	no.		
vi	Ø50mm sweep tee	4	no.		
vii	Ø50mm sweep bend	4	no.		
vii	Ø40mm sweep tee	2	no.		
ix	Ø40mm sweep bend	12	no.		
x	Ø40mm access cap	2	no.		
c	Water traps/Trapped gulleys				
i	Four way trapped floor gulleys ref:281.2 and all interconnecting accessories and stainless steel cover grating or equal & approved	7	no.		
d	LP Gas Sleeve				
a	Horizontal discharge heavy duty pipes as 'Metro' or equal and approved.				
i	Ø40mm	6	lm		
e	Air Conditioning Provisional Drainage				
e.1	Straight Run PVC Pipes				
I	Ø32mm PVC pipes	24	lm		
e.2	Extras over straight pipes				
i	Ø32mm elbows	12	no.		
iii	Ø32-25mm reducers	4	no.		
	Sub-Total for Internal Soil and Waste Water Installations to Collection Page No.32				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2.3	**Rainwater Drainage**				
a	Horizontal discharge heavy duty pipes in grey or white colour as 'Metro' or equal and approved.				
i	Ø50mm straight run pipes	2	lm		
b	Extra fittings over pipes				
i	Ø50mm sweep bend	2	no.		
ii	Ø100x50mm boss connector	2	no.		
iii	100X100mm stainless steel cover	2	no.		
	Sub-Total for Rainwater Drainage Installations to Collection Page No.32				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2.4	**Sanitary and Tap ware fittings** Supply, deliver, install, set to work, test and commission the following sanitary fittings described below and supplied by others:- The works shall include 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. **All sanitary ware as "Miran" or equal and approved:** Note: (i) All sanitary fittings shall be in approved colour. (ii) The Model and Ref No. indicated is only a guide to the type and quality of fittings. (iii) Equivalent and Approved models may be acceptable.				
a	<u>Water closets</u>				
a.1	White vitreous China dual flush, close coupled suite (2 piece) comprising of closet "P" or "S" trap, 6 litres cistern with valveless fittings including syphon, internal overflow, 1/2" bottom inlet connection, chrome plated flushing button, heavy duty plastic seat and cover, pan plugged and screwed to concrete floor and bedded in mastic and cistern fixed to walls measuring 625x360x825mm as **"Make: Miran, Model: MN537"** or equal and approved.	4	no.		
a.2	Hand Spray Hand spray complete with a hose and angle valve as **"Make: Miran, Model: MN-DSS"** or equal and approved.	4	no.		
a.3	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	8	no.		
a.4	Flexible connector 1/2*1/2*300mm long metallic woven flex connector as **"Make: Miran, Model: MN-FT1.5".**	4	no.		
a.5	Wall mounted toilet roll holder, chrome plated of size 165x165mm a flipping cover as **"Make: Miran, Model: 96710"** or equal and approved.	4	no.		
b	<u>Wash hand basin</u>				
b.1	Counter top wash hand basin				
i	Counter top wash hand basin with an overflow, 1No. Tap hole configuration, Ø40mm waste outlet measuring 600x430x145mm as: **"Make: Miran, Model: 4323"** or equal and approved.	1	no.		
b.2	Wall mount wash hand basin				
i	White vitreous China, size 515x395x825mm fitting with 1 tap hole configuration complete with dia.32mm chrome plated waste, P trap and chain waste, chain and stay, heavy duty plastic bottle trap 75mm seal, full pedestal as **"Make: Miran, Model;1088"** or equal & approved	2	no.		
ii	White vitreous China, size 510x420x415mm fitting with 1 tap hole configuration complete with dia.32mm chrome plated waste, P trap and chain waste, chain and stay, heavy duty plastic bottle trap 75mm seal, half pedestal as **"Make: Miran, Model: 2253"** or equal & approved	1	no.		
b.3	WHB Taps				
i	Single lever, wash hand basin mixer pillar type tap as **"Make: Miran, Model: MN-62201"** for hot and cold water, chrome plated complete with 1/2" BSP female inlet and flexible connectors.	3	no.		
ii	Single lever, wash hand basin mixer pillar type tap as **"Make: Miran, Model: MN-1005"** for cold water, chrome plated complete with 1/2" BSP female inlet.	1	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
b.4	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	7	no.		
b.5	Flexible connector 1/2*1/2*300mm long metallic woven flex connector as **"Make: Miran, Model: MN-FT1.5".**	1	no.		
b.6	Mirrors 6mm thick polished plate glass, silver backed mirror with bevelled edges, size 800x6000mm plugged and screwed to wall with 2No.chrome plated capped screws and 5mm thick foam back rest.	4	no.		
c	Kitchen sink				
c.1	Stainless steel grade 304 kitchen sink as 1 + 1/2 double bowl, single drain heavy duty finished in bright machine polish to BS 1449: part 2; 1983, size 1000*550mm as **"Make: Miran, Model: MN-851"** complete with chain waste, 1No. Hole, chain and stay, 40mm chrome plated waste, 40mm heavy duty plastic P-trap, with 75mm deep seal or equal and approved.	1	no.		
c.2	Kitchen sink pillar type mixer with swivel outlet for cold and hot water, chrome plated c/w flex. connectors as **"Make: Miran, Model: MN-851"** or equal and approved.	1	no.		
c.3	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	2	no.		
d	Utility Area				
d.1	Long neck, chrome plated bib tap for the splash area, 150mm long as **"Make, "Milan, Model MN-1002"** or equal and approved.	1	no.		
d.2	Hose tap, bib type for the washing machine as **"Make: Miran, Model: MN-GT"** or equal and approved.	1	no.		
e	Shower Fittings				
e.1	Single lever, concealed divertor shower mixer consisting 1/2" chrome plated brass concealed shower mixer with diverter as **Make" Miran, Model: MN-62407"** or equal and approved.	3	no.		
e.2	Single function shower rose consisting of 1/2" chrome plated single function and dia.800mm circular shower head, a 450mm long shower arm, silicon nozzles as **"Make: Miran, Model: A82C/SY-3580C"** or equal and approved.	3	no.		
e.3	Wall mounted and chrome plated spout consisting of origins bath spout as **"Make: Miran, Model: PM-4105"** or equal and approved.	3	no.		
e.4 i	Soap Dish Surface mounted, chrome plated corner type soap basket c/w screws measuring 175x175mm as **"Make: Miran, Model: MN-809"** or equal and approved.	3	no.		
e.5 i	Robe hook Chrome plated, double sided coat hook c/w screws as **"Make: Miran, Model: 51505"** or equal and approved.	4	no.		
e.6 i	Towel Bar Chrome plated towel bar as **"Make: Miran, Model: 96701"** or equal and approved.	3	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
e.7 i	Towel Ring Chrome plated towel ring as **"Make: Miran, Model: 96711"** or equal and approved.	4	no.		
f i	<u>Hot Water Geyser</u> Vertical wall mounted hot water cylinder with a glass lined internal water tank, magnesium anode, sheathed immersion heating element, CFC free, s/s outlet pipe, inbuilt diffuser, pressure gauge of capacity: 100 litres size Ø433x948(h)mm hot water geyser with pressure rating of 8 bars as **"Make: Atlantic, O'pro, Model: 861216"** or equal and approved.	1	no.		
	Sub-total for Sanitary Fittings Installations to Collection Page No.32				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	COLLECTION PAGE				
	Bill No. 2: Two Bedroom + DSQ Apartment Unit				
1	Sub-Totals for Internal Plumbing Installations from Page No.26				
2	Sub-Totals for Internal Soil and Waste Water Drainage Installations from Page No.27				
3	Sub-Totals for Rain Water Drainage Installations from Page No.28				
4	Sub-Totals for Sanitary Fittings Installations from Page No.31				
	Totals for One (1No.) Two Bedroom + DSQ Apartments				
	Multiply by Sixty (x60.) Units			**60**	**x 60**
	Totals for Sixty (60No.) 2 B.R Units C/F to Summary Page No.33				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	SUMMARY PAGE - BLOCK A				
1	**Sub-Totals for Bill No.1: Common Shared Services from Page No.24**				
2	**Sub-Totals for Bill No.2: Internal Plumbing, Drainage and Sanitary Fittings to 2 B.R + DSQ Apartment Units from Page No.32**				
	Totals for Block A Mechanical Installations to Main Summary Page No.98				

PROPOSED PROPERTY RE-DEVELOPMENT ON PLOT LR. No. KISUMU/MUNICIPALITY/BLOCK 8/258 IN KISUMU
MECHANICAL INSTALLATIONS - INTERNAL PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

SECTION III: BILLS OF QUANTITIES FOR MECHANICAL INSTALLATIONS TO BLOCK B, 2B.R + DSQ (G+13)

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1	**BILL No. 1: COMMONS SHARED SERVICES**				
1.1	**Domestic Water Booster Pumpset** Supply, deliver, install, set to work, test and commission the following domestic water pumpset:				
a	Variable speed domestic water booster pumpset assembled in a skid, **Ref: "Pedrollo VHT2 20/60**", comprising of 2No. Pumps as **"Make; Pedrollo, Model: HT 10/7",** and will operate as "1No. Duty & 1No. Auto Assist" in parallel connection with a flow rate of 10m³/hr at a static pressure of 6.0 bars, power rating of 3.0kWx2No., three phase and 24 litre pressure vessel as **"GWS24".** The pumps to be assembled in a common skid and manifold with control and non-return valves, pressure switch, VFD Controllers, float switch in the underground tank for automatic operation and dry run protection. The pump shall have over and under voltage protection from unstable power conditions, overload and high temperature conditions. The pump set to have weather proof smart 2 evo control panel and associated wiring for automatic operation as duty & assist mode. The VFD control panel to have a pre-selector switch for auto/manual positions, contact relay arrangement for alternate running, thermal overload relays, display lamps etc.	1	set		
b	Float Switch Allow for a float switch cable and float switch between the underground water storage tank and the pump set for dry-run protection.	1	item		
	Sub-Total for Domestic Booster Pumpset to Collection Page No.45				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.2	**Mains Rising Pipe and Roof Water Storage Tank Installations** Supply, deliver, install, test and commission pipes, tubing and fittings as described and shown on the drawings. The pipes shall be galvanised mild steel pipes to **BS1387, 'Class B'.** Tenderers must allow in their pricing of pipework for all couplings, connectors, joints, unions, etc. as required in running lengths of pipework. Also, where necessary for pipe fixing clips, holder brats, plugged or screwed. The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures.				
a	Straight run pipes				
i	Ø50mm GMS class "B"	170	lm		
b	Extra over pipes				
b.1	Elbows/Bends				
i	Ø50mm Bend	16	no.		
b.2	Unions				
i	Ø50mm Union	4	no.		
c	Gate Valves				
i	Ø50mm approved medium pressure screw down full way non rising wedge gate valve to BS1952 with wheel and head joints to steel tubing as "Peglar".	1	no.		
	Sub-Total for Mains Rising Water Pipe to Roof Tanks Installations to Collection Page No.45				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.3	**Sectional Roof Water Storage Tanks Installations**				
a	Supply deliver, erect, test and commission the following tank, including pipework and equipment as described; Tenderers must allow all labour, materials, appetences, mortices, couplers, jointing's and plugging's necessary for complete and proper functioning of the installations. Fiber glass reinforced plastic (GRP) water storage tank with UV protection, stable thermal transition, zero light penetration to BS 13121-1:2021, tank size 6000*5000*2000mm, nominal capacity of 60,000 litres complete with 74No., 10mm tank panels, and flanges, cleats, stays, jointing compound, bolts, washers, nuts, 1No. Access hole with hinges & lock, internal & external stainless steel ladders, bracings, connections and PVC air vents. The tank shall be erected on bearers provided by others on the roof slab of the building. The following provisions will be required in the tank are described as follows; □ 1No x 2" inlet pipe connection. □ 2No x 2 1/2" outlet pipe connection □ 1No x 3" overflow Pipe. □ 1No x 2" washout. □ 1No. vent with mosquito netting.	1	no.		
b	<u>Accessories</u>				
b.1	Ball Valves				
i	2" Inlet brass female ball valve as Pegler.	1	no.		
ii	2 1/2" Outlet brass female ball valve as Pegler.	3	no.		
iii	2" Washout brass female ball valve as Pegler.	1	no.		
b.2	Ball Float Bricon 10" diameter high pressure polypropylene plastic float as Ref No. 753T.	1	no.		
b.3	Level Indicator	1	no.		
b.4	Ladders				
i	Internal & External S/S Ladders	1	lot		
b.5	Water level float switch	1	item		
c	100 x 8mm thick and 5000mm long G I bearer plate	6	no.		
d	Shop drawings				
i	Allow for submission of two sets of hard copies and soft copies of detailed shop drawings from a recognised fabricator including galvanising certificate for the tank panels. **<u>Note</u>** **Tenderers will submit written warranties for the tank panels with a minimum of 10 years and internal bracings with a minimum of 2 years.**	1	item		
e	<u>Sterilisation</u>				
i	Allow for disinfection/sterilisation and flushing out of the water tank of capacity: 60,000 litres and pipework with water containing 0.05g/l granular calcium hypochlorite for a minimum period of 24hrs.	1	item		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
f	Meter Manifold				
f.1	Straight run pipes				
i	Ø63mm GMS class "B"	18	lm		
f.2	Extra over pipes				
i	Ø63mm GMS Tee	54	no.		
ii	Ø63mm GMS elbows	4	no.		
iii	Ø63mm GMS end caps	4	no.		
iv	Ø63x25mm GMS Hex. Nipples	53	no.		
	Sub-Total for Sectional Roof Water Storage Tanks Installations to Collection Page No.45				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.4	**Soil and Waste Water Drainage Installations** Supply & install the following soil & waste water drainage pipework as described and shown in the drawing. All pipes and fittings shall be uPVC and MuPVC to BS5572:1978 and BS5750 as manufactured by 'Key Terrain' or equal and approved. All joining's and fixtures shall be in accordance with the manufacturers instructions and as described. Tenderers must allow for joining's, couplings, holderbats, reducers, clippings, spacers etc, necessary for the proper functioning of the installation when pricing. The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures.				
a	Vertical discharge pipes in Golden brown heavy duty PVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø100mm straight run pipes	1026	lm		
b	<u>Extra fittings over pipes</u>				
i	Ø100mm vent cowl	20	no.		
	Sub-Total for Soil and Waste Water Drainage Installations to Summary Page No.45				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.5	**Rainwater drainage Installations**				
a	Vertical discharge heavy duty pipes in grey or white colour as 'Metro' or equal and approved.				
i	Ø100mm straight run pipes	524	lm		
ii	Ø50mm ditto'	14	lm		
b	Extra fittings over pipes				
i	Ø100mm shoe bend	14	no.		
ii	Ø100mm sweep bend	28	no.		
iii	Ø100mm paddle flange	20	no.		
iv	Ø100x50mm boss connector	26	no.		
v	150x150 Roof grating c/w frame in mild steel and painted in rust free paint as rain water full Bora.	10	no.		
vi	Ø50mm Aluminium grating cover	26	no.		
	Sub-Total for Rain Water Drainage Pipe Installations to Collection Page No.45				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.6	**Fire Hose Reels Installations**				
a	Fire Hose Reel Pumpset Supply and install the following fire fighting installation and equipment as described and shown on the drawings. Tenderers should allow for all fittings, jointing's couplings including unions and clamps necessary for the proper functioning of the installation when pricing.				
a.1	Fire hose reel pump set to operate as "1No. Duty and 1No. Standby" with a flow rate of 4m³/hr at a static pressure of 5.0 bars, power rating of 1.3kW, single phase as **"Grundfos, CM5-6A"** or equal and approved. The pumps to be assembled in a common base plate and manifold with control and non-return valves, pressure switch, float switch in the ground tank for dry run protection. The pump shall have over and under voltage protection from unstable power conditions, overload and high temperature conditions. The pump set to have weather proof smart 2 evo 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 etc.	1	set		
a.2	Pressure vessel tanks as "VT24".	1	no.		
b	Fire Hose Pipework Supply and install the following fire fighting installation and equipment as described and shown on the drawings. Tenderers should allow for all fittings, jointing's couplings including unions and clamps necessary for the proper functioning of the installation when pricing.				
b.1	Straight Run pipes				
i	Ø50mm tubing to BS 1387 Class "B"	60	lm		
ii	Ø32mm ditto'	12	lm		
iii	Ø25mmditto'	12	lm		
b.2	Extra over tubing for: -				
i	Ø50mm bend	7	no.		
ii	Ø32mm ditto'	14	no.		
iii	Ø25mm ditto'	14	no.		
b.3	Reducers				
i	Ø50x32mm GI reducer	14	no.		
ii	Ø32x25mm ditto'	14	no.		
b.4	Unions				
i	Ø25mm Union	14	no.		
b.5	BRASSWORK				
i	Ø50mm approved medium pressure screw down full way non-rising stem wedge gate valve to BS5154 with wheel head and two joints to steel tubing, brass work to be as Pegler or equal and approved.	1	no.		
ii	Ø25mm ditto'	14	no.		
b.6	Non Kinking Ø20mmx30m long swinging type wall mounted hose reels complete with fixing brackets as manufactured by **"Bristol"** or equal and approved.	14	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
c	Allow a sum for painting of the whole installation with two coats of super gloss paint on a primer coat to the approval of the Engineer.	1	item		
d	Printed fire signage to Engineers approval and as follows;				
i	Fire action signs c/w instructions and emergency number display in blue colour.	14	no.		
ii	Fire extinguisher signage in red colour.	14	no.		
iii	Fire hose reel signage in red colour.	14	no.		
iv	Fire assembly signage.	1	no.		
	Sub-Total for Fire Hose Reel Installations to Collection Page No.45				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.7	**Portable Fire Extinguishers Installations** 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	9 kg dry powder fire extinguisher gas cartridge type in metal casing and fixed to wall surface, unit as **'Bristol'** ABC all purpose powder or equivalent and approved with content gauge and initial fill..	22	no.		
b	15kg automatic dry powder fire extinguisher gas cartridge type in metal casing and fixed to ceiling/roof slab unit as **"Bristol"** or equal and approved with contents gauge sprinkler head and discharge nozzle for the switch room.	3	no.		
c	9 Litre water type fire extinguisher e in metal casing and fixed to wall surface, unit as 'Bristol' A water carbon dioxide or equivalent and approved with content gauge and initial fill.	15	no.		
d	9 Kg carbon dioxide gas fire extinguisher gas cartridge type in metal casing and fixed to wall surface, unit as **'Bristol'** B all purpose gas r or equivalent and approved with content gauge and initial fill..	15	no.		
c	9" diameter(22.5mm) Manual Alarm Bell c/w fixing screws	15	no.		
	Sub-Total for Portable Fire Extinguishers Installations to Collection Page No.45				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.8	**Dry Riser Fire System Installations** Supply, deliver, install, test and commission pipes, tubing and fittings as described and shown on the drawings. The pipes shall be galvanised mild steel pipes to **BS1387, 'Class B'.** Fire fighting equipment to be UL/FM Listed as **"Bristol"** of equal and approved. Tenderers must allow in their pricing of pipework for all couplings, connectors, joints, unions, etc. as required in running lengths of pipework. Also, where necessary for pipe fixing clips, holder brats, plugged or screwed. The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures. <u>Important Note</u> The tenderer is to deliver a complete fire hydrant system. The tenderer should include in his unit rates for any accessories or items which are not stated but are necessary for the complete and satisfactory operation of the system to the requirements of the current edition of NFPA. ***All the valves in this section to be UL listed and to have provision for locking the valve in open or closed position.***				
a	Straight pipes				
i	Ø100mm tubing to BS 1387 Class "B"	52	lm		
	<u>Extras over piping;</u>				
b	Bends/elbows				
i	Ø100mm	2	no.		
c	Equal tees				
i	Ø100mm Equal Tee	15	no.		
d	<u>Landing valves</u> Gate pattern outlet valves manufactured to BS 5041-2 in Gunmetal, body and internal designed for low working pressure, flanged inlets to BS 4504, straps and padlocks, blank plugs and chains provided.	14	no.		
e	<u>Hose Reel and Accessories</u>				
i	Ø65mm canvas hose, 30m long designed for a bursting pressure of 250 p.s.i for coupling into fire hydrant, 65mm hose coupling branch pipe and nozzle to BS 336.	14	no.		
ii	Swing Hose cradle for the above canvas hose, manufactured in aluminium, complete with wall bracket.	14	no.		
f	Automatic air release valves as angus	1	no.		
g	Allow a sum for painting of the whole installation with two coats of super gloss paint on a primer coat to the approval of the Engineer.	1	item		
	Sub-Total for Dry Riser Fire System Installations to Collection Page No.45				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.9	**Common Cleaning Areas** Supply, deliver and install **CPVC 4120, SDR 13.5** Plastic pipes and fittings as per ASTM D-2846 As **"Astral Technologies".** 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 6 bars.				
a	Internal Plumbing				
a.1	Straight run pipes				
i	Ø32mm	54	lm		
	Extra fittings to pipe				
a.2	Elbow/bend				
i	Ø32mm	10	no.		
b	Fittings				
b.1	Tee				
i	Ø32*25*32mm tee	4	no.		
b.2	Brass threaded joints				
i	Ø25x15mm adaptor	10	no.		
c	Control valves				
i	Ø32mm brass ball cocks as "Pegler"	6	no.		
d	Hose Taps				
i	Ø15mm lockable aluminium type garden hose tap as "Plumber" complete with a polished G.I stand pipe, female threaded elbow and wall clips.	13	no.		
e	Cleaners Sink				
e.1	Stainless steel grade 304 dhobi sink as single bowl finished in bright machine polish as **"Miran"**, complete with chain waste, 40mm dia. Waste and heavy duty plastic P-trap, 75mm deep seal or equal and approved.	13	no.		
	Sub-Total for Common Cleaning Installations to Collection Page No.45				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	COLLECTION PAGE				
	Bill No. 1: Common Shared Services In Block B				
1	Sub-Totals for Domestic Water Booster Pump Installations from Page No.34				
2	Sub-Totals for Mains Rising Water Pipe Installations from Page No.35				
3	Sub-Totals for Roof Water Storage Tank Installations from Page No.37				
4	Sub-Totals for Soil & Waste Water Drainage Installations from Page No.38				
5	Sub-Totals for Rain Water Drainage Installations from Page No. 39				
6	Sub-Totals for Fire Hose Reel System Installations from Page No.41				
7	Sub-Totals for Portable Fire Extinguishers Installations from Page No.42				
8	Sub-Totals for Dry Riser Fire System Installations from Page No.43				
9	Sub-Totals for Janitors Cleaning Installations from Page No.44				
	Total for Common Shared Services in Block B C/F Summary Page No.54				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2	**BILL No. 2: TWO BEDROOMED + DSQ UNITS**				
2.1	**Internal Plumbing Installations**				
	Supply, deliver and install **CPVC 4120, SDR 13.5** Plastic pipes and fittings as per ASTM D-2846 As **"Astral Technologies".**				
	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 6 bars.				
a	Water Meter				
i	Supply, deliver and install a Ø25mm single jet, mechanical smart meter with an in-built valve control, non-return valve, dry dial resolution of 4dp, pre-strainer, anti magnetic transmission and eight digit configuration reading, rotating indicator disc, pre-strainer, sealed totalizer made in brass material as "Maji Smart" or equal and approved.	1	no.		
b	Control valves				
i	Ø32mm gate valve as "Pegler"	1	no.		
c	Brass Threaded Adaptors				
i	Ø32mm x 1" male bush	2	no.		
ii	Ø32mm x 1" female bush	2	no.		
d	Cold water pipes				
d.1	Vertical and Roof pipe work				
i	Ø32mm	72	lm		
d.2	Horizontal pipe work				
i	Ø25mm	56	lm		
d.3	Extra over pipes				
	Elbow/bend				
i	Ø32mm	9	no.		
ii	Ø25mm	26	no.		
	Fittings				
d.4	Equal Tee fittings				
i	Ø32*25mm reducing tee	6	no.		
ii	Ø25*25mm equal tee	28	no.		
d.5	Brass threaded adaptors				
i	Ø25mm*1/2" female elbow	23	no.		
ii	Ø25mm*1/2" female tee	16	no.		
iii	Ø25mm*1/2" female threaded bush	12	no.		
iv	Ø32mm*1" male threaded bush	4	no.		
d.6	Control Valves				
i	Ø32mm gate valve as Pegler	2	no.		
e	Hot water pipes				
e.1	Horizontal pipe work				
i	Ø25mm	44	lm		
e.2	Extra over pipes				
	Elbow/bend				
i	Ø25mm	16	no.		
	Fittings				
e.3	Equal Tee fittings				
i	Ø25x20x25mm equal tee	11	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
	Fittings				
e.3	Equal Tee fittings				
i	Ø25x20x25mm equal tee	11	no.		
b.5	Brass threaded adaptors				
i	Ø25mm*1/2" female elbow	12	no.		
ii	Ø25mm*1/2" female tee	6	no.		
iii	Ø25mm*1/2" female threaded bush	8	no.		
b.6	Control Valves				
i	Ø25mm gate valve as Pegler	1	no.		
	Sub-Total for Internal Plumbing Installations to Collection Page No.53				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2.2	**Internal Soil & Waste Water Drainage**				
	Supply & install the following soil & waste water drainage pipework as described and shown in the drawing.				
	All pipes and fittings shall be uPVC and MuPVC to BS5572:1978 and BS5750 as manufactured by 'Key Terrain' or equal and approved.				
	All joining's and fixtures shall be in accordance with the manufacturers instructions and as described.				
	Tenderers must allow for joining's, couplings, holderbats, reducers, clippings, spacers etc, necessary for the proper functioning of the installation when pricing.				
a	Horizontal discharge pipes in Golden brown heavy duty PVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø100mm straight run pipe	9	lm		
ii	Ø50mm ditto"	16	lm		
iii	Ø40mm ditto"	16	lm		
b	Extra fittings over pipes				
i	Ø100mm WC connector c/w rubber seal	4	no.		
ii	Ø100mm sweep bend	4	no.		
iii	Ø100mm sweep tee	4	no.		
iv	Ø100x50mm boss connector	6	no.		
v	Ø100x40mm boss connector	2	no.		
vi	Ø50mm sweep tee	4	no.		
vii	Ø50mm sweep bend	4	no.		
vii	Ø40mm sweep tee	2	no.		
ix	Ø40mm sweep bend	12	no.		
x	Ø40mm access cap	2	no.		
c	Water traps/Trapped gulleys				
i	Four way trapped floor gulleys ref:281.2 and all interconnecting accessories and stainless steel cover grating or equal & approved	7	no.		
d	LP Gas Sleeve				
a	Horizontal discharge heavy duty pipes as 'Metro' or equal and approved.				
i	Ø40mm	6	lm		
e	Air Conditioning Provisional Drainage				
e.1	Straight Run PVC Pipes				
I	Ø32mm PVC pipes	24	lm		
e.2	Extras over straight pipes				
i	Ø32mm elbows	12	no.		
iii	Ø32-25mm reducers	4	no.		
	Sub-Total for Internal Soil and Waste Water Installations to Collection Page No.53				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2.3	**Rainwater Drainage**				
a	Horizontal discharge heavy duty pipes in grey or white colour as 'Metro' or equal and approved.				
i	Ø50mm straight run pipes	2	lm		
b	Extra fittings over pipes				
i	Ø50mm sweep bend	2	no.		
ii	Ø100x50mm boss connector	2	no.		
iii	100X100mm stainless steel cover	2	no.		
	Sub-Total for Rainwater Drainage Installations to Collection Page No.53				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2.4	**Sanitary and Tap ware fittings** Supply, deliver, install, set to work, test and commission the following sanitary fittings described below and supplied by others:- The works shall include 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. **All sanitary ware as "Miran" or equal and approved:** Note: (i) All sanitary fittings shall be in approved colour. (ii) The Model and Ref No. indicated is only a guide to the type and quality of fittings. (iii) Equivalent and Approved models may be acceptable.				
a	<u>Water closets</u>				
a.1	White vitreous China dual flush, close coupled suite (2 piece) comprising of closet "P" or "S" trap, 6 litres cistern with valveless fittings including syphon, internal overflow, 1/2" bottom inlet connection, chrome plated flushing button, heavy duty plastic seat and cover, pan plugged and screwed to concrete floor and bedded in mastic and cistern fixed to walls measuring 625x360x825mm as **"Make: Miran, Model: MN537"** or equal and approved.	4	no.		
a.2	Hand Spray Hand spray complete with a hose and angle valve as **"Make: Miran, Model: MN-DSS"** or equal and approved.	4	no.		
a.3	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	8	no.		
a.4	Flexible connector 1/2*1/2*300mm long metallic woven flex connector as **"Make: Miran, Model: MN-FT1.5".**	4	no.		
a.5	Wall mounted toilet roll holder, chrome plated of size 165x165mm a flipping cover as **"Make: Miran, Model: 96710"** or equal and approved.	4	no.		
b	<u>Wash hand basin</u>				
b.1	Counter top wash hand basin				
i	Counter top wash hand basin with an overflow, 1No. Tap hole configuration, Ø40mm waste outlet measuring 600x430x145mm as: **"Make: Miran, Model: 4323"** or equal and approved.	1	no.		
b.2	Wall mount wash hand basin				
i	White vitreous China, size 515x395x825mm fitting with 1 tap hole configuration complete with dia.32mm chrome plated waste, P trap and chain waste, chain and stay, heavy duty plastic bottle trap 75mm seal, full pedestal as **"Make: Miran, Model;1088"** or equal & approved	2	no.		
ii	White vitreous China, size 510x420x415mm fitting with 1 tap hole configuration complete with dia.32mm chrome plated waste, P trap and chain waste, chain and stay, heavy duty plastic bottle trap 75mm seal, half pedestal as **"Make: Miran, Model: 2253"** or equal & approved	1	no.		
b.3	WHB Taps				
i	Single lever, wash hand basin mixer pillar type tap as **"Make: Miran, Model: MN-62201"** for hot and cold water, chrome plated complete with 1/2" BSP female inlet and flexible connectors.	3	no.		
ii	Single lever, wash hand basin mixer pillar type tap as **"Make: Miran, Model: MN-1005"** for cold water, chrome plated complete with 1/2" BSP female inlet.	1	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
b.4	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	7	no.		
b.5	Flexible connector 1/2*1/2*300mm long metallic woven flex connector as **"Make: Miran, Model: MN-FT1.5".**	1	no.		
b.6	Mirrors 6mm thick polished plate glass, silver backed mirror with bevelled edges, size 800x6000mm plugged and screwed to wall with 2No.chrome plated capped screws and 5mm thick foam back rest.	4	no.		
c	Kitchen sink				
c.1	Stainless steel grade 304 kitchen sink as 1 + 1/2 double bowl, single drain heavy duty finished in bright machine polish to BS 1449: part 2; 1983, size 1000*550mm as **"Make: Miran, Model: MN-851"** complete with chain waste, 1No. Hole, chain and stay, 40mm chrome plated waste, 40mm heavy duty plastic P-trap, with 75mm deep seal or equal and approved.	1	no.		
c.2	Kitchen sink pillar type mixer with swivel outlet for cold and hot water, chrome plated c/w flex. connectors as **"Make: Miran, Model: MN-851"** or equal and approved.	1	no.		
c.3	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	2	no.		
d	Utility Area				
d.1	Long neck, chrome plated bib tap for the splash area, 150mm long as **"Make, "Miran, Model MN-1002"** or equal and approved.	1	no.		
d.2	Hose tap, bib type for the washing machine as **"Make: Miran, Model: MN-GT"** or equal and approved.	1	no.		
e	Shower Fittings				
e.1	Single lever, concealed divertor shower mixer consisting 1/2" chrome plated brass concealed shower mixer with diverter as **Make" Miran, Model: MN-62407"** or equal and approved.	3	no.		
e.2	Single function shower rose consisting of 1/2" chrome plated single function and dia.800mm circular shower head, a 450mm long shower arm, silicon nozzles as **"Make: Miran, Model: A82C/SY-3580C"** or equal and approved.	3	no.		
e.3	Wall mounted and chrome plated spout consisting of origins bath spout as **"Make: Miran, Model: PM-4105"** or equal and approved.	3	no.		
e.4 i	Soap Dish Surface mounted, chrome plated corner type soap basket c/w screws measuring 175x175mm as **"Make: Miran, Model: MN-809"** or equal and approved.	3	no.		
e.5 i	Robe hook Chrome plated, double sided coat hook c/w screws as **"Make: Miran, Model: 51505"** or equal and approved.	4	no.		
e.6 i	Towel Bar Chrome plated towel bar as **"Make: Miran, Model: 96701"** or equal and approved.	3	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
e.7 i	Towel Ring Chrome plated towel ring as **"Make: Miran, Model: 96711"** or equal and approved.	4	no.		
f i	Hot Water Geyser Vertical wall mounted hot water cylinder with a glass lined internal water tank, magnesium anode, sheathed immersion heating element, CFC free, s/s outlet pipe, inbuilt diffuser, pressure gauge of capacity: 100 litres size Ø433x948(h)mm hot water geyser with pressure rating of 8 bars as **"Make: Atlantic, O'pro, Model: 861216"** or equal and approved.	1	no.		
	Sub-total for Sanitary Fittings Installations to Collection Page No.53				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	COLLECTION PAGE				
	Bill No.2: Two Bedroom + DSQ Apartment Units				
1	Sub-Totals for Internal Plumbing Installations from Page No.47				
2	Sub-Totals for Internal Soil and Waste Water Drainage Installations from Page No.48				
3	Sub-Totals for Rain Water Drainage Installations from Page No.49				
4	Sub-Totals for Sanitary Fittings Installations from Page No.52				
	Totals for One (1No.) Two Bedroom + DSQ Apartments				
	Multiply by Fifty Two (x52.) Units			**52**	**x 52**
	Totals for Fifty Two (52No.) 2 B.R Units C/F to Summary Page No.54			Totals for Fifty Two (52No.) 2 B.R Units C/F to Summary Page No.54	

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	SUMMARY PAGE - BLOCK B				
1	**Sub-Totals for Bill No.1: Common Shared Services from Page No.45**				
2	**Sub-Totals for Bill No.2: Internal Plumbing, Drainage and Sanitary Fittings to 2 B.R + DSQ Apartment Units from Page No.53**				
	Totals for Block B Mechanical Installations to Main Summary Page No.98				

PROPOSED PROPERTY RE-DEVELOPMENT ON PLOT LR. No. KISUMU/MUNICIPALITY/BLOCK 8/258 IN KISUMU
MECHANICAL INSTALLATIONS - INTERNAL PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

SECTION IV: BILLS OF QUANTITIES FOR MECHANICAL INSTALLATIONS TO BLOCK C, 3B.R + DSQ (G+13)

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1	**BILL No. 1: COMMONS SHARED SERVICES**				
1.1	**Domestic Water Booster Pumpset** Supply, deliver, install, set to work, test and commission the following domestic water pumpset:				
a	Variable speed domestic water booster pumpset assembled in a skid, **Ref: "Pedrollo VHT2 20/60**", comprising of 2No. Pumps as **"Make; Pedrollo, Model: HT 10/7",** and will operate as "1No. Duty & 1No. Auto Assist" in parallel connection with a flow rate of 10m³/hr at a static pressure of 6.0 bars, power rating of 3.0kWx2No., three phase and 24 litre pressure vessel as **"GWS24".** The pumps to be assembled in a common skid and manifold with control and non-return valves, pressure switch, VFD Controllers, float switch in the underground tank for automatic operation and dry run protection. The pump shall have over and under voltage protection from unstable power conditions, overload and high temperature conditions. The pump set to have weather proof smart 2 evo control panel and associated wiring for automatic operation as duty & assist mode. The VFD control panel to have a pre-selector switch for auto/manual positions, contact relay arrangement for alternate running, thermal overload relays, display lamps etc.	1	set		
b	Float Switch Allow for a float switch cable and float switch between the underground water storage tank and the pump set for dry-run protection.	1	item		
	Sub-Total for Domestic Booster Pumpset to Collection Page No.66				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.2	**Mains Rising Pipe and Roof Water Storage Tank Installations** Supply, deliver, install, test and commission pipes, tubing and fittings as described and shown on the drawings. The pipes shall be galvanised mild steel pipes to **BS1387, 'Class B'.** Tenderers must allow in their pricing of pipework for all couplings, connectors, joints, unions, etc. as required in running lengths of pipework. Also, where necessary for pipe fixing clips, holder brats, plugged or screwed. The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures.				
a	Straight run pipes				
i	Ø50mm GMS class "B"	130	lm		
b	<u>Extra over pipes</u>				
b.1	Elbows/Bends				
i	Ø50mm Bend	13	no.		
b.2	Unions				
i	Ø50mm Union	4	no.		
c	Gate Valves				
i	Ø50mm approved medium pressure screw down full way non rising wedge gate valve to BS1952 with wheel and head joints to steel tubing as "Peglar".	1	no.		
	Sub-Total for Mains Rising Water Pipe Installations to Collection Page No.66				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.3	**Sectional Roof Water Storage Tanks Installations**				
a	Supply deliver, erect, test and commission the following tank, including pipework and equipment as described; Tenderers must allow all labour, materials, appetences, mortices, couplers, jointing's and plugging's necessary for complete and proper functioning of the installations. Fiber glass reinforced plastic (GRP) water storage tank with UV protection, stable thermal transition, zero light penetration to BS 13121-1:2021, tank size 6000*5000*2000mm, nominal capacity of 60,000 litres complete with 74No., 10mm tank panels, and flanges, cleats, stays, jointing compound, bolts, washers, nuts, 1No. Access hole with hinges & lock, internal & external stainless steel ladders, bracings, connections and PVC air vents. The tank shall be erected on bearers provided by others on the roof slab of the building. The following provisions will be required in the tank are described as follows; □ 1No x 2" inlet pipe connection. □ 2No x 2 1/2" outlet pipe connection □ 1No x 3" overflow Pipe. □ 1No x 2" washout. □ 1No. vent with mosquito netting.	1	no.		
b	<u>Accessories</u>				
b.1	Ball Valves				
i	2" Inlet brass female ball valve as Pegler.	1	no.		
ii	2 1/2" Outlet brass female ball valve as Pegler.	3	no.		
iii	2" Washout brass female ball valve as Pegler.	1	no.		
b.2	Ball Float Bricon 10" diameter high pressure polypropylene plastic float as Ref No. 753T.	1	no.		
b.3	Level Indicator	1	no.		
b.4	Ladders				
i	Internal & External S/S Ladders	1	lot		
b.5	Water level float switch	1	item		
c	100 x 8mm thick and 5000mm long G I bearer plate	6	no.		
d	Shop drawings				
i	Allow for submission of two sets of hard copies and soft copies of detailed shop drawings from a recognised fabricator including galvanising certificate for the tank panels. **<u>Note</u>** **Tenderers will submit written warranties for the tank panels with a minimum of 10 years and internal bracings with a minimum of 2 years.**	1	item		
e	<u>Sterilisation</u>				
i	Allow for disinfection/sterilisation and flushing out of the water tank of capacity: 60,000 litres and pipework with water containing 0.05g/l granular calcium hypochlorite for a minimum period of 24hrs.	1	item		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
f	Meter Manifold				
f.1	Straight run pipes				
i	Ø63mm GMS class "B"	18	lm		
f.2	Extra over pipes				
i	Ø63mm GMS Tee	54	no.		
ii	Ø63mm GMS elbows	4	no.		
iii	Ø63mm GMS end caps	4	no.		
iv	Ø63x25mm GMS Hex. Nipples	53	no.		
	Sub-Total for Sectional Roof Water Storage Tanks Installations to Collection Page No.66				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.4	**Soil and Waste Water Drainage Installations**				
	Supply & install the following soil & waste water drainage pipework as described and shown in the drawing.				
	All pipes and fittings shall be uPVC and MuPVC to BS5572:1978 and BS5750 as manufactured by 'Key Terrain' or equal and approved.				
	All joining's and fixtures shall be in accordance with the manufacturers instructions and as described.				
	Tenderers must allow for joining's, couplings, holderbats, reducers, clippings, spacers etc, necessary for the proper functioning of the installation when pricing.				
	The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures.				
a	Vertical discharge pipes in Golden brown heavy duty PVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø100mm straight run pipes	1308	lm		
b	<u>Extra fittings over pipes</u>				
i	Ø100mm vent cowl	24	no.		
	Sub-Total for Soil and Waste Water Drainage Installations to Summary Page No.66				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.5	**Rainwater drainage Installations**				
a	Vertical discharge heavy duty pipes in grey or white colour as 'Metro' or equal and approved.				
i	Ø100mm straight run pipes	524	lm		
ii	Ø50mm ditto'	14	lm		
b	Extra fittings over pipes				
i	Ø100mm shoe bend	14	no.		
ii	Ø100mm sweep bend	28	no.		
iii	Ø100mm paddle flange	20	no.		
iv	Ø100x50mm boss connector	26	no.		
v	150x150 Roof grating c/w frame in mild steel and painted in rust free paint as rain water full Bora.	10	no.		
vi	Ø50mm Aluminium grating cover	26	no.		
	Sub-Total for Rain Water Drainage Pipe Installations to Collection Page No.66				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.6	**Fire Hose Reels Installations**				
a	Fire Hose Reel Pumpset Supply and install the following fire fighting installation and equipment as described and shown on the drawings. Tenderers should allow for all fittings, jointing's couplings including unions and clamps necessary for the proper functioning of the installation when pricing.				
a.1	Fire hose reel pump set to operate as "1No. Duty and 1No. Standby" with a flow rate of 4m³/hr at a static pressure of 5.0 bars, power rating of 1.3kW, single phase as **"Grundfos, CM5-6A"** or equal and approved. The pumps to be assembled in a common base plate and manifold with control and non-return valves, pressure switch, float switch in the ground tank for dry run protection. The pump shall have over and under voltage protection from unstable power conditions, overload and high temperature conditions. The pump set to have weather proof smart 2 evo 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 etc.	1	set		
a.2	Pressure vessel tanks as "VT24".	1	no.		
b	Fire Hose Pipework Supply and install the following fire fighting installation and equipment as described and shown on the drawings. Tenderers should allow for all fittings, jointing's couplings including unions and clamps necessary for the proper functioning of the installation when pricing.				
b.1	Straight Run pipes				
i	Ø50mm tubing to BS 1387 Class "B"	60	lm		
ii	Ø32mm ditto'	12	lm		
iii	Ø25mmditto'	12	lm		
b.2	Extra over tubing for: -				
i	Ø50mm bend	7	no.		
ii	Ø32mm ditto'	14	no.		
iii	Ø25mm ditto'	14	no.		
b.3	Reducers				
i	Ø50x32mm GI reducer	14	no.		
ii	Ø32x25mm ditto'	14	no.		
b.4	Unions				
i	Ø25mm Union	14	no.		
b.5	BRASSWORK				
i	Ø50mm approved medium pressure screw down full way non-rising stem wedge gate valve to BS5154 with wheel head and two joints to steel tubing, brass work to be as Pegler or equal and approved.	1	no.		
ii	Ø25mm ditto'	14	no.		
b.6	Non Kinking Ø20mmx30m long swinging type wall mounted hose reels complete with fixing brackets as manufactured by **"Bristol"** or equal and approved.	14	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
c	Allow a sum for painting of the whole installation with two coats of super gloss paint on a primer coat to the approval of the Engineer.	1	item		
d	Printed fire signage to Engineers approval and as follows;				
i	Fire action signs c/w instructions and emergency number display in blue colour.	14	no.		
ii	Fire extinguisher signage in red colour.	14	no.		
iii	Fire hose reel signage in red colour.	14	no.		
iv	Fire assembly signage.	1	no.		
	Sub-Total for Fire Hose Reel Installations to Collection Page No.66				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.7	**Portable Fire Extinguishers Installations** 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	9 kg dry powder fire extinguisher gas cartridge type in metal casing and fixed to wall surface, unit as **'Bristol'** ABC all purpose powder or equivalent and approved with content gauge and initial fill..	22	no.		
b	15kg Automatic dry powder fire extinguisher gas cartridge type in metal casing and fixed to ceiling/roof slab unit as **"Bristol"** or equal and approved with contents gauge sprinkler head and discharge nozzle for the switch room.	3	no.		
c	9 Litre water type fire extinguisher e in metal casing and fixed to wall surface, unit as 'Bristol' A water carbon dioxide or equivalent and approved with content gauge and initial fill.	14	no.		
d	9 Kg carbon dioxide gas fire extinguisher gas cartridge type in metal casing and fixed to wall surface, unit as **'Bristol'** B all purpose gas r or equivalent and approved with content gauge and initial fill..	14	no.		
c	9" diameter(22.5mm) Manual Alarm Bell c/w fixing screws	14	no.		
	Sub-Total for Portable Fire Extinguishers Installations to Collection Page No.66				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.8	**Dry Riser Fire System Installations** Supply, deliver, install, test and commission pipes, tubing and fittings as described and shown on the drawings. The pipes shall be galvanised mild steel pipes to **BS1387, 'Class B'.** Fire fighting equipment to be UL/FM Listed as **"Bristol"** of equal and approved. Tenderers must allow in their pricing of pipework for all couplings, connectors, joints, unions, etc. as required in running lengths of pipework. Also, where necessary for pipe fixing clips, holder brats, plugged or screwed. The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures. <u>Important Note</u> The tenderer is to deliver a complete fire hydrant system. The tenderer should include in his unit rates for any accessories or items which are not stated but are necessary for the complete and satisfactory operation of the system to the requirements of the current edition of NFPA. ***All the valves in this section to be UL listed and to have provision for locking the valve in open or closed position.***				
a	Straight pipes				
i	Ø100mm tubing to BS 1387 Class "B"	48	lm		
	<u>Extras over piping;</u>				
b	Bends/elbows				
i	Ø100mm	2	no.		
c	Equal tees				
i	Ø100mm Equal Tee	15	no.		
d	<u>Landing valves</u> Gate pattern outlet valves manufactured to BS 5041-2 in Gunmetal, body and internal designed for low working pressure, flanged inlets to BS 4504, straps and padlocks, blank plugs and chains provided.	13	no.		
e	<u>Hose Reel and Accessories</u>				
i	Ø65mm canvas hose, 30m long designed for a bursting pressure of 250 p.s.i for coupling into fire hydrant, 65mm hose coupling branch pipe and nozzle to BS 336.	13	no.		
ii	Swing Hose cradle for the above canvas hose, manufactured in aluminium, complete with wall bracket.	13	no.		
f	Automatic air release valves as angus	1	no.		
g	Allow a sum for painting of the whole installation with two coats of super gloss paint on a primer coat to the approval of the Engineer.	1	item		
	Sub-Total for Dry Riser Fire System Installations to Collection Page No.66				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1.9	**Common Cleaning Areas** Supply, deliver and install **CPVC 4120, SDR 13.5** Plastic pipes and fittings as per ASTM D-2846 As **"Astral Technologies".** 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 6 bars.				
a	Internal Plumbing				
a.1	Straight run pipes				
i	Ø32mm	50	lm		
	Extra fittings to pipe				
a.2	Elbow/bend				
i	Ø32mm	10	no.		
b	Fittings				
b.1	Tee				
i	Ø32*25*32mm tee	4	no.		
b.2	Brass threaded joints				
i	Ø25x15mm adaptor	10	no.		
c	Control valves				
i	Ø32mm brass ball cocks as "Pegler"	6	no.		
d	Hose Taps				
i	Ø15mm lockable aluminium type garden hose tap as "Plumber" complete with a polished G.I stand pipe, female threaded elbow and wall clips.	13	no.		
e	Cleaners Sink				
e.1	Stainless steel grade 304 dhobi sink as single bowl finished in bright machine polish as **"Miran"**, complete with chain waste, 40mm dia. Waste and heavy duty plastic P-trap, 75mm deep seal or equal and approved.	13	no.		
	Sub-Total for Common Cleaning Installations to Collection Page No.66				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	COLLECTION PAGE				
	Bill No. 1: Common Shared Services In Block C				
1	Sub-Totals for Domestic Water Booster Pump Installations from Page No.55				
2	Sub-Totals for Mains Rising Water Pipe Installations from Page No.56				
3	Sub-Totals for Roof Water Storage Tank Installations from Page No.58				
4	Sub-Totals for Soil & Waste Water Drainage Installations from Page No.59				
5	Sub-Totals for Rain Water Drainage Installations from Page No.60				
6	Sub-Totals for Fire Hose Reel System Installations from Page No.62				
7	Sub-Totals for Portable Fire Extinguishers Installations from Page No.63				
8	Sub-Totals for Dry Riser Fire System Installations from Page No.64				
9	Sub-Totals for Janitors Cleaning Installations from Page No.65				
	Total for Common Shared Services in Block C C/F Summary Page No.75				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2	**BILL No. 2: THREE BEDROOMED + DSQ UNITS**				
2.1	**Internal Plumbing Installations**				
	Supply, deliver and install **CPVC 4120, SDR 13.5** Plastic pipes and fittings as per ASTM D-2846 As **"Astral Technologies".**				
	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 6 bars.				
a	Water Meter				
i	Supply, deliver and install a Ø25mm single jet, mechanical smart meter with an in-built valve control, non-return valve, dry dial resolution of 4dp, pre-strainer, anti magnetic transmission and eight digit configuration reading, rotating indicator disc, pre-strainer, sealed totalizer made in brass material as "Maji Smart" or equal and approved.	1	no.		
b	Control valves				
i	Ø32mm gate valve as "Pegler"	1	no.		
c	Brass Threaded Adaptors				
i	Ø32mm x 1" male bush	2	no.		
ii	Ø32mm x 1" female bush	2	no.		
d	Cold water pipes				
d.1	Vertical and Roof pipe work				
i	Ø32mm	72	lm		
d.2	Horizontal pipe work				
i	Ø25mm	62	lm		
d.3	Extra over pipes				
	Elbow/bend				
i	Ø32mm	9	no.		
ii	Ø25mm	30	no.		
	Fittings				
d.4	Equal Tee fittings				
i	Ø32*25mm reducing tee	8	no.		
ii	Ø25*25mm equal tee	31	no.		
d.5	Brass threaded adaptors				
i	Ø25mm*1/2" female elbow	26	no.		
ii	Ø25mm*1/2" female tee	20	no.		
iii	Ø25mm*1/2" female threaded bush	16	no.		
iv	Ø32mm*1" male threaded bush	6	no.		
d.6	Control Valves				
i	Ø32mm gate valve as Pegler	2	no.		
e	Hot water pipes				
e.1	Horizontal pipe work				
i	Ø25mm	56	lm		
e.2	Extra over pipes				
	Elbow/bend				
i	Ø25mm	22	no.		
	Fittings				
e.3	Equal Tee fittings				
i	Ø25x20x25mm equal tee	15	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
	Fittings				
e.3	Equal Tee fittings				
i	Ø25x20x25mm equal tee	15	no.		
b.5	Brass threaded adaptors				
i	Ø25mm*1/2" female elbow	16	no.		
ii	Ø25mm*1/2" female tee	11	no.		
iii	Ø25mm*1/2" female threaded bush	8	no.		
b.6	Control Valves				
i	Ø25mm gate valve as Pegler	1	no.		
	Sub-Total for Internal Plumbing Installations to Collection Page No.74				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2.2	**Internal Soil & Waste Water Drainage**				
	Supply & install the following soil & waste water drainage pipework as described and shown in the drawing.				
	All pipes and fittings shall be uPVC and MuPVC to BS5572:1978 and BS5750 as manufactured by 'Key Terrain' or equal and approved.				
	All joining's and fixtures shall be in accordance with the manufacturers instructions and as described.				
	Tenderers must allow for joining's, couplings, holderbats, reducers, clippings, spacers etc, necessary for the proper functioning of the installation when pricing.				
a	Horizontal discharge pipes in Golden brown heavy duty PVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø100mm straight run pipe	11	lm		
ii	Ø50mm ditto"	20	lm		
iii	Ø40mm ditto"	20	lm		
b	Extra fittings over pipes				
i	Ø100mm WC connector c/w rubber seal	5	no.		
ii	Ø100mm sweep bend	5	no.		
iii	Ø100mm sweep tee	5	no.		
iv	Ø100x50mm boss connector	8	no.		
v	Ø100x40mm boss connector	4	no.		
vi	Ø50mm sweep tee	6	no.		
vii	Ø50mm sweep bend	6	no.		
vii	Ø40mm sweep tee	4	no.		
ix	Ø40mm sweep bend	14	no.		
x	Ø40mm access cap	3	no.		
c	Water traps/Trapped gulleys				
i	Four way trapped floor gulleys ref:281.2 and all interconnecting accessories and stainless steel cover grating or equal & approved	9	no.		
d	LP Gas Sleeve				
a	Horizontal discharge heavy duty pipes as 'Metro' or equal and approved.				
i	Ø40mm	6	lm		
e	Air Conditioning Provisional Drainage				
e.1	Straight Run PVC Pipes				
I	Ø32mm PVC pipes	24	lm		
e.2	Extras over straight pipes				
i	Ø32mm elbows	12	no.		
iii	Ø32-25mm reducers	4	no.		
	Sub-Total for Internal Soil and Waste Water Installations to Collection Page No.74				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2.3	**Rainwater Drainage**				
a	Horizontal discharge heavy duty pipes in grey or white colour as 'Metro' or equal and approved.				
i	Ø50mm straight run pipes	2	lm		
b	Extra fittings over pipes				
i	Ø50mm sweep bend	2	no.		
ii	Ø100x50mm boss connector	2	no.		
iii	100X100mm stainless steel cover	2	no.		
	Sub-Total for Rainwater Drainage Installations to Collection Page No.74				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2.4	**Sanitary and Tap ware fittings** Supply, deliver, install, set to work, test and commission the following sanitary fittings described below and supplied by others:- The works shall include 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. **All sanitary ware as "Miran" or equal and approved:** Note: (i) All sanitary fittings shall be in approved colour. (ii) The Model and Ref No. indicated is only a guide to the type and quality of fittings. (iii) Equivalent and Approved models may be acceptable.				
a	<u>Water closets</u>				
a.1	White vitreous China dual flush, close coupled suite (2 piece) comprising of closet "P" or "S" trap, 6 litres cistern with valveless fittings including syphon, internal overflow, 1/2" bottom inlet connection, chrome plated flushing button, heavy duty plastic seat and cover, pan plugged and screwed to concrete floor and bedded in mastic and cistern fixed to walls measuring 625x360x825mm as **"Make: Miran, Model: MN537"** or equal and approved.	5	no.		
a.2	Hand Spray Hand spray complete with a hose and angle valve as **"Make: Miran, Model: MN-DSS"** or equal and approved.	5	no.		
a.3	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	10	no.		
a.4	Flexible connector 1/2*1/2*300mm long metallic woven flex connector as **"Make: Miran, Model: MN-FT1.5".**	5	no.		
a.5	Wall mounted toilet roll holder, chrome plated of size 165x165mm a flipping cover as **"Make: Miran, Model: 96710"** or equal and approved.	5	no.		
b	<u>Wash hand basin</u>				
b.1	Counter top wash hand basin				
i	Counter top wash hand basin with an overflow, 1No. Tap hole configuration, Ø40mm waste outlet measuring 600x430x145mm as: **"Make: Miran, Model: 4323"** or equal and approved.	1	no.		
b.2	Wall mount wash hand basin				
i	White vitreous China, size 515x395x825mm fitting with 1 tap hole configuration complete with dia.32mm chrome plated waste, P trap and chain waste, chain and stay, heavy duty plastic bottle trap 75mm seal, full pedestal as **"Make: Miran, Model;1088"** or equal & approved	3	no.		
ii	White vitreous China, size 510x420x415mm fitting with 1 tap hole configuration complete with dia.32mm chrome plated waste, P trap and chain waste, chain and stay, heavy duty plastic bottle trap 75mm seal, half pedestal as **"Make: Miran, Model: 2253"** or equal & approved	1	no.		
b.3	WHB Taps				
i	Single lever, wash hand basin mixer pillar type tap as **"Make: Miran, Model: MN-62201"** for hot and cold water, chrome plated complete with 1/2" BSP female inlet and flexible connectors.	4	no.		
ii	Single lever, wash hand basin mixer pillar type tap as **"Make: Miran, Model: MN-1005"** for cold water, chrome plated complete with 1/2" BSP female inlet.	1	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
b.4	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	9	no.		
b.5	Flexible connector 1/2*1/2*300mm long metallic woven flex connector as **"Make: Miran, Model: MN-FT1.5".**	1	no.		
b.6	Mirrors 6mm thick polished plate glass, silver backed mirror with bevelled edges, size 800x6000mm plugged and screwed to wall with 2No.chrome plated capped screws and 5mm thick foam back rest.	5	no.		
c	Kitchen sink				
c.1	Stainless steel grade 304 kitchen sink as 1 + 1/2 double bowl, single drain heavy duty finished in bright machine polish to BS 1449: part 2; 1983, size 1000*550mm as **"Make: Miran, Model: MN-851"** complete with chain waste, 1No. Hole, chain and stay, 40mm chrome plated waste, 40mm heavy duty plastic P-trap, with 75mm deep seal or equal and approved.	1	no.		
c.2	Kitchen sink pillar type mixer with swivel outlet for cold and hot water, chrome plated c/w flex. connectors as **"Make: Miran, Model: MN-851"** or equal and approved.	1	no.		
c.3	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	2	no.		
d	Utility Area				
d.1	Long neck, chrome plated bib tap for the splash area, 150mm long as **"Make, "Miran, Model MN-1002"** or equal and approved.	1	no.		
d.2	Hose tap, bib type for the washing machine as **"Make: Miran, Model: MN-GT"** or equal and approved.	1	no.		
e	Shower Fittings				
e.1	Single lever, concealed divertor shower mixer consisting 1/2" chrome plated brass concealed shower mixer with diverter as **Make" Miran, Model: MN-62407"** or equal and approved.	4	no.		
e.2	Single function shower rose consisting of 1/2" chrome plated single function and dia.800mm circular shower head, a 450mm long shower arm, silicon nozzles as **"Make: Miran, Model: A82C/SY-3580C"** or equal and approved.	4	no.		
e.3	Wall mounted and chrome plated spout consisting of origins bath spout as **"Make: Miran, Model: PM-4105"** or equal and approved.	4	no.		
e.4 i	Soap Dish Surface mounted, chrome plated corner type soap basket c/w screws measuring 175x175mm as **"Make: Miran, Model: MN-809"** or equal and approved.	4	no.		
e.5 i	Robe hook Chrome plated, double sided coat hook c/w screws as **"Make: Miran, Model: 51505"** or equal and approved.	5	no.		
e.6 i	Towel Bar Chrome plated towel bar as **"Make: Miran, Model: 96701"** or equal and approved.	4	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
e.7 i	Towel Ring Chrome plated towel ring as **"Make: Miran, Model: 96711"** or equal and approved.	5	no.		
f i	Hot Water Geyser Vertical wall mounted hot water cylinder with a glass lined internal water tank, magnesium anode, sheathed immersion heating element, CFC free, s/s outlet pipe, inbuilt diffuser, pressure gauge of capacity: 100 litres size Ø433x948(h)mm hot water geyser with pressure rating of 8 bars as **"Make: Atlantic, O'pro, Model: 861216"** or equal and approved.	1	no.		
	Sub-total for Sanitary Fittings Installations to Collection Page No.74				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	COLLECTION PAGE				
	Bill No. 2: Three Bedroom + DSQ Apartment Unit				
1	Sub-Totals for Internal Plumbing Installations from Page No.68				
2	Sub-Totals for Internal Soil and Waste Water Drainage Installations from Page No.69				
3	Sub-Totals for Rain Water Drainage Installations from Page No.70				
4	Sub-Totals for Sanitary Fittings Installations from Page No.73				
	Totals for One (1No.) Three Bedroom + DSQ Apartments				
	Multiply by Fifty Two (x52.) Units			**52**	**x 52**
	Totals for Fifty Two (52No.) 3 B.R Units C/F to Summary Page No.75				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	SUMMARY PAGE - BLOCK C				
1	**Sub-Totals for Bill No.1: Common Shared Services from Page No.66**				
2	**Sub-Totals for Bill No.2: Internal Plumbing, Drainage and Sanitary Fittings to 3 B.R + DSQ Apartment Units from Page No.74**				
	Totals for Block C Mechanical Installations to Main Summary Page No.98				

PROPOSED PROPERTY RE-DEVELOPMENT ON PLOT LR. No. KISUMU/MUNICIPALITY/BLOCK 8/258 IN KISUMU
MECHANICAL INSTALLATION WORKS

SECTION V: BILLS OF QUANTITIES FOR MECHANICAL INSTALLATIONS TO CLUB HOUSE

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1	**BILL No. 1: PUMPS, MAINS RISING WATER PIPE AND ROOF TANKS**				
1.1	**Domestic Water Booster Pumpset**				
	Supply, deliver, install, set to work, test and commission the following domestic water pumpset:				
a	Supply, deliver, install, test and commission the following pumpset:				
i	Domestic water booster pump comprising of 1No "Duty" and 1No. to "Duty" with a flow rate of 3.0m³/hr at a static pressure of 4.0 bar, Power rating: 1.1kW, single phase and an integral variable speed controller to maintain constant pressure and sensor, inbuilt 3 litre pressure tank as **"Make: Pedrollo, Model: DG Ped"** or equal and approved.				
	The pump assembly to be complete with ball and non return valves, manifolds, skid and **AVS30, Sollatek**.	1	set		
1.2	**Mains Rising Pipe and Roof Water Storage Tank Installations**				
	Supply, deliver and install **CPVC 4120, SDR 13.5** Plastic pipes and fittings as per ASTM D-2846 as **"Astral Technologies".**				
	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 6 bars.				
a	Supply to tanks				
a.1	Straight run pipes				
i	Ø32mm	30	lm		
	Extra fittings to pipe				
a.2	Elbow/bend				
i	Ø32mm	11	no.		
b	Fittings				
b.1	Tee				
i	Ø32*32*32mm equal tee	3	no.		
b.2	Union				
i	Ø32mm PPR Union	4	no.		
b.3	Reducers				
i	Ø32x25mm	4	no.		
b.4	Brass threaded joints				
i	Ø25x15mm Male adaptor	23	no.		
c	Control valves				
i	32mm brass ball cocks as "Pegler"	3	no.		
ii	32mm Non Return valve as "Pegler"	1	no.		
d	Water Filters				
i	Supply and install the following inline water filters; Self cleaning strainer filter with a backwash facility activated filter c/w a cartridge, drain valve, strainer made of plastic net of 90 microns with a flow rate of 10m³/hr at a static pressure of 8 bars as **"Make: Atlas, Model: Hydra".**	1	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
1.3	**Roof Water Storage Tanks Installations** Supply deliver, erect, test and commission the following tank, including pipework and equipment as described;				
a	Rotary moulded cylindrical tanks as **"Roto"** or equal and approved with a capacity of 2500Ltrs, dim: Ø1550*1500(h)mm. The tanks to have a Ø32mm inlet connection & Ø32mm outlet connection, Ø32mm overflow Ø32mm washout and ball valve, backnuts, lid and a Ø32mm high pressure cast brass ball valve and high pressure polypropylene plastic float.	2	no.		
	Note **Tenderers will submit written warranties for the PVC tank with a minimum of 7 years.**				
b i	Sterilisation Allow for disinfection/sterilisation and flushing out of the water tank of capacity: 2,500 litres and pipework with water containing 0.05g/l granular calcium hypochlorite for a minimum period of 24hrs.	1	item		
1.4 i	**Submersible Drainage Pump - Plant Room** Supply, deliver, install, test and commission the following pump: Submersible drainage pumpset to operate as "Duty Only" with a flow rate of 10m³/hr at a static pressure of 2.0 bars for light duty, non-aggressive and de-watering conditions. The pumps to be fitted with Noryl plastic impeller, stainless steel intake screens and inbuilt float switch for automatic control of pump start and stop, as **"Make: Pedrollo, Model: DM30"** or equal and approved.	1	no.		
	Sub -Total for Bill No.1: Domestic Booster Pump, Water Storage Tank & Mains Rising Pipe Installations to Summary Page No.85				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2	**BILL No. 2: INTERNAL PLUMBING AND DRAINAGE INSTALLATIONS**				
2.1	**Water Supply from Roof Tank to Internal Facilities**				
	Supply, deliver and install **CPVC 4120, SDR 13.5** Plastic pipes and fittings as per ASTM D-2846 As **"Astral Technologies".**				
	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 6 bars.				
a	Internal Plumbing				
a.1	Straight run pipes				
i	Ø32mm	24	lm		
ii	Ø25mm	18	lm		
	Extra fittings to pipe				
a.2	Elbow/bend				
i	Ø32mm	8	no.		
ii	Ø25mm	14	no.		
b	Fittings				
b.1	Tee				
i	Ø32*32*32mm tee	4	no.		
ii	Ø32*25*32mm tee	8	no.		
b.2	Reducers				
i	Ø32x25mm	6	no.		
b.3	Brass threaded joints				
i	Ø25x15mm adaptor	9	no.		
ii	Ø25x15mm elbow adaptor	11	no.		
iii	Ø32*25*32mm tee adaptor	4	no.		
c	Control valves				
i	32mm brass ball cocks as "Pegler"	1	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
2.2	**Soil and Waste Water Drainage Installations**				
	Supply & install the following soil & waste water drainage pipework as described and shown in the drawing.				
	All pipes and fittings shall be uPVC and MuPVC to BS5572:1978 and BS5750 as manufactured by 'Key Terrain' or equal and approved.				
	All joining's and fixtures shall be in accordance with the manufacturers instructions and as described.				
	Tenderers must allow for joining's, couplings, holderbats, reducers, clippings, spacers etc, necessary for the proper functioning of the installation when pricing.				
	The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures.				
a	Horizontal discharge pipes in Golden brown heavy duty MuPVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø100mm	24	lm		
ii	Ø50mm	18	lm		
iii	Ø40mm	24	lm		
b	Extra fittings over pipes				
i	Ø100mm WC connector	2	no.		
ii	Ø100mm seal ring adaptors	2	no.		
iii	Ø100mm sweep bend	2	no.		
viii	Ø50x40mm reducer	3	no.		
ix	Ø50mm sweep bend	7	no.		
x	Ø50mm sweep tee	2	no.		
xi	Ø50mm plug	4	no.		
xii	Ø40mm sweep bend	8	no.		
xiii	Ø40mm sweep tee	8	no.		
xiv	Ø40mm plugs	3	no.		
x	Ø100mm Vent cowl	1	no.		
c	Water traps/Trapped gulleys				
i	Four way trapped floor gulleys ref:281.2 and all interconnecting accessories and 'PVC' cover grating or equal & approved.	7	no.		
d	Gulley trap chamber ref:1844.4.25 size 350*350*450(d) mm in glass reinforced cover etc and allow for excavation in soil or murram and making good.	6	no.		
e	Air Conditioning Provisional Drainage				
e.1	Straight Run PVC Pipes				
I	Ø32mm PVC pipes	6	lm		
e.2	Extras over straight pipes				
i	Ø32mm elbows	2	no.		
iii	Ø32-25mm reducers	1	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
2.3	**Rainwater drainage Installations**				
a	Vertical discharge heavy duty pipes in grey or white colour as 'Metro' or equal and approved.				
i	Ø100mm straight run pipes	30	lm		
ii	Ø50mm ditto'	4	lm		
b	Extra fittings over pipes				
i	Ø100mm shoe bend	4	no.		
ii	Ø100mm sweep bend	4	no.		
iii	Ø100mm paddle flange	4	no.		
iv	Ø100x50mm boss connector	4	no.		
v	150x150 Roof grating c/w frame in mild steel and painted in rust free paint as rain water full Bora.	4	no.		
vi	Ø50mm Aluminium grating cover	4	no.		
	Sub -Total for Bill No.2: Internal Plumbing and Drainage Installations to Summary Page No.85				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
3	**BILL No. 3: SANITARY FITTINGS INSTALLATIONS** Supply, deliver, install, set to work, test and commission the following sanitary fittings described below and supplied by others:- The works shall include 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. **All sanitary ware as "Miran" or equal and approved:** Note: (i) All sanitary fittings shall be in approved colour. (ii) The Model and Ref No. indicated is only a guide to the type and quality of fittings. (iii) Equivalent and Approved models may be acceptable.				
a	<u>Water closets</u>				
a.1	White vitreous China dual flush, close coupled suite (2 piece) comprising of closet "P" or "S" trap, 6 litres cistern with valveless fittings including syphon, internal overflow, 1/2" bottom inlet connection, chrome plated flushing button, heavy duty plastic seat and cover, pan plugged and screwed to concrete floor and bedded in mastic and cistern fixed to walls measuring 625x360x825mm as **"Make: Miran, Model: MN537"** or equal and approved.	3	no.		
a.2	Hand Spray Hand spray complete with a hose and angle valve as **"Make: Miran, Model: MN-DSS"** or equal and approved.	3	no.		
a.3	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	6	no.		
a.4	Flexible connector 1/2*1/2*300mm long metallic woven flex connector as **"Make: Miran, Model: MN-FT1.5".**	3	no.		
a.5	Wall mounted toilet roll holder, chrome plated of size 165x165mm a flipping cover as **"Make: Miran, Model: 96710"** or equal and approved.	3	no.		
b	<u>Wash hand basin</u>				
b.1 i	Counter top wash hand basin Counter top wash hand basin with an overflow, 1No. Tap hole configuration, Ø40mm waste outlet measuring 600x430x145mm as: **"Make: Miran, Model: 4323"** or equal and approved.	6	no.		
b.2 i	WHB Taps Single lever, wash hand basin mixer pillar type tap as **"Make: Miran, Model: MN-1005"** for cold water, chrome plated complete with 1/2" BSP female inlet.	6	no.		
b.3	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	6	no.		
b.4	Flexible connector 1/2*1/2*300mm long metallic woven flex connector as **"Make: Miran, Model: MN-FT1.5".**	6	no.		
b.5	<u>Mirrors</u> 6mm thick polished plate glass, silver backed mirror with bevelled edges, size 800x6000mm plugged and screwed to wall with 2No.chrome plated capped screws and 5mm thick foam back rest.	6	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
e	Shower Fittings				
e.1	1/2" BSP concealed brass threaded shower stop cork in chrome plated steel valve as **"Plumber"**	4	no.		
e.2	450mm long silver painted galvanised iron shower arm with one end fixed to a Brass adaptor and the other end with socket ready to receive instant shower heater.	4	no.		
e.3	Long neck, chrome plated splash bib tap as **"Plumber"** with 150mm wall mounted supplied with cold indices	4	no.		
e.4	Instant Shower Heater – Make: Lorenzetti c/w a polished G.I shower arm & socket – Model: Maxi Duchi – Power Cons: 5.5kW	4	no.		
e.5 i	Soap Dish Surface mounted, chrome plated corner type soap basket c/w screws measuring 175x175mm as **"Make: Miran, Model: MN-809"** or equal and approved.	4	no.		
e.6 i	Robe hook Chrome plated, double sided coat hook c/w screws as **"Make: Miran, Model: 51505"** or equal and approved.	7	no.		
f	**Urinal**				
f.1 i	Urinal bowl Urinal bowl with top inlet for exposed pipework, pair of supports, 1 1/2 diameter domed outlet urinal grating and plastic bottle P-trap with an extension to the wall and flange in Vitreous China as "**Make: Miran, Model: 6602"** or equal and approved.	1	no.		
f.2 i	Exposed Flush Valve Chrome plated, exposed and auto closing urinal flush valve as **"Make: Plumber, Model: AC8107"** or equal and approved.	1	no.		
	Sub -Total for Bill No. 3: Sanitary Fittings Installations to Summary Page No.85				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
4	**BILL No. 4: FIRE FIGHTING INSTALLATIONS**				
	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	9 Litre dry powder fire extinguisher gas cartridge type in metal casing and fixed to wall surface, unit as **'Bristol'** ABC all purpose powder or equivalent and approved with content gauge.	6	no.		
b	15kg Automatic dry powder fire extinguisher gas cartridge type in metal casing and fixed to ceiling/roof slab unit as **"Bristol"** or equal and approved with contents gauge sprinkler head and discharge nozzle for the switch room.	2	no.		
c	9" diameter(22.5mm) Manual Alarm Bell c/w fixing screws	1	no.		
	Sub -Total for Bill No.4: Fire Fighting Installations to Summary Page No.85				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
5	**BILL No. 5: AIR CONDITIONING UNITS - SERVER ROOM**				
	Supply, install, commission and set to work the following:				
	The unit must have **Refrigerant (R410a)** initial Charge. All A/C units must be tropicalised, operate on full & dual inverter compressors.				
	EER Rating: >3.25 or equal				
	Trade Names:				
	The air conditioing units specified in the foregoing are based on technical specifications contained else where in this document.				
	Tenderers are requested to indicate the make of the units on offer in their tender bid, and submit technical brochures for the same for the bid to be considered complete.				
5.1	**Split Type - Server Room**				
a	**Wall Mounted Type**				
a.1	High wall mounted type single split air conditioner with 70% energy saving (cooling type), with dual cool inverter and complete with a wireless remote control, indoor and outdoor units as **"Make: LG, Model: S4-Q24K23QE"** or approved equivalent.				
	Cooling capacity: 7.1 **KW (24,000 BTU/hr)**	2	no.		
a.2	30 Amps Automatic Voltage Stabilisers as **'Sollatek"**	2	no.		
a.3	Aluminium coated wall mounting brackets for outdoor units c/w mounting rubbers, rawl bolts and other accessories.	2	lot		
a.4	Allow for refrigerant pre-insulated copper pipes for liquid and gas				
i	• Ø6.35mm (1/4) liquid line	24	lm		
ii	• Ø12.7mm (1/2) gas line	24	lm		
a.5	Allow for 2.5mm² x 3 core flexible cable by **"Metsec"**				
	or equal and approved.	40	lm		
5.2	**Condensate Drainage**				
a	Drainage Pipework				
a.1	Ø25mm PVC straight run pipe	12	lm		
a.2	Extras over straight pipes				
i	Ø25mm elbows	6	no.		
ii	Wall clips	1	item		
b	Service & Mainteinance				
i	Allow sum for service and mainteinance of entire installation on quarterly basis and user training for a period of one year after practical completion during the warranty period.				
	To be paid upon submission of signed job cards and comprehensive mainteinance has been carried out.	1	item		
	Sub -Total for Bill No.5: Air Conditioning Installations to Summary Page No.85				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	SUMMARY PAGE - CLUB HOUSE				
1	Sub-Totals for Bill No.1: Pumps, Mains Rising Pipes and Roof Tanks Installations from Page No.77				
2	Sub-Totals for Bill No.2: Internal Plumbing & Drainage Installations from Page No.80				
3	Sub-Totals for Bill No.3: Sanitary Fittings Installations from Page No.82				
4	Sub-Totals for Bill No.4: Fire Fire Fighting Installations from Page No.83				
5	Sub-Totals for Bill No.5: Server Room Air Conditioning Installations from Page No.84				
	Total for Club House Mechanical Installations C/F to Main Summary Page No.98				

PROPOSED PROPERTY RE-DEVELOPMENT ON PLOT LR. No. KISUMU/MUNICIPALITY/BLOCK 8/258 IN KISUMU
MECHANICAL INSTALLATIONS - INTERNAL PLUMBING, DRAINAGE AND FIRE FIGHTING INSTALLATIONS

SECTION VI: BILLS OF QUANTITIES FOR MECHANICAL INSTALLATIONS TO GATE HOUSE & AUXILLIARY ROOMS

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1	**BILL No. 1: MAINS RISING WATER PIPE AND ROOF TANKS**				
1.1	**Mains Rising Pipe and Roof Water Storage Tank Installations**				
	Supply, deliver and install **CPVC 4120, SDR 13.5** Plastic pipes and fittings as per ASTM D-2846 as **"Astral Technologies".**				
	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 6 bars.				
a	Supply to tanks				
a.1	Straight run pipes				
i	Ø32mm	12	lm		
	Extra fittings to pipe				
a.2	Elbow/bend				
i	Ø32mm	4	no.		
b	Fittings				
b.1	Tee				
i	Ø32*32*32mm equal tee	1	no.		
b.2	Union				
i	Ø32mm PPR Union	1	no.		
b.3	Reducers				
i	Ø32x25mm	2	no.		
b.4	Brass threaded joints				
i	Ø25x15mm Male adaptor	4	no.		
c	Control valves				
i	32mm brass ball cocks as "Pegler"	1	no.		
ii	32mm Non Return valve as "Pegler"	1	no.		
d	Water Filters				
i	Supply and install the following inline water filters;				
	Self cleaning strainer filter with a backwash facility activated filter c/w a cartridge, drain valve, strainer made of plastic net of 90 microns with a flow rate of 10m³/hr at a static pressure of 8 bars				
	as **"Make: Atlas, Model: Hydra".**	1	no.		

Sub-total C/F to next page

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
1.2	**Roof Water Storage Tanks Installations** Supply deliver, erect, test and commission the following tank, including pipework and equipment as described;				
a	Rotary moulded cylindrical tanks as **"Roto"** or equal and approved with a capacity of 1000Ltrs, dim: Ø1170*1100(h)mm. The tanks to have a Ø32mm inlet connection & Ø32mm outlet connection, Ø32mm overflow Ø32mm washout and ball valve, backnuts, lid and a Ø32mm high pressure cast brass ball valve and high pressure polypropylene plastic float.	1	no.		
	Note **Tenderers will submit written warranties for the PVC tank as 7 years.**				
b i	Sterilisation Allow for disinfection/sterilisation and flushing out of the water tank of capacity: 1,000 litres and pipework with water containing 0.05g/l granular calcium hypochlorite for a minimum period of 24hrs.	1	item		
	Sub -Total for Bill No.1: Water Storage Tank & Mains Rising Pipe Installations to Summary Page No.94				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2	**BILL No. 2: INTERNAL PLUMBING AND DRAINAGE INSTALLATIONS**				
2.1	**Water Supply from Roof Tank to Internal Facilities**				
	Supply, deliver and install **CPVC 4120, SDR 13.5** Plastic pipes and fittings as per ASTM D-2846 As **"Astral Technologies".**				
	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 6 bars.				
a	Internal Plumbing				
a.1	Straight run pipes				
i	Ø32mm	8	lm		
ii	Ø25mm	12	lm		
	Extra fittings to pipe				
a.2	Elbow/bend				
i	Ø32mm	4	no.		
ii	Ø25mm	8	no.		
b	Fittings				
b.1	Tee				
i	Ø32*32*32mm tee	2	no.		
ii	Ø32*25*32mm tee	4	no.		
b.2	Reducers				
i	Ø32x25mm	3	no.		
b.3	Brass threaded joints				
i	Ø25x15mm adaptor	2	no.		
ii	Ø25x15mm elbow adaptor	2	no.		
iii	Ø32*25*32mm tee adaptor	2	no.		
c	Control valves				
i	32mm brass ball cocks as "Pegler"	1	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
2.2	**Soil and Waste Water Drainage Installations** Supply & install the following soil & waste water drainage pipework as described and shown in the drawing. All pipes and fittings shall be uPVC and MuPVC to BS5572:1978 and BS5750 as manufactured by 'Key Terrain' or equal and approved. All joining's and fixtures shall be in accordance with the manufacturers instructions and as described. Tenderers must allow for joining's, couplings, holderbats, reducers, clippings, spacers etc, necessary for the proper functioning of the installation when pricing. The pipes will be pressure tested before the backfilling the trenches as per the manufacturers recommended testing pressures.				
a	Horizontal discharge pipes in Golden brown heavy duty MuPVC pipes class 41 as 'Key Terrain' or equal and approved				
i	Ø100mm	12	lm		
ii	Ø50mm	8	lm		
iii	Ø40mm	8	lm		
b	<u>Extra fittings over pipes</u>				
i	Ø100mm WC connector	1	no.		
ii	Ø100mm seal ring adaptors	1	no.		
iii	Ø100mm sweep bend	1	no.		
viii	Ø50x40mm reducer	2	no.		
ix	Ø50mm sweep bend	2	no.		
x	Ø50mm sweep tee	2	no.		
xi	Ø50mm plug	2	no.		
xii	Ø40mm sweep bend	2	no.		
xiii	Ø40mm sweep tee	2	no.		
xiv	Ø40mm plugs	2	no.		
x	Ø100mm Vent cowl	1	no.		
c	<u>Water traps/Trapped gulleys</u>				
i	Four way trapped floor gulleys ref:281.2 and all interconnecting accessories and 'PVC' cover grating or equal & approved.	1	no.		
d	Gulley trap chamber ref:1844.4.25 size 350*350*450(d) mm in glass reinforced cover etc and allow for excavation in soil or murram and making good.	1	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
2.3	**Rainwater drainage Installations**				
a	Vertical discharge heavy duty pipes in grey or white colour as 'Metro' or equal and approved.				
i	Ø100mm straight run pipes	6	lm		
ii	Ø50mm ditto'	2	lm		
b	Extra fittings over pipes				
i	Ø100mm shoe bend	2	no.		
ii	Ø100mm sweep bend	2	no.		
iii	Ø100mm paddle flange	2	no.		
iv	Ø100x50mm boss connector	2	no.		
v	150x150 Roof grating c/w frame in mild steel and painted in rust free paint as rain water full Bora.	2	no.		
vi	Ø50mm Aluminium grating cover	4	no.		
	Sub -Total for Bill No.2: Internal Plumbing and Drainage Installations to Summary Page No.94				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
3	**BILL No. 3: SANITARY FITTINGS INSTALLATIONS** Supply, deliver, install, set to work, test and commission the following sanitary fittings described below and supplied by others:- The works shall include 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. **All sanitary ware as "Miran" or equal and approved:** Note: (i) All sanitary fittings shall be in approved colour. (ii) The Model and Ref No. indicated is only a guide to the type and quality of fittings. (iii) Equivalent and Approved models may be acceptable.				
a	<u>Water closets</u>				
a.1	White vitreous China dual flush, close coupled suite (2 piece) comprising of closet "P" or "S" trap, 6 litres cistern with valveless fittings including syphon, internal overflow, 1/2" bottom inlet connection, chrome plated flushing button, heavy duty plastic seat and cover, pan plugged and screwed to concrete floor and bedded in mastic and cistern fixed to walls measuring 625x360x825mm as **"Make: Miran, Model: MN537"** or equal and approved.	1	no.		
a.2	Hand Spray Hand spray complete with a hose and angle valve as **"Make: Miran, Model: MN-DSS"** or equal and approved.	1	no.		
a.3	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	2	no.		
a.4	Flexible connector 1/2*1/2*300mm long metallic woven flex connector as **"Make: Miran, Model: MN-FT1.5".**	1	no.		
a.5	Wall mounted toilet roll holder, chrome plated of size 165x165mm a flipping cover as **"Make: Miran, Model: 96710"** or equal and approved.	1	no.		
b	<u>Wash hand basin</u>				
b.1 i	Counter top wash hand basin Counter top wash hand basin with an overflow, 1No. Tap hole configuration, Ø40mm waste outlet measuring 600x430x145mm as: **"Make: Miran, Model: 4323"** or equal and approved.	1	no.		
b.2 i	WHB Taps Single lever, wash hand basin mixer pillar type tap as **"Make: Miran, Model: MN-1005"** for cold water, chrome plated complete with 1/2" BSP female inlet.	1	no.		
b.3	Angle Valve Ø15mm chrome plated angle valve as **"Make: Miran, Model: MN-AV"** or equal and approved.	1	no.		
b.4	Flexible connector 1/2*1/2*300mm long metallic woven flex connector as **"Make: Miran, Model: MN-FT1.5".**	1	no.		
b.5	<u>Mirrors</u> 6mm thick polished plate glass, silver backed mirror with bevelled edges, size 800x6000mm plugged and screwed to wall with 2No.chrome plated capped screws and 5mm thick foam back rest.	1	no.		
	Sub-total C/F to next page				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	Sub-total B/F from previous page				
c	Shower Fittings				
c.1	Soap Dish				
i	Surface mounted, chrome plated corner type soap basket c/w screws measuring 175x175mm as **"Make: Miran, Model: MN-809"** or equal and approved.	1	no.		
c.2	Robe hook				
i	Chrome plated, double sided coat hook c/w screws as **"Make: Miran, Model: 51505"** or equal and approved.	1	no.		
	Sub -Total for Bill No.3: Sanitary Fittings Installations to Summary Page No.94				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
4	**BILL No. 4: FIRE FIGHTING INSTALLATIONS**				
	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	9 Litre dry powder fire extinguisher gas cartridge type in metal casing and fixed to wall surface, unit as **'Bristol'** ABC all purpose powder or equivalent and approved with content gauge.	2	no.		
b	15kg Automatic dry powder fire extinguisher gas cartridge type in metal casing and fixed to ceiling/roof slab unit as **"Bristol"** or equal and approved with contents gauge sprinkler head and discharge nozzle for the switch room.	4	no.		
c	9" diameter(22.5mm) Manual Alarm Bell c/w fixing screws	1	no.		
	Sub -Total for Bill No. 4: Fire Fighting Installations to Summary Page No.94				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	SUMMARY PAGE - GATE HOUSE AND AUXILLIARY SERVICES				
1	Sub-Totals for Bill No.1: Pumps, Mains Rising Pipes and Roof Tanks Installations from Page No.87				
2	Sub-Totals for Bill No.2: Internal Plumbing & Drainage Installations from Page No.90				
3	Sub-Totals for Bill No.3: Sanitary Fittings Installations from Page No.92				
4	Sub-Totals for Bill No.4: Fire Fighting Installations from Page No.93				
	Total for Gate House and Auxiliary Buildings Mechanical Installations C/F to Main Summary Page No.98				

PROPOSED PROPERTY RE-DEVELOPMENT ON PLOT LR. No. KISUMU/MUNICIPALITY/BLOCK 8/258 IN KISUMU
MECHANICAL INSTALLATIONS - SWIMMING POOL EQUIPMENT INSTALLATION WORKS

SECTION VII: BILLS OF QUANTITIES FOR SWIMMING POOL PIPES AND EQUIPMENT INSTALLATIONS

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
1	**BILL No. 1: SWIMMING POOL INSTALLATIONS**				
	Supply, delivery, install, set to work, test and commission the following pool equipment as described below;				
1.1	**Pool Equipment**				
a	Dayliff DX750 sand filter complete with MPV	2	no.		
b	Sand filter media for DX750 filter	24	kg		
c	Pedrollo magnifica 3 pool pump, 1.1kW	2	no.		
d	DOL starter complete with a timer.	2	no.		
e	Certikin eyeball inlet complete with water bar	8	no.		
f	Certikin vacuum point complete with water bar	3	no.		
g	Ø63mm PVC, Class D suction water bar	7	no.		
h	Ø75mm PVC, Class D suction water bar	18	no.		
i	Ø110mm PVC, Class D balance tank water bar	3	no.		
j	450*450mm stainless steel pool suction grating	2	no.		
k	300*300mm stainless steel pool suction grating	1	no.		
l	250mm wide deck level channel grilles	62	no.		
m	90° standard GRP corner spacers	4	no.		
n	Dayliff LED underwater lights c/w niche and deck box (warm-white)	6	no.		
o	100/12V lights single transformer	2	no.		
p	Davey Ecosalt EC25 salt water chlorinator	1	no.		
q	3 steps stainless steel ladder	2	no.		
r	4 steps stainless steel ladder	2	no.		
s	Pedrollo Top 3, 0.37kW submersible drainage pump	1	no.		
t	Life saving buoy	1	no.		
u	Pool start up chemicals: 40-l ph. Minus, 40kg chlorine 65%, 5-l pool magic, 5No. HTH sparkle cube and 20 bags pool salt.	1	item		
v	Set of pool cleaning kit: 8 wheel sweeper, 15m vacuum hose, leaf rake, leaf net, floor brush, algae brush, telescopic handle, aluminium handle and pool test kit.	1	item		
	Sub-Total for Bill No.1: Pool Equipment Installations C/F to Summary Page No.97				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
2	**BILL No. 2: POOL CIRCULATION PIPES AND FITTINGS INSTALLATIONS** Supply & install PVC Class D pipes of 12454 per ASTM D1784 compliance with ASTM D1785 cell classification as flow guard 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	Straight Run Pipes				
i	Ø75mm PVC, Class D pipe, 6m	14	no.		
ii	Ø63mm PVC, Class D pipe, 6m	20	no.		
iii	Ø50mm PVC, Class D pipe, 6m	8	no.		
	Extra over pipes				
b	Reducers				
i	Ø75x63mm	14	no.		
ii	Ø63x50mm	14	no.		
c	Elbows/Bends				
i	Ø75mm	35	no.		
ii	Ø63mm	18	no.		
iii	Ø50mm	18	no.		
d	Tees				
i	Ø75x75x75mm	13	no.		
ii	Ø63x63x63mm	15	no.		
iii	Ø50x50x50mm	8	no.		
e	Ball Valves				
i	Ø75mm PVC Ball Valve	8	no.		
ii	Ø63mm ditto"	4	no.		
f	Non Return Valves				
i	Ø75mm N.R Valve	4	no.		
ii	Ø63mm	4	no.		
iii	Ø50mm	4	no.		
g	Socket				
i	Ø75mm Valve Socket	12	no.		
ii	Ø63mm	8	no.		
iii	Ø50mm	4	no.		
h	Foot Valve				
i	2 1/2" Balance tank foot valve	2	no.		
i	Electrical Wiring				
i	Ø2.5mmx3 core armoured cable	140	lm		
	Sub-Total for Bill No.2: Pool Piping Installations C/F to Summary Page No.97				

Item Ref.	Description	Qty	Unit	Rate (Kes)	Total Amount (Kes)
	SUMMARY PAGE - SWIMMING POOL INSTALLATIONS				
1	Sub-Totals for Bill No.1: Pool Equipment Installations from Page No.95				
2	Sub-Totals for Bill No.2: Pool Piping Installations from Page No.96				
	Totals for Swimming Pool Equipment and Piping Installations C/F to Main Summary Page No.98				

PROPOSED PROPERTY RE-DEVELOPMENT ON PLOT LR. No. KISUMU/MUNICIPALITY/BLOCK 8/258 IN KISUMU
MECHANICAL INSTALLATIONS

MAIN SUMMARY PAGE - MECHANICAL SERVICES INSTALLATIONS

Item Ref.	Description	Total Amount (Kes)
1	**Section I: Totals for Shared Mechanical Installations B/F from Page No.12**	
2	**Section II: Totals for Block A Units, 2 B.R + DSQ (G+15) B/F from Page No.33**	
3	**Section III: Totals for Block B Units, 2 B.R + DSQ (G+13) B/F from Page No.54**	
4	**Section IV: Totals for Block C Units, 3 B.R + DSQ (G+13) B/F from Page No.75**	
5	**Section V: Totals for Club House Installations B/F from Page No.85**	
6	**Section VI: Totals for Gate House & Auxilliary Building Installations B/F from Page No.94**	
7	**Section VII: Totals for Swimming Pool Installations B/F from Page No.97**	
8	**Working and As-Installed Drawings**	
a	Prepare and submit working drawings comprising the following to the satisfaction of the Engineer both in hard and soft copy. All soft copy drawings to be in AutoCAD format:- □ Routes - types & sizes of all pipework. □ Schematic diagrams. □ General arrangement drawings of equipment, plant etc. □ All the required operating instructions for all pipes, boards etc. □ Maintenance, operational and installation Manuals for all items installed.	
6	**PC Sums**	
a	Water and Sewer Connection Fee (KIWASCO)	250,000.00
b	Borehole Drilling & Equipping	6,000,000.00
c	Raw Water Treatment Plant	5,000,000.00
7	**Testing and Commissioning**	
a	Allow for systems testing and commissioning to the satisfaction of the Architect/Engineer	
8	**Contingency Sum**	
a	Provisional Contingency Sum	2,000,000.00
9	**Preliminaries**	
a	Insurance	
b	Performance Bond	
	Total For Mechanical Installations Carried Forward to Main Works Grand Summary	