PROPOSED CONSTRUCTION OF BUFFALO PLAZA ON LR 37/262/1

SPECIFICATIONS AND BILLS OF QUANTITIES

FOR

SUPPLY, INSTALLATION, TESTING AND COMMISSIONING

OF

PLUMBING AND DRAINAGE INSTALLATION WORKS

ARCHITECT
Dama Services Limited,
P.O. Box 9656-00100
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Email:damaservices@gmail.com

QUANTITY SURVEYOR
Integra Consulting Limited
P.O. Box 27974-00100
Nairobi
Email:info@integraconsulting.co.ke

STRUCTURAL ENGINEER
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P.O. Box 14105-00100
Nairobi
Email:inticomltd@gmail.com

ELECTRICAL ENGINEER
FluidSystem Engineers Limited,
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Nairobi
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MECHANICAL ENGINEER
Fluidsystem Engineers Limited,
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JANUARY, 2022

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SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF PLUMBING AND DRAINAGE INSTALLATION WORKS

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DEFINITIONS

The following terms and expressions used in the contract document shall have the following meanings:

The Employer:	Nyati Sacco
Represented by:	Board of Management

ARCHITECT shall mean Dama Services Limited

ELECTRICAL ENGINEER shall mean Fluidsystem Engineers Limited,

QUANTITY SURVEYOR shall mean Integra Consulting Limited

ENGINEER shall mean Fluidsystem Engineers Limited,

STRUCTURAL ENGINEER shall mean Inticom Limited

Employer's representative: This shall mean the Project Manager and shall be Dama Services Limited,

Main contractor	The firm appointed to carry out the builders works.
Contractor:	The firm appointed to carry out the supply, delivery, installation, testing and commissioning of Plumbing and Drainage Installation
Site:	Nairobi

NOTES TO ALL TENDERERS;

1. The tenderer is required to check the number of pages in this document and should any be found to be missing or the figures indistinct, he must inform the Engineer at once and have the same rectified. Should the tenderer be in doubt the precise meaning of any item, word or figure. Or for any reason whatsoever observe any apparent omission of words or figures, he must inform the Engineer in order that the correct meaning may be decided upon before the date for the submission of the tenders.

2. No liability whatsoever will be admitted nor claim allowed in respect of errors in the completed tender due to mistakes in this document which should have been rectified in the manner described above.

3. The tenderer shall not otherwise qualify the text of this specification. Any alteration or qualification made without authority will be ignored and the text of the specification as printed will be adhered to.

4. The tenderer shall be deemed to have made allowances in his unit prices generally to cover items of preliminaries or additions to prime cost Sums or other items. If those have not been priced against the respective items.

5. The tenderer's price shall include all government taxes including duties, VAT, etc which must be included in the rates. No claims whatsoever will be allowed in respect of duties, VAT etc if the tenderer does not price them as aforementioned.

6. In no case will expense incurred by the tenderer in preparation of this tenderer be reimbursed.

7. The copyright of this specification is vested in the Engineer and no part thereof may be reproduced without their express permission, given in writing.

8. The Sub-Conductor shall be solely responsible for the accurate ordering of materials in accordance with the drawings and these specifications.

9. The specifications must be priced in Kenya Shillings

10. This is a fixed price Contract and no claims shall be entertained on whatever ground. The sub-contractor is advised to include all such costs as he projects may arise in his unit rates. Any variations in the exchange rate will also be no excuse for any variations in the contract sum.

Signed (As in form of Tender) .....

Date/Stamp .....

FORM OF TENDER

To: The Chief Executive Officer,
Nyati Sacco,
P.O. Box 7601 – 00200
NAIROBI

Dear Sir,

SUPPLY, DELIVERY, INSTALLATION, TESTING AND COMMISSIONING OF SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF PLUMBING AND DRAINAGE INSTALLATION WORKS FOR THE PROPOSED CONSTRUCTION OF BUFFALO PLAZA ON LR 37/262/1

1. In accordance with the Instructions to Tenderers, Conditions of Contract, Specifications and Bills of Quantities for the execution of the above named Works, we, the undersigned offer to construct, install and complete such Works and remedy any defects therein for the sum of:

   Kshs……..*[Amount in figures]*

   Kenya Shillings……*[Amount in words]*

2. We undertake, if our tender is accepted, to commence the Works as soon as is reasonably possible after the receipt of the Employer's Representative's notice to commence, and to complete the whole of the Works comprised in the Contract within the time stated in the Appendix to Conditions of Contract.

3. We agree to abide by this tender for **a period of 120 days from the date of tender opening** and shall remain binding upon us and may be accepted at any time before that date.

4. Unless and until a formal Agreement is prepared and executed this tender together with your written acceptance thereof, shall constitute a binding Contract between us.

5. Understand that you are not bound to accept the lowest or any tender you may receive.

   Dated this …….. day of ……20…..

   Signature ……in the capacity of …….

   duly authorized to sign tenders for and on behalf of:

   ……..*[Name of Tenderer]*

   of……..*[Address of Tenderer]*

FORM OF TENDER SECURITY

WHEREAS

……(her einafter called "the Tenderer") has submitted his tender dated …… For the supply, delivery, installation, testing and commissioning of plumbing and drainage Installation for the Proposed Construction of Buffalo Plaza on 37/262/1

KNOW ALL PEOPLE by these presents that WE ……..
Having our registered office at …….
(hereinafter called "the Bank'), are bound unto ……
(hereinafter called "the Employer") in the sum of Kshs……
for which payment will and truly to be made to the said Employer, the Bank/Insurance binds itself, its successors and assigns by these presents sealed with the Common Seal of the said Bank this ……Day of ……..20 ……

THE CONDITIONS of this obligation are:

1. If after tender opening the Tenderer withdraws his tender during the period of tender validity specified in the instructions to Tenderers

   Or

2. If the Tenderer, having been notified of the acceptance of his tender by the Employer during the period of tender validity:

   (a) fails or refuses to execute the form of Agreement in accordance with the Instructions to Tenderers, if required; or

   (b) fails or refuses to furnish the Performance Security, in accordance with the Instructions to Tenderers;

We undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by his is due to him, owing to the occurrence of one or both of the two conditions, specifying the occurred condition or conditions.
This guarantee will remain in force for a period of 150 days from the date of tender opening, and any demand in respect thereof should reach the Bank not later than the said date.

…….. ……
(Date) *(Signature of the Bank)*

…… ……..
(Witness) *(Seal)*

PART A:

PRELIMINARIES AND GENERAL CONDITIONS

PART A - PRELIMINARIES AND GENERAL CONDITIONS

NAMES OF PARTIES
The following will be inserted in the Articles of Agreement:-

Architects:	**AS PER MAIN WORKS**
Engineer:	**AS PER MAIN WORKS**
Employer:	**AS PER MAIN WORKS**

2. DEFINITIONS OF TERMS

The terms, phrases and abbreviations shall be deemed to have the following meanings wherever used hereinafter and in all contract documents.

"Engineer" shall in the case of mechanical works mean **'project mechanical engineer"** and, or in the event of any of their deaths, or ceasing to be the Engineers for the purposes of this Sub-contract, such other person as the client shall nominate for that purpose. For the purpose of **Mechanical** engineering works the Engineer shall be deemed vested with the duties of, and be the representative of the Architect, except on respect of variations which involve the sub-contract sum.

"Main Contractor" shall mean the person or persons, partnership, firm or company, whose tender for the main contract has been accepted, and who has or have, signed the main contract and shall include his or their heirs, executors, administrators, assigned successors and duly appointed representatives. For the purposes of this work, the terms "Main Contractor" and "Contractor" shall have the same meaning.

"Sub-Contractor" shall mean the person or persons, partnership, firm or company, whose tender for the sub-contract for the electrical and mechanical works has been accepted, and who has or have, signed the sub-contract and shall include his or their heirs, executors, administrators, assigned successors and duly appointed representatives.

"Works" shall mean all or part of the works, material and articles, wherever the same are being manufactured or prepared, which are to be used in the execution of this sub-contract and whether the same may be on the site or not.

"Approved" shall mean approved by the Engineer/Architect at his absolute discretion.
"Directed" shall mean directed by the Engineer/Architect at; his absolute discretion.

"Selected" shall mean selected by the Engineer/Architect at his absolute discretion.

"M^3" shall mean cubic metre

"M^2" shall mean square metre

"M" shall mean linear millimetre

"Kg" shall mean Kilogram

"No." shall mean Number
"Prs" shall mean Pairs

"B.S." shall mean the current British Standard Specification published by the British Standards institution, 2 Park Street, London, W.I. England

"As before" shall mean in all respects as earlier described in the same or previous bill

"Ditto" shall mean the whole of the preceding description except as qualified in the description. Where it occurs in descriptions of succeeding terms it shall mean the whole of the preceding description which is contained within the appropriate brackets.

"Fix Only" shall mean take delivery on site (unless otherwise stated), unload where necessary, transport within site compound, store, unpack, check contents against orders and packing lists, assemble as necessary, distribute to position, hoist and fix only.

3. TENDER CONDITIONS

Any act of collusion that may distort normal competitive conditions may cause the rejection of the tenders concerned. By participating in the tendering, tenderers certify not to be involved in such acts of collusion.

Tenders containing abnormally high or low unit prices and /or lump sums may be rejected. Before such rejection, however the sub-contractor may be given the opportunity of giving a detailed explanation.

Tenders must be returned complete and tenderers, or their assigned representatives are at liberty to witness the tender opening at the time and venue stated in the letter of invitation to tender. Tenders received after the stated time will be returned unopened and incomplete tenders will be rejected.

Tenders are invited in strict accordance with the documents issued, counter offers submitted with tenders will not be considered, letters of qualifications with tenders may be ignored if they have the effect of modifying either the terms of a tender or the compatibility of a tender with the other tenders. However should a tenderer. In good faith wish to propose modifications to the tender terms, conditions and contents for the purposes of reducing the tender amount then he shall contact the Engineer in writing well before the date of tender opening. Should the Engineer approve the proposed modification, all tenderers will be advised in due time for the modification of their tenders. No proposed modification will be considered unless this procedure has been followed.

The client is not bound to accept the lowest or any tender, nor is the client bound to divulge reasons for the acceptance or non-acceptance of any tender. Any tender may be accepted by the client within the stated period unless previously withdrawn by the tenderer.

All deletions, additions and corrections to figures inserted in the tender document are to be counter signed by the tenderer.

In the event of two or more tenders being in the same sum, tenderers may be given 7 days within which to revise their tender prices. Should there again be two or more tenders in the same sum, and in the absence of any qualities to give one tenderer preference over the other(s), then the sub-contract may be awarded by drawing lots in the presence of the tenderers concerned.

4. DESCRIPTION OF SITE

The site of the works is within **Nairobi**. Due care will be required during construction so that the occupants and facilities in the adjacent premises and the premises themselves are not interfered with in any way.

The sub-contractor is recommended to visit the site and will be deemed to have satisfied himself with regard to the relevant details of preliminary. If the sub-contractor, for whatever reason, feels specialised attendance will be required, with significant financial implications or requires specialised mobilisation to start the works, he should spread the cost of such works in his unit rates.

No claims whatsoever by the sub-contractor for additional payment will be allowed on the grounds of any misunderstanding or misapprehension in respect of any such matters or otherwise, should the sub-contractor be required to offer specialised attendance prior to, or during, the performance of the contract.

5. TENDER EVALUATION PROCEDURES

Following the return of the tenders for the works measured in these bills of quantities, arithmetical and other analysis will be carried out in order to select the lowest acceptable tender in terms of responsive and realistic pricing, etc. This section will be at the sole discretion of the Employer.

The unit rates offered by the selected tenderer will then be applied to new quantities measured by the Engineer for the revised scope of works.

The resultant total, together with the priced preliminaries and any modified prime cost and provisional sums will be consolidated into a sum for which the sub-contract will be signed. This procedure will be applied only to the selected tender. Neither the Client nor the Consultants will enter into discussion or any correspondence with the other tenderers after the selection process has been carried out and no reasons will be given for selection or non-selection.

Any tenderer unable to comply with these procedures will be disqualified from the selection process

6. ACCESS TO SITE AND SECURITY

Means of access to the site will be as directed by the Architect; no other access will be permitted in any circumstances.

7. AREA TO BE OCCUPIED BY THE SUB-CONTRACTOR

Areas to be occupied by the sub-contractor for use as storage shall be as directed by the Project Architect.

8. DRAWINGS

8.1 The sub-contractor will be deemed to have examined the drawings before tendering and to have satisfied himself regarding their details and regarding the nature and extent of the works and the method of installation involved. No claims arising out of misapprehension in these respects will be allowed.

8.2 The sub-contractor shall at his own risk and costs execute and perform the works described in the conditions of contract and bills of quantities and detailed in the drawings provided and supplied to the sub-contractor for the purpose of works and completely finish the said works in a good workmanship and with the utmost expedition.

8.3 The sub-contractor shall satisfy himself as to the correctness of all drawings and measurements. If the sub-contractor finds any discrepancy in the drawing or between the drawing and the specifications he shall immediately refer the same to the Engineer who will decide which shall be followed.

Figured dimensions shall be taken in preference to the scale mentioned on or attached to any drawing. Details shown on drawings shall be taken in preference to items and quantities in the specification.

8.4 Two copies of all drawings and of the specifications will be furnished free of cost to the sub-contractor (whose tender has been accepted) for his own use. Any extra copies will be paid for.

9. VALUATIONS OF LUMP SUMS AND PRELIMINARY COSTS

Lump sums entered in these bills of quantities against any item of general condition or preliminaries will be included in appropriate valuations according to reasonable assessment of actual costs involved in the item.

10. PAYMENT FOR MATERIALS ON SITE

All materials for incorporation in the works must be properly installed before payment is effected unless specifically exempted by the Engineer/Architect. This is to include the materials of the sub-contractor, and his nominated suppliers.

11. CONTRACT AGREEMENT AND CONDITIONS

11.1 General

The articles of Agreement and conditions shall be the agreement and schedule of conditions of building contract forms published by the Kenya Association of Building and Civil Engineering Contractors' (KABCEC).

11.2 Water and Electricity Supply

The main contractor will make water and electrical power available to the **mechanical** sub-contractor. The main contractor and the sub-contractor will mutually agree whether or not the latter should pay for the water /electricity used for the works. That notwithstanding, no excuse will be entertained for power failure or lack of water as the sub-contractor is required to make his own arrangements in such circumstances.

11.3 Sub-contractor's Materials

Purchase of materials by the sub-contractor and their storage on site for inclusion in payment certificates far in advance of reasonable requirements may be allowed at the sole discretion of the Engineer. This however is also subject to availability of such storage space. Storage space may be provided on site.

12. WARRANTY AND PERFORMANCE STANDARDS

The sub-contractor must furnish the client through the Engineer with a general written warranty covering quality of workmanship, material and equipment and be compelled thereby for a one year period after practical completion of the sub-contract.

The sub-contractor must make good, at his own expense, such repairs and replacements as may be required as a consequence of negligent workmanship or defective materials. The sub-contractor must also procure such warranties and guarantees as aforesaid from all manufacturers and/or suppliers of materials or equipment incorporated in the project under this contract.

The sub-contractor must comply in all respects with given standards of workmanship as defined and described in the specifications and Bills of Quantities and relevant codes of Practice. The sub-contractor must also comply with all tests of materials as required and/or directed by the Engineer.

13. TOOLS, PLANTS, ETC

The sub-contractor shall allow for providing of all ladders, tools, plant and transport required for the works, except in so far as may be specifically stated otherwise.

14. SAFETY, HEALTH AND WELFARE OF WORKPEOPLE

The sub-contractor shall allow for providing for the safety, health and welfare of workpeople and for complying with any relevant ordinances, Regulations or Union agreement.

15. NATIONAL INSURANCE AND PENSIONS

The Sub-contractor shall allow for making any National Social Security Fund payments due in respect of workpeople.

16. HOLIDAY AND TRANSPORT OF WORKPEOPLE

The sub-contractor shall allow for providing holidays and transport for workpeople and for complying with any relevant ordinances or union agreement.

17. TRAINING LEVY

The sub-contractor's attention is drawn to legal notice no. 237 of October, 1971,which requires payments by the sub-contractor of a training levy on all contracts of more than Shs. 50,000/= in value and his tender must include for all costs arising or resulting there from. Proof of payment of those training levies will be required.

18. EXISTING PROPERTY

The sub-contractor shall take every precaution to avoid damage to all existing property including flower beds, fences, roads, cables, office equipment, drains, adjacent buildings and other services and he will be held responsible for all damages arising from the execution of this sub-contract to the afore-mentioned property and he shall make good all such damage where directed at his own expenses to the satisfaction of the Engineer.

19. TESTING

The sub-contractor shall allow for all testing of material and installations required by these specifications and he shall be responsible for all expenses incurred in completing such tests, including costs of materials and labour, equipment, transport and all other costs.

20. SUPERVISION AND WORKING HOURS

The works shall be executed under the direction, and to the entire satisfaction in all respects, of the Engineer who shall at all times during normal working hours have access to the works and to the yards and workshops of the sub-contractor or other places where work is being prepared for the sub-contractor.

The working hours shall be those generally worked by good employers in the building and civil engineering trades taking note of gazetted holidays unless the Engineer shall so direct.

No work shall be covered up in the absence of the clerk of works without the prior approval of the Engineer in writing.

21. SAMPLES

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

The Engineer shall instruct for the testing of such materials as he may at his discretion deem desirable and the testing shall be made at the sub-contractor's cost. The sub-contractor shall allow in his tender for such samples and tests.

22. MATERIALS, TOOLS, PLANT ETC.

All materials and workmanship used in the execution of works shall be of the best quality and description unless otherwise described. Any materials for the works condemned by the Engineer shall immediately be removed from the site at the sub-contractor's expense.

The sub-contractor shall provide at his own risk and cost all materials, scaffolding, tools, plant, transport and workmen required for the works except, insofar as may be stated otherwise herein.

The sub-contractor shall order all materials to be obtained from overseas immediately after the sub-contract is signed and shall also order materials to be obtained from local sources as early as necessary to ensure that such materials are on site when required for use in the works.

Any defects which may appear, either of materials or of workmanship, during the defects liability period provided by the sub-contract, shall be made good by the sub-contractor at his own expense, as and when directed.

If the sub-contractor shall fail to carry out such orders, as by the preceding paragraph provided within such reasonable time as may be specified in the order, the materials or works affected may be made good by others in such manner as the Engineer may direct, in which case the cost thereby incurred shall, upon the written certificate of the Engineer, be recovered from the sub-contractor as liquidated damages.

23. FOREMAN

The sub-contractor shall keep constantly on works a competent English-speaking foreman and any directions or explanations given by the Engineer to such a foreman shall be deemed to have been given to the sub-contractor.

24. INSURANCE

The sub-contractor shall during the execution of the works, insure himself and keep himself insured against all liability under the workmen's compensation act or any amendment thereto for accidents to workmen employed by him on the said works and shall hold the employer and all parties to the contract harmless in respect of any such liability.

The sub-contractor shall further insure himself and keep himself insured against all liabilities arising from all Third party claims arising from accidents and he shall hold the Employer, the Consultants and all parties to the contract harmless in respect of any such liabilities.

No payments on account of the work executed will be made to the sub-contractor until he has satisfied the Engineer either by the production of an Insurance Certificate that the foregoing provisions have been complied with in all respects. Thereafter the Engineer may from time to time check that premiums are duly paid up by the sub-contractor who shall, if called upon to do so, produce receipts of premium renewals for the Engineer's inspection.

25. BOND

The sub-contractor shall find and submit for the approval by the Engineer one surety who shall be an established bank, Insurance company or fidelity guarantee corporation and who will be willing to be bound to the Employer in an amount equal to ten percent (10%) of the sub-contract amount for the due performance of the sub-contractor up to the date of completion as certified by the architect and who will then and if called upon, sign a bond to that effect, on the same day as the sub-contract agreement is signed. In the event of the surety named not being approved by the Engineer, the sub-contractor shall furnish within seven days another surety to the approval of the Engineer. This shall be complied with unless the **MAIN WORKS** deems the subcontract as **DOMESTIC** contract.

26. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

The sub-contractor shall proceed with the works in such manner and in such order, as the Engineer shall direct so as to complete the works on the shortest possible time.

It is the responsibility of the sub-contractor to ensure that all material, fittings, equipment and items to be supplied are ordered and delivered to the site ready for installation at such times as to cause no hold up to the programme of work.

NOTE: 1.The sub-contract completion period is the same as that of main contract.

2. Liquidated damages and Ascertained damages will be calculated pro-rata on the rate provided in the main contract.

27. PAYMENT AND CERTIFICATES

Payments shall be made through certificates to the sub-contractor through the main contractor. All payments shall be less retention as specified in the sub-contract agreement. The sub-contractor shall be paid only for work done and /or materials on site.

The percentage of certified value retained should be 10%. Limit of Retention shall be a sum equivalent to 5% of the sub-contract sum.

Prices quoted shall include 16% VAT and 3% withholding tax and all taxes applicable at the time of tender.

No certificate so issued by the Engineer/Architect shall in itself be considered conclusive evidence as to the sufficiency of any work or materials to which the terms and conditions of this agreement or from his liability to make good all defects as provided thereby.

28. CONDITIONS OF SUB-CONTRACT, ETC

The sub-contract agreement shall be based on KABCEC conditions. FIDIC conditions for electrical and mechanical works shall form complementary reference where clear interpretation cannot be made.

29. BLASTING

Blasting will not be allowed unless with express authority of the Engineer.

30. HOISTING

The sub-contractor is referred to the Drawings and to the general description of the building. Throughout these specifications generally no mention is made of heights for hoisting.

All prices must include for hoisting and fixing at any level within the limits shown on the drawings or included in the general description of works. Where a particular level is specified the sub-contractor shall price accordingly.

31. CASING UP AND PROTECTING

The sub-contractor shall be responsible for casing up or otherwise protecting to the satisfaction of the Engineer all parts of the sub-contract works liable to cause injury and for removing such protection and making good on completion.

32. WORKS TO BE DELIVERED UP CLEAN

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

33. DEFECTS LIABILITY PERIOD

The defects liability period shall be as provided in the main contract.

34. CLAIMS FOR EXTRAS

This is a fixed price contract and no claims whatsoever on extras will be entertained.

35. TRADE NAMES

Where trade names of manufacturer's catalogue numbers are mentioned in these specifications the reference is intended, as a guide to the type of the article or material required. The sub-contractor may use any article or material equal in type or quality to those therein described subject to the prior approval of the Engineer, and at his (Engineer's) absolute discretion. The onus of proof as to equivalent quality will rest with the sub-contractor, whose tender will be deemed to include for the makes described hereafter.

36. FLUCTUATIONS

This is a fixed price sub-contract and claims shall not be allowed on fluctuations.

TENDER EVALUATION CRITERIA

After tender opening, the tenders will be evaluated in 3 stages, namely:

1. Preliminary evaluation
2. Technical Evaluation; and
3. Financial Evaluation.

STAGE 1: PRELIMINARY EXAMINATION

This stage of evaluation shall involve examination of the mandatory requirements as set out in the Tender Advertisement Notice or Letter of Invitation to tender and any other conditions as stated in the bid document.

These conditions include the following:

i. Current **Category of Registration** and **Valid Practising Licenses** with National Construction Authority (NCA) for the category as listed below.
   - **"NCA 4"** and above in the **Plumbing and Drainage Category**

ii. Fully filled technical schedule for Compliance with Technical Specifications
iii. Proof of payment for tender document if required;
iv. The Bid has been submitted in the format required by the procuring entity for the bidder (and all joint venture bids);
v. Provision of a tender Security that is in the required form, amount and that the tender security is valid for the period required;(1% of the quoted sum)
vi. Fully filled Form of Tender for the bidder (and all joint venture bids contractors);
vii. Valid Tax Compliance Certificate for the bidder (and all joint venture bids contractors);
viii. Fully filled Confidential Business Questionnaire (and all joint venture bids contractors);
ix. Fully signed Statement of Compliance (and all joint venture bids contractors);
x. One Number Bid Document for the bidder (and for joint venture one number bid having all the sub bids);
xi. Signed Pre-tender site visit form if pre-tender site visit is required;
xii. Proof of authorization shall be furnished in form of a written power of attorney which shall accompany the tender if the signatory to the tender is not a director of the company (provide name and attach proof of citizenship of the signatory to the tender). Provide also Form CR12 from the Registrar of Companies.
xiii. A copy of valid business permit for the bidder (and all joint venture bids);

xiv. A copy certificate of registration/Incorporation for the bidder (and all joint venture bids);

xv. A copy pin certificate for the bidder (and all joint venture bids);

xvi. A copy of company's list of directors, beneficial owners, name if proprietor or names of partners (copy of CR 12) for the bidder (and all joint venture bids);

xvii. Signed and signed statement of verification that no debarment in matters of public procurement proceedings for the bidder (and all joint venture bids);

xviii. Declaration that the firm has not been convicted of corrupt or fraudulent practices and will not engage in any corrupt or fraudulent practices for the bidder (and all joint venture bids);

STAGE 2: TECHNICAL EVALUATION

The tender document shall be examined based on clause 2.2 of the Instruction to Tenderers which states as follows:

'The tenderers will be required to provide evidence for eligibility of the award of the tender by satisfying the employer of their eligibility under Instruction to Tenderers and their capability and adequacy of resources to effectively carry out the subject contract. In order to comply with provisions of Instruction to Tenderers, the tenderers shall be required;

a) To fill the Standard Forms provided in the bid document for the purposes of providing the required information. The tenderers may also attach the required information if they so desire;

PARAMETER	MAXIMUM POINTS
(i) Compliance with Technical Specifications	40
(ii) Key personnel	20
(iii) Contract Completed in the last Four (4) years	18
(iv) Audited Financial Report for the last 3 years	10
(v) Evidence of Financial Resources	12
TOTAL	**100**

The pass-mark under the Technical Evaluation is 70 percent. Any bidder who scores below the pass mark will be considered non responsive

STAGE 2 - TECHNICAL EVALUATION

Item	Description	Point Scored	Max. Point
	Director of the firm Holder of degree in Architectural, Quantity surveying or Engineering field (attach degree certificate)---------- 5 Holder of diploma in any of the above fields (attach diploma certificate) ---------- 4 Holder of certificate in in any of the above fields (attach craft certificate) ----------3 No relevant certificate ----------0		**5**
	Project supervisor Holder of degree in mechanical Engineering field (attach degree certificate)---------- 5 Holder of diploma in mechanical engineering field (attach diploma certificate) ---------- 4 Holder of certificate in mechanical engineering field (attach craft certificate) ----------3 No relevant certificate ----------0		**5**

	Project skilled staff(2no.officers) Holder of degree in mechanical Engineering field (attach degree certificate)---------- 2 each Holder of diploma in mechanical engineering field (attach diploma certificate) ---------- 3 each Holder of certificate in mechanical engineering field (attach craft certificate) ----------5 each No relevant certificate ----------0		**10**
	Contracts completed in three (3) projects with similar nature, complexity and magnitude in the last five (5) years from the date of tender opening (Attach signed project completion certificates) projects of a value more than 70% and above of contract price quoted for this project @ 6 marks each projects of a value of a value between 50% - 69% of contract price quoted for this project @ 5 marks each projects of a value of a value between 20% - 49% of contract price quoted for this project @ 2 marks each projects of a value of a value between 1% - 19% of contract price quoted for this project @ 1 marks each no projects @ 0 marks		**18**

	Audited financial report **Attach Audited financial report for the last two (2) years (2019 and 2020) or (2020 and 2021) whichever is the latest. The Audited Financial Reports are valid only when be signed and stamped by a registered Accountant or Audit Firm registered and recognized in Kenya. indicate the current ratio for each year** Has current ratio over 2 @ 5 marks for each year Has current ratio of between 2 and 1.5 @ 4 marks for each year Has current ratio of between 1.5 and 1 @ 3 marks for each year Has current ratio of between 1 and 0.7 @ 2 marks for each year Has current ratio of less than 0.7 @ 1 marks Has not indicated current ratio @ 0 marks		**10**
	Financial Resources Attach record of cash in hand in form of certified bank statement or Current letter (dated 2021 or 2022) from the bidders' bankers and level of overdraft or credit limits allowed. Has financial resources of a value of 100% and above of contract price quoted for this project @ 12 marks Has financial resources of a value of a value between 99% - 90% of contract price quoted for this project @ 5 marks each		**12**

	Has financial resources of a value less than 90% of contract price quoted for this project @ 2 marks Has no financial resources @ 0 marks		
	Compliance with technical specifications • Has submitted relevant technical brochure/catalogues • Has highlighted the Catalogue Number if many options for the same item are on the attached catalogue • Fulfill the tender specifications in terms of Standards of manufacture; Performance ratings/characteristics; a) Has fully complied with the technical specifications @ 40 marks b) Has not fully complied with the technical specifications @ 0 marks		**40**

Current ratio = current assets/current liabilities

Any bidder who scores 70 points and above in this Technical Evaluation shall be considered for further evaluation

STAGE 3 - FINANCIAL EVALUATION

Upon completion of the technical evaluation a detailed financial evaluation for the bidder (and all their joint venture partners) shall follow.

The evaluation shall be in three stages

a) Determination of Arithmetic Errors for the bidder (and all their joint venture partners);
b) Comparison of Rates for the bidder (and all their joint venture partners); ; and
c) Consistency of the Rates for the bidder (and all their joint venture partners);

A) Determination of the Arithmetic Errors

Arithmetic Errors will be corrected by the Procuring Entity as follows:

i) In the event of a discrepancy between the amount as stated in the form of Tender and the corrected tender figure in the Main summary of the Bills of Quantities, the amount as stated in the Form of tender shall prevail. Pursuant to Section 82 of the Public Procurement and Asset Disposal Act 2015, the tender sum as submitted and read out during the tender opening shall be absolute and final and shall not be the subject of correction, adjustment or amendment in any way by any person or entity;

ii) Error correction factor shall be computed by expressing the difference between the amount and the corrected tender sum as a percentage of the corrected contract works

iii) The Error correction factor shall be applied to all contract works (as a rebate or addition as the case may be) for the purposes of valuations for Interim Certificates and valuations of variations.

B) Comparison of rates for the bidder (and all their joint venture partners)-

Items that are underpriced or overpriced may indicate potential for non-delivery and front loading respectively. The committee shall promptly write to the tenderer asking for detailed breakdown of costs for any of the quoted items, relationship between those prices, proposed construction/installation methods and schedules.

The evaluation committee shall evaluate the responses and make an appropriate recommendation to the procuring entity's tender committee giving necessary evidence. Such recommendations may include but not limited to:

a) Recommend no adverse action to the tenderer after a convincing response;
b) Employer requiring that the amount of the performance bond be raised at the expense of the successful tenderer to a level sufficient to protect the employer against potential financial losses;
c) Recommend non-award based on the response provided and the available demonstrable evidence that the scope, quality, completion timing, administration of works to be undertaken by the tenderer, would adversely be affected or the rights of the employer or the tenderers obligations would be limited in a substantial way.

C) Consistency of the Rates

The evaluation committee will compare the consistency of rates for similar items and note all inconsistencies of the rates for similar items.

STAGE 4 - RECOMMENDATION FOR AWARD

BILL NO 1					
SUBCONTRACT PRELIMINARIES					
Item	**Description**	**Qty**	**Unit**	**Rate (Kshs)**	**Amount (Kshs)**
	PRELIMINARIES				
	Scope of Contract Works				
A	The contractor shall supply, deliver, unload, hoist, fix, test, commission and hand-over in satisfactory working order the complete installations specified hereinafter and/or as shown on the Contract Drawings attached hereto, including the provision of labour, transport and plant for unloading material and storage, and handling into position and fixing, also the supply of ladders, scaffolding the other mechanical devices to plant, installation, painting, testing, setting to work, the removal from site from time to time of all superfluous material and rubbish caused by the works.	1	Item		
	Firm price contract				
B	This is a firm-price Contract and the contractor must allow in his tender for the increase in the cost of labour and/or materials during the duration of the contract. No claims will be allowed for increased costs arising from the fluctuations in duties and/or day to day currency fluctuations. The Sub-contractor will be deemed to have allowed in his tender for any increase in the cost of materials, which may arise as a result of currency fluctuation during the contract period.	1	Item		
	Bond				
C	The tenderer must submit with his tender the name of one Surety who must be an established Bank only who will be willing to be bound to the Government for an amount equal to 5 % of the Contract amount	1	Item		
	Government Legislation and Regulations				
D	The Contractor's attention is called to the provision of the Factory Act 1972 and subsequent amendments and revisions, and allowance must be made in his tender for compliance therewith, in so far as they are applicable. The Contractor must also make himself acquainted with current legislation and any Government regulations regarding the movement, housing, security and control of labour, labour camps, passes for transport, etc.	1	Item		
	Total carried forward				

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Import Duty and Value Added Tax				
A	The contractor will be required to pay full Import Duty and Value Added Tax on all items of equipment, fittings and plant, whether imported or locally manufactured. The tenderer shall make full allowance in his tender for all such taxes.	1	Item		
	Insurance Company Fees				
B	Attention is drawn to the tenderers to allow for all necessary fees, where known, that may be payable in respect of any fees imposed by Insurance Companies or statutory authorities for testing or inspection.	1	Item		
	Samples and Materials Generally				
C	The Contractor shall, when required, provide for approval at no extra cost, samples of all materials to be incorporated in the works. Such samples, when approved, shall be retained by the Engineer and shall form the standard for all such materials incorporated.	1	Item		
	Builder's Work				
	All chasing, cutting away and making good will be done by the Contractor. The Contractor shall mark out in advance and shall be responsible for accuracy of the size and position of all holes and chases required.				
D	The Contractor shall drill and plug holes in floors, walls, ceiling and roof for securing services and equipment requiring screw or bolt fixings.	1	Item		
	Any purpose made fixing brackets shall be provided and installed by the Contractor				
	Total carried forward				

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
A	**Position of Services, Plant, Equipment, Fittings and Apparatus** The Contract Drawings give a general indication of the intended layout. The position of the equipment and apparatus, and also the exact routes of the ducts, main and distribution pipework shall be confirmed before installation is commenced. The exact sitting of appliances, pipework, etc., may vary from that indicated. The contractor shall be deemed to have allowed in his Contract Sum for locating terminal points of services (e.g. lighting, switches, socket outlets, lighting points, control switches, thermostats and other initiating devices, taps, stop cocks) in positions plus or minus 1.2m horizontally and vertically from the locations shown on Contract Drawings.	1	Item		
B	**Setting to Work and Regulating System** The Contractor shall carry out such tests of the Contract Works as required by British Standard Specifications, or equal and approved codes as specified hereinafter and as customary. No testing or commissioning shall be undertaken except in the presence of and to the satisfaction of the Engineer unless otherwise stated by him (Contractor's own preliminary and proving tests excepted). It will be deemed that the Contractor has included in the Contract Sum for the costs of all fuel, power, water and the like, for testing and commissioning as required as part of the Contract Works. He shall submit for approval to the Engineer a suitable programme for testing and commissioning. The Engineer and Employer shall be given ample warning in writing, as to the date on which testing and commissioning will take place.	1	Item		
	Total carried forward				**0.00**

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
A	**Working Drawings** The Contractor shall allow for Working Drawings as may be necessary. The Working Drawings shall be complete in such detail not only that the Contract Works can be executed on site but also that the Engineer can approve the Contractor's proposals, detailed designs and intentions in the execution of the Contract Works. Two copies of all Working Drawings shall be submitted to the Engineer for approval. One copy of the Working Drawings submitted to the Engineer for approval shall be returned to the Contractor indicating approval or amendment therein.	1	Item		
B	**Record Drawings (As Installed) and Instructions** The Contractor shall allow for Record Drawings of the installed Contract Works. Three copies of all Record Drawing shall be submitted to the Engineer for approval.	1	Item		
C	**Maintenance Manual** The Contractor shall allow for furnishing the Engineer four copies of a Maintenance Manual relating to the installation forming part of all of the Contract Works. The manual shall be loose-leaf type, International A4 size with stiff covers and cloth bound. It may be in several volumes and shall be sub-divided into sections, each section covering one Engineering service system. It shall have a ready means of reference and a detailed index.	1	Item		
	Total carried forward				

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
A	**Mobilization and Demobilization** The Contractor shall allow for mobilization of labour plant and equipment to site according to his programme and schedule of work. He shall ensure optimum presence and utilization of labour, plant and equipment. He should not pay and maintain unnecessary labour force or maintain and service idle plant and equipment. Where necessary he shall demobilize and mobilize the labour, plant and equipment, as he deems fit to ensure optimum progress of the works and this shall be considered to be a continuous process as works progress. He shall make provision for this item in his tender. No claim will be entertained where the contractor has not made any provision for mobilization and demobilization of labour, plant and equipment in the preliminary bills of quantities or elsewhere in this tender.	1	Item		
B	**Contractor Obligation** The contractor will finance all activities as part of his obligation to this contract. The employer shall pay interim payment for materials and work completed on site as his obligation in this contract, as the works progresses. No claims will be entertained for pre-financing of the project by the sub-contractor, or for loss of profit (expectation loss) in case of premature termination, reduction or increase of works as the sub-contractor shall be deemed to have taken adequate measures in programming his works and expenditure and taken necessary financial precaution while executing the works.	1	Item		
C	**Validation** Allow foe engineers cost in approval of sample sanitary fittings and pumps and casings which cannot be vailed on site office	1	Item		
C	**Any other Preliminaries** The contractor to allow for any other preliminaries neccesary for hime to complte all the works	1	Item		
	Total				

COLLECTION PAGE

Item	Description	Amount (Kshs)
1	Total cost carried forward	
2	Total cost carried forward	
3	Total cost carried forward	
4	Total cost carried forward	
5	Total cost carried forward	
Total Cost Carried to Summary Page		

BILL NO.2 SANITARY FITTINGS

SANITARY FITTINGS,PLUMBING AND DRAINAGE WORKS

(i) ALL ITEMS SHALL BE SUPPLY,DELIVER,INSTALL,TEST AND COMMISSION

(ii) ALL ITEMS SHALL BE COMPLETE WITH ALL ACCESSORIES INCLUDING CONNECTIONS TO THE SERVICES,JOINTING TO WATER SUPPLY OVERFLOWS AND SUPPORTS

(iii) ALL ITEMS SHALL BE COMPLETE WITH ALLPLUGGING AND SCREWING TO WALLS AND FLOORS

(iv) ALL ITEMS SHALL BE AS PER PARTICULAR SPECIFICATIONS

GROUND AND FIRST

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Water Closet				
A	Water Closet pan with toilet seat cover	5	No		
B	Water Closet Flush Valve with actuator plates	5	No		
C	Health Faucet Kit (Shattaff)	5	No		
D	Robe Hook	5	No		
E	Toilet Roll	5	No		
F	Toilet Brush Set	5	No		
G	Angle Valve with Triangular Handle & Wall Flange	5	No		
	Wash hand basin				
H	Tabletop Wash Hand Basin	5	No		
I	Mirror	5	No		
	Wash hand basin tap				
J	Self closing pillar Tap	5	No		
K	Angle Valve with Triangular Handle & Wall Flange	5	No		
Total carried to collection page					

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Physically Challenged sanitary				
A	Physically Challenged Water Closet	1	No		
B	Angle Valve with Triangular Handle & Wall Flange	2	No		
	Urinal				
C	Urinal Bowl with Fixing Accessories Set	3	No		
D	Mains operated urinal flush valve	3	No		
E	Ceramic urinal partition/Division	3	No		
	Hand Dryer				
F	Hand Dryer	3	No		
	Soap dispenser				
G	Automatic Soap dispenser	3	No		
	Dispensers				
H	Paper Towel Dispenser	3	No.		
I	Toilet Paper Roll dispenser	5	No		
J	Recessed combined unit removable waste bin	0	No.		
	Cleaners sink				
K	Cleaners sink	1	No.		
	Bathroom signs				
L	Womens Washroom Sign	1	No		
M	Men Washroom Sign	1	No		
N	Adapted Washroom Sign	1	No		
Total carried to collection page					

COLLECTION PAGE FOR SANITARY FITTINGS

Item	Description	Amount (Kshs)
1	Total carried	
2	Total carried	
Total Cost for Sanitary Fittings		
x2		**X2**
Total Cost for Sanitary Fittings for 2 floors		

TYPICAL FLOORS(2ND TO 9TH)

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Water Closet				
A	Water Closet pan with toilet seat cover	4	No		
B	Water Closet Flush Valve with actuator plates	4	No		
C	Health Faucet Kit (Shattaff)	4	No		
D	Robe Hook	4	No		
E	Toilet Roll	4	No		
F	Toilet Brush Set	4	No		
G	Angle Valve with Triangular Handle & Wall Flange	4	No		
	Wash hand basin				
H	Tabletop Wash Hand Basin	4	No		
I	Mirror	4	No		
	Wash hand basin tap				
J	Self closing pillar Tap	4	No		
K	Angle Valve with Triangular Handle & Wall Flange	4	No		
	Physically Challenged sanitary				
L	Physically Challenged Water Closet	1	No		
M	Angle Valve with Triangular Handle & Wall Flange	2	No		
Total carried to collection page					

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Urinal				
A	Urinal Bowl with Fixing Accessories Set	3	No		
B	Mains operated urinal flush valve	3	No		
C	Ceramic urinal partition/Division	3	No		
	Hand Dryer				
D	Dual Flow Hand Dryer	2	No		
E	Speed Flow Hand Dryer	1	No		
	Soap dispenser				
F	Automatic Soap dispenser	3	No		
	Dispensers				
G	Paper Towel Dispenser	3	No.		
H	Toilet Paper Roll dispenser	3	No		
I	Recessed combined unit with removable waste bin	0	No.		
	Cleaners sink				
J	Cleaners sink	1	No.		
	Kitchen Sink				
K	One and half bowl kitchen sink	1	No.		
L	Kitchen sink Mixer tap	1	No.		
	Bathroom signs				
M	Womens Washroom Sign	1	No		
N	Men Washroom Sign	1	No		
O	Adapted Washroom Sign	1	No		
Total carried to collection page					

COLLECTION PAGE FOR SANITARY FITTINGS

Item	Description	Amount (Kshs)
1	Total carried	
2	Total carried	
Total Cost for Sanitary Fittings		
x8		**X8**
Total Cost for Sanitary Fittings for 8 floors		

COLLECTION PAGE FOR SANITARY FITTINGS

Item	Description	Amount (Kshs)
1	Total carried	
2	Total carried	
Total Cost for Sanitary Fittings		

BILL NO.3 PLUMBING

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	CPVC Pipework				
A	25mm diameter pipework	25	Lm		
B	50mm diameter pipework	40	Lm		
	Bends				
C	25mm diameter bend	12	No.		
D	50mm diameter bend	12	No.		
	Tees				
E	25mm equal tee	12	No.		
F	50mm equal tee	12	No.		
	Reducers				
G	50 x 25mm diameter reducer	12	No.		
H	50 x 40mm diameter reducer	12	No.		
	Male/Female Adapters (Brass threaded)				
I	25mm brass threaded adapter	12	No.		
J	50mm brass threaded adapter	12	No.		
	Male/Female Bend (Brass threaded)				
K	25mm brass threaded bend	12	No.		
L	50mm brass threaded bend	6	No.		
	Threaded Brass Coupling				
M	25mm threaded brass coupling	6	No.		
N	50mm threaded brass coupling	6	No.		
	Valves				
O	25mm dia gate valve	5	No.		
P	ditto 50mm gate valve	3	No.		
	Unions				
Q	25mm diameter pipe union	5	No.		
R	50mm diameter pipe union	3	No.		
	Pipe Sleeves				
S	100mm diameter heavy duty PVC pipe sleeves for crossing over columns and beams.	10	Lm		
	Pressure Testing				
T	Allow for all costs for pressure testing for plumbing piping and issuance of pressure testing certicates	1	No.		
Total Carried Forward					
					X10
Total Carried Forward for 10 floors					

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	CPVC Pipework supply lines				
A	63mm diameter drop pipework	400	Lm		
B	75mm diameter drop pipework	300	Lm		
	Bends				
C	63mm diameter bend	200	No.		
D	75mm diameter bend	120	No.		
	Tees				
E	63mm equal tee	100	No.		
F	75mm equal tee	60	No.		
	Reducers				
G	63 x 25mm diameter reducer	100	No.		
H	75 x 50mm diameter reducer	60	No.		
	Valves				
I	63mm dia gate valve	5	No.		
J	75mm gate valve	3	No.		
	Unions				
K	63mm diameter pipe union	5	No.		
L	75mm diameter pipe union	3	No.		
	Pipe Sleeves				
M	100mm diameter heavy duty PVC pipe sleeves for crossing over columns and beams.	20	Lm		
	Pressure Testing				
N	Allow for all costs for pressure testing for plumbing piping and issuance of pressure testing certicates	1	No.		
Total Carried Forward					

COLLECTION PAGE FOR PLUMBING WORKS		
Item	**Description**	**Amount (Kshs)**
1	Total carried forward	
2	Total carried forward	
Total cost for Internal Plumbing Piping		

BILL NO 4:INTERNAL DRAINAGE PIPEWORK					
Item	**Description**	**Qty**	**Unit**	**Rate (Kshs)**	**Amount (Kshs)**
	FOUL WATER INTERNAL DRAINAGE				
	MuPVC and uPVC Waste and Soil pipework				
A	100mm diameter heavy gauge golden brown UPVC pipe	20	Lm		
B	100mm diameter heavy gauge grey mUPVC pipe	15	Lm		
C	50mm diameter waste pipe	20	Lm		
D	40mm diameter waste pipe	20	Lm		
E	32mm diameter waste pipe	20	Lm		
	Bends				
F	100mm diameter long radius bend	6	No.		
G	100mm diameter short radius bend	6	No.		
H	100mm diameter bend with access	6	No.		
I	100mm diameter sweep bend	4	No.		
J	50mm diameter sweep bend	12	No.		
K	40mm diameter sweep bend	6	No.		
L	32mm diameter sweep bend	12	No.		
	Tees				
M	100mm diameter sweep tee	6	No.		
N	50mm diameter sweep tee	6	No.		
O	40mm diameter sweep tee	6	No.		
P	32mm diameter sweep tee	6	No.		
	Access Caps				
Q	100mm diameter access cap	60	No.		
R	50mm diameter access cap	120	No.		
S	40mm diameter access cap	80	No.		
T	32mm diameter access cap	60	No.		
	Boss Connectors				
U	100 x 50mm diameter boss connector	25	No.		
V	100 x 40mm diameter boss connector	15	No.		
	Total Carried to Collection Page				

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Single Branches				
A	100mm diameter single branch	2	No.		
	WC Connectors				
B	100mm diameter WC connector	6	No.		
	Traps				
C	100 x 50mm diameter floor trap and grating	6	No.		
D	600 x 450mm manhole with heavy duty cover.Manual depth to be determined on site but to a minimum of 600mm	0	No.		
E	Allow for all costs for level testing for drainage piping and issuance of level testing certicates	1	No.		
	Total Carried to Collection Page				

COLLECTION PAGE FOR FOUL DRAINAGE		
Item	**Description**	**Amount (Kshs)**
1	Total carried forward	
2	Total carried forward	
Total cost for Drainage Pipework		
		X10
Total Carried Forward for 10 floors		

RAIN WATER AND BASEMENT AND GENERAL FLOOR DRAINAGE					
BASEMENT AND GENERAL FLOOR DRAINAGE					
Item	**Description**	**Qty**	**Unit**	**Rate (Kshs)**	**Amount (Kshs)**
	BASEMENT DRAINAGE				
A	150mm diameter heavy gauge golden brown UPVC pipe	250	Lm		
B	150mm diameter long radius bend	12	No.		
C	150mm diameter bend with access	12	No.		
D	150mm diameter sweep bend	12	No.		
E	150mm diameter access cap	12	No.		
F	300 x 300mm and between 300mm to 600mm deep floor trap with heavy duty steel grating capable of supporting heavy traffic of vehicles	8	No.		
G	Allow for a standard 600 x 450mm manhole and between 300mm to 600mm deep complete heavy duty steel grating capable of supporting heavy traffic of vehicles	25	No.		
H	2000mm x 300mm wide Stainless steel kitchen floor drains	1	Item		
	Weathering Slates and Vent Cowls				
I	150mm diameter weathering slate and apron.	8	No.		
J	150mm diameter vent cowl	8	No.		
K	100mm diameter weathering slate and apron.	1	No.		
L	100mm diameter vent cowl	1	No.		
M	150mm diameter heavy gauge grey mUPVC pipe Drop	450	Lm		
N	Stainless steel pipe clipping capable of strongly supporting 20mm to 150mm pipes with all asociated screwa and bolting to the finished walls	200	No		
	Total carried to collection page				

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Submersible Pump				
A	A submersible pump capable of delivering 5.5m^3/hr against 10M head, power rating 0.55KW, single phase, 50HZ as Pedrollo model Top 2 or equal and approved complete with control panel, associated electrical works, protection against dry run, on/off neon lights, control/pump status display panel, audio alarm with manual silencer to indicate when the pump is faulty, float switch and all necessary controls.	1	No.		
	Electrical Works				
B	Allow for electrical works wiring and fitting to all pumps, control panel and float switches, from isolator provided by others with 3 metres distance.	1	Item		
	Petrol Interceptor				
C	2700 x 900 x 600mm deep concrete three chamber petrol interceptor trap complete with all the fitings including the 50mm diameter vent pipe, interconnecting pipes, gulley traps and 3No. heavy duty manhole covers. It shall be constructed with 125mm thick reinforced concrete and water proofed.	1	No		
	Sump				
D	Allow for construction of waste water sump size: 3600mmx1200x1200mm deep.	1	No		
E	Allow for water proofing of the sump hole as shall be done by others	1	Sum		
	Gratings				
F	Allow for open channel grating 350x450 deep fabricated from 12"x 10mm thick flat bar MS laid to 1;100 gradient to the satisfaction of the Engineer	15	LM		
	Total carried to collection page				

Item	Description	Qty	Unit	Rate (Kshs)	Cost (Kshs)
	Sump Drainage pipework				
A	50mm diameter CPVC pipework from the basement sumps to storm water drain.	150	No		
B	50mm diameter CPVC bend	8	No		
C	50mm diameter gate valve	4	No		
D	50mm diameter non-returm valve	4	No		
E	Allow for sleeves, paddle flanges &bends for suction pipes passing through walls of the tanks	1	Item		
	Excavations for Pipes				
F	Allow for excavation in black cotton soil/murram for drainage pipes not exceeding 1500mm deep and average 900mm deep, part return in, fill, ram and surplus cart away.	15	LM		
	Supporting Brackets				
G	Allow for suitable supporting steel brackets for anchoring and supporting drainage pipes bends on the lower floor. To be painted to match the walling colour.	20	No.		
	Testing and commisioning				
H	Testing and Commissioning of drainage installations to the satisfaction of the Engineer	Item	Sum		
	Total Carried to Collection Page				

COLLECTION PAGE FOR BASEMENT AND RAIN WATER DRAINAGE			
Item	**Description**		**Amount (Kshs)**
1	Total carried forward	.....	
2	Total carried forward	.....	
3	Total carried forward	.....	
	Total Carried to Collection Page		

COLLECTION PAGE FOR FOUL DRAINAGE		
Item	**Description**	**Amount (Kshs)**
1	Total carried forward	
2	Total carried forward	
Total cost for Drainage Pipework		

BILL NO 5:RAIN WATER AND GENERAL FLOOR DRAINAGE					
Item	**Description**	**Qty**	**Unit**	**Rate (Kshs)**	**Cost (Kshs)**
	RAIN WATER DRAINAGE				
A	200mm diameter heavy gauge grey mUPVC pipe	0	Lm		
B	150mm diameter heavy gauge grey mUPVC pipe	300	Lm		
C	150mm diameter short radius bend	20	No.		
D	150mm diameter bend with access	20	No.		
E	150mm diameter sweep bend	20	No.		
F	200x150mm diameter reducer	0	No.		
G	200mm Galvanized Mild Steel Bend to be connected at the pressure corners	0	No.		
H	200mm equal sweep tee	0	No.		
I	150mm equal sweep tee	20	No.		
J	150mm diameter sweep tee	20	No.		
K	150mm diameter access cap	20	No.		
L	Stainless steel pipe clipping capable of strongly supporting 20mm to 150mm pipes with all asociated screwa and bolting to the finished walls	40	No		
	Roof Fulbora				
M	Aluminium silicon casting alloy 150mm diameter roof outlet with vertical spigot and with domical grate.The External circumference to be at least 380mm with slope off starting at 300mm.The final pipe drop off to be 160mm as caro 10/VS/F	15	No.		
Total Carried Forward					

BILL NO.6: WATER TANKS AND PUMPS

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Water Storage and Rising Mains				
	All GALVANIZATION SHALL BE HOT DIPPED AND DONE AS PER ISO 1461 AND APPLICABLE KS STANDARDS TO AT LEAST 70 MICRONS WITH A MINIMUM 25 YEAR GUARANTEE ISSUED.				
	Basement Level Water Tank fittings				
	-100mm diameter overflow				
	-100mm diameter outlets				
	-100mm diameter inlet				
	-100mm diameter washout with gate valve	1	No.		
A	Allow for sleeves, paddle flanges &bends for suction pipes passing through walls of the tanks	1	Item		
	Roof Level Water Tank for the site				
B	Supply, deliver and assemble a high level water tanks, made of pressed **Galvanized** steel sectional tank plates 6mm thick plates (type 1 and 4) and of size 1000mm x 1000mm capacity of tank to be 45,000 litres and of preferred dimensions 5000mm x 3000mm x 3000mm. The tank to come complete with tank cover, mosquito proof inspection vent, internal stays, jointing material, bolts and nuts. The tank shall be complete with the following pipe connections:--				
	-100mm diameter overflow				
	-100mm diameter outlets				
	-100mm diameter inlet				
	-100mm diameter washout with gate valve	2	No.		
C	Allow for lightining arrester installed at the elevated pressed steel tank	2	No.		
	Total Carried Forward Collection Page for Water Tanks				

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
A	Copper Conductor cable from lightining arrestor to the ground	150	Lm		
B	Allow inspection of the galvanization process at a local plant where the contractor proposes to galvanize the tanks.Allow for all costs for inspection for the panels before delivery to site.The contractor to allow for all associated equipment catalogues and pre and during construction as installed layout for the tank systems.	1	Item		
C	**Water Booster Pumpset and panel** Set of automatic electrically driven twin booster pump. Alternating pump with automatic changeover, capable of delivering 8 cubic metres per hour against a head of 60 meters with a three phase power source. The pumpset shall be complete with 100 litres pressure vessel (as Dayliff pressure set or equal and approved) and all accessories required for proper and satisfactory operation. It includes pressure switches, time delay switch, a switch to protect against dry run, timer, gate valves, non-return valves, water level indicator, float level regulator, 65mm diameter foot valve and strainer. The pump to be as Grundfos model or approved equivalent. Pump to be installed on mild steel frame with approved paint.				
D	Control panel for above pumps with contactors, over voltage and under voltage protection relays, MCBs, phase failure protection, timer, 180 meters long float switch control cable to the roof tanks, start/stop push buttons and indicator lights. All these shall be housed in a lockable cabinet (with integral isolator) made from SWG 18 mild steel sheet that is oven powder coated. There shall also be an adjustable time delay switch to ensure pumping cycles are controlled to not more than 6 per hour. It should include a change-over switch to enable the pumps to work alternately.	1	Item		
Total Carried Forward					

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Supply Pipework from council line to water Tanks				
	Pipe				
A	50mm diameter pipework water supply to tank	200	Lm		
B	50mm diameter bend	12	No.		
C	50mm equal tee	12	No.		
D	50 x 32mm diameter reducer	8	No.		
	Supply Drop Piping to floors using CPVC pipes				
E	100mm diameter pipework	600	Lm		
F	100mm diameter bend	80	No.		
G	100mm equal tee	80	No.		
H	100 x 50mm diameter reducer	30	No.		
I	100 x 40mm diameter reducer	30	No.		
J	100 x 32mm diameter reducer	30	No.		
K	100 x 25mm diameter reducer	30	No.		
	Valves				
L	100mm diameter approved medium pressure screw down full way non-rising stem wedge sluice valve to BS 5154 PN 20 for series B rating, with wheel and head joints to steel tubing and complete with round male threaded transition fittings. The gate valve to be as PEGLER or approved equivalent.	6	No.		
M	100mm diameter pipe union	6	No.		
Total Carried Forward					

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Pipe Sleeves				
A	100mm diameter heavy duty PVC pipe sleeves for crossing over columns and beams.	10	Lm		
	Stand pipe				
B	Stand pipe consisting of 25mm PPR 2000mm pipe anchored with two clips on a 2000mm gms pipe.The gms pipe to to anchored with concrete at the base. It incudes a plastic Bib Tap	2	No		
	Water Meters				
C	32 mm coucil water meter as 'Kent' or equal and approved equivalent	1	No.		
D	Allow for connection to the water main supply to site and i**nclude local council charges.**	1	No.		
	Water Meters chamber				
E	Meter chamber size 300x300x300mm deep with 100mm concrete (1: 3: 6) base 50mm block sides rendered all round in cement and sand (1:4) and with approved hinged and flanged cast iron cover and frame including all necessary excavation, disposal and formwork.	4	No.		
	Gate Valve Indicator Plates				
F	Standard precast concrete Sluice valve marker post marked 'GV' set in concrete (1:3:6) base, including formwork, excavations backfilling and disposal. The plate to be painted with blue gloss oil paint.	10	No		
	Water Line Markers				
G	Standard precast concrete water line marker, post marked 'WL' set in concrete (1:3:6) base, including formwork, excavations backfilling and disposal. The plate to be painted with blue gloss oil paint.	10	No		
Total Carried Forward					

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Pipe Sleeves				
A	100mm diameter heavy duty PVC (class 41, 2.5mm thick) pipe sleeves for crossing over columns and beams.	24	Lm		
	Pipe Sleeves with concrete surround				
B	200mm diameter heavy duty PVC Class 41pipe sleeves for crossing over pathways and driveways. The sleeves will be encased in 250mm concrete sorround.	15	Lm		
	Sterilization				
C	Allow for flushing out and sterilizing the whole system with chlorine to the satisfaction of the Project Engineer.	1	Item		
	Working Drawings and Documents				
D	Allow for working drawings for the system indicating the size,material and volume of the tanks,the pumpset datasheet with electrical power layout,All piping configurations and any other specification as directed by the engineer.	1	Item		
	Sterilization				
E	Allow for flushing out and sterilizing the whole system with chlorine to the satisfaction of the Project Engineer.	1	Item		
	Water for Testing				
F	Allow for water for pressure testing pressure testing,sterilization and commissioning of the system installation which will be in excess of 160,000 litres	1	Item		
Total Carried Forward					

Item	Description	Qty	Unit	Rate (Kshs)	Amount (Kshs)
	Testing				
A	Pressure testing of the system Installation with provision of **pressure testing certificates** for all the pipework as directed by the engineer.	1	Item		
	As installed Drawings and Documents				
B	Allow for as installed drawings for the system indicating the size,material and volume of the tanks,the pumpset datasheet with electrical power layout,All piping configurations and any other specification as directed by the engineer.These to be 3No.sets in both hardcopy A2 format and soft copy in 2Gigabyte Flashdrive.	1	Item		
	Commissioning				
C	Allow for issuance of commissioning guides and certificates for the water tanks and piping installation .The cost to include all maintenace manuals,warranties issued and any other documents as directed by the engineer.3No.sets Hardcopy in A3 format and 2No.sets in Soft copy in 2GB flash Disk	1	Item		
Total Carried Forward					

COLLECTION PAGE FOR WATER TANKS

Item	Description	Amount (Kshs)
1	Total carried forward	
2	Total carried forward	
3	Total carried forward	
4	Total carried forward	
5	Total carried forward	
6	Total carried forward	
Total Carried Forward to plumbing and drainage summary page for water tanks and general plumbing installation works		

SUMMARY PAGE SANITARY,PLUMBING, DRAINAGE AND WATER TANK

Item	Description	Amount (Kshs)
1	Total carried forward for sanitary fittings	
2	Total carried forward for plumbing pipework	
3	Total carried forward for foul drainage pipework	
4	Total carried forward for Rain Water drainage pipework	
5	Total carried forward for Water Tanks	
	Total for Plumbing and Drainage Installation Works carried to final summary page	**0**

FINAL SUMMARY PAGE

Item	Description	Total Cost
1	Preliminaries	
2	Total cost for plumbing and drainage installation works	
3	**Contigency**	**500,000.00**
	Total Cost for plumbing and drainage carried to Form of tender	

Amount in words……

……

Tenderer's Name and Stamp……

……

Address ……

Period To Execute The Works ……

Tenderer's V.A.T No ……

Tenderer's P.I.N No ……

Telephone No. ……

Mobile No. ……

Tenderer's Signature …… Date……

Witness Signature …… Date……

SECTION NAME:

BILLS OF QUANTITIES

BILLS OF QUANTITIES AND SCHEDULE OF UNIT RATES

CONTENTS

GENERAL NOTES TO TENDERERS

1. The Bills of Quantities form part of the contract documents and are to be read in conjunction with the contract drawings, general specifications of materials and works and particular specifications of materials

2. The prices quoted shall be deemed to include for all obligations under the sub-contract including but not limited to supply of materials, labour, delivery to site, storage on site, installation, testing, commissioning and all taxes (**including 16% VAT**).

   In accordance with Government policy, the 3% Withholding Tax **shall be deducted** from all payments made to the Tenderer, and the same shall be forwarded to the **Kenya Revenue Authority (KRA).**

3 All prices omitted from any item, section or part of the Bills of Quantities shall be deemed to have been included to another item, section or part there of.

4. The brief description of the items given in the Bills of Quantities are for the purpose of establishing a standard to which the sub-contractor shall adhere. Otherwise alternative brands of **equal** and **approved** quality will be accepted.

   Should the sub-contractor install any material not specified here in before receiving **written approva**l from the Project Manager, the sub-contractor shall remove the material in question and, **at his own cost**, install the proper material.

5. The grand total of prices in the price summary page must be carried forward to the **Form of Tender for the tender to be deemed valid**.

Statement of Compliance

a) I confirm compliance of all clauses of the General Conditions, General Specifications and Particular Specifications in this tender.

b) I confirm compliance to the items specified in technical catalogues and brochures I have attached as required in the technical schedule.

Name: ……..

Capacity:…… *(Person with power of attorney)*

Signed: ……*for and on behalf of the Tenderer*

Date: ……..

Official Rubber Stamp: ……

PRICING OF ITEMS.

The Bills of Quantities are divided generally into three sections:-

Preliminaries – Bill 1

Prices will be inserted against item of preliminaries in the sub-contractor's Bills of Quantities and specification. These Bills are designated as Bill 1 in this Section. Where the sub-contractor fails to insert his price in any item he shall be deemed to have made adequate provision for this on various items in the Bills of Quantities. The preliminaries form part of this contract and together with other Bills of Quantities covers for the costs involved in complying with all the requirements for the proper execution of the whole of the works in the contract

Sub-contractors preliminaries are as per those described in section C – sub-contractor preliminaries and conditions of contractor.

The sub-contractor shall study the conditions and make provision to cover their cost in this Bill. The number of preliminary items to be priced by the Tenderer have been limited to tangible items such as site office, temporary works and others.

However the Tenderer is free to include and price any other items he deems necessary taking into consideration conditions he is likely to encounter on site.

Mechanical installation Items – Bill 2

The brief description of the items in these Bills of Quantities should in no way modify or supersede the detailed descriptions in the contract Drawings, conditions of contract and specifications.

Summary – Bill 3

The summary contains tabulation of the separate parts of the Bills of Quantities carried forward with provisional sum, contingencies and any prime cost sums included. The sub-contract shall insert his totals and enter his grand total tender sum in the space provided below the summary.
This grand total tender sum shall be entered in the Form of Tender provided elsewhere in this document

SECTION NAME:

GENERAL MECHANICAL SPECIFICATIONS

GENERAL MECHANICAL SPECIFICATION

GENERAL MECHANICAL SPECIFICATION

1.01 General

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

1.02 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 connection by the Sub-contractor shall be carefully examined on receipt. 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.

1.03 **Regulations and Standards**

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

- The Kenya Government Regulations.
- The United Kingdom Institution of Electrical Engineers (IEE) Regulations for the Electrical Equipment of Buildings.
- The United Kingdom Chartered Institute of Building Services Engineers (CIBSE) Guides.
- British Standard and Codes of Practice as published by the British Standards Institution (BSI)
- The Local Council By-laws.
- The Electricity Supply Authority By-laws.
- Local Authority By-laws.
- The Kenya Building Code Regulations.
- The Kenya Bureau of Standards

1.04 **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 and connections to equipment shall form part of this Sub-contract and be the responsibility of the Sub-contractor. 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 Company (KP) 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 240Volts, 50Hz, 1-phase.Any equipment that is not rated for the above voltages and frequencies shall be rejected by the Engineer.

1.05 **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.

1.06 **Site Supervision**

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

1.07 **Installation**

Installation of all special plant and 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 1.03 of this Section.

1.08 **Testing**

1.08.1 General

The Sub-contractor's attention is drawn to Part 'C' Clause 1.38 of the "Preliminaries and General Conditions".

1.08.2 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 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 specially 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.

1.08.3 Manufactured Plant and Equipment – Work Tests

The rights of the Engineer relating to the inspection, examination and testing of plant and equipment during manufacture shall be applicable to the Insurance Companies or Inspection Authorities so nominated by the Engineer.The Sub-contractor shall give two weeks' notice to the Engineer of the manufacturer's intention to carry out such tests and inspections.

The Engineer or his representative shall be entitled to witness such tests and inspections. The cost 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.

1.08.4 Pressure Testing

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

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

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

1.09 **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 and to the approval of the Engineer or Architect.

1.10 **Welding**

1.10.1 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 imperfection due to shearing or flame cutting operation, etc., and shall be free from rust scale, grease and other foreign matter.

1.10.2 Method

All welding shall be carried out by the electric arc processing 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.

1.10.3 Welding Code and Construction

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

a) Pipe Welding

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

b) General Welding

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

1.10.4 Welders Qualifications

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

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

PARTICULAR SPECIFICATIONS FOR SANITARY FITTINGS

WATER CLOSET

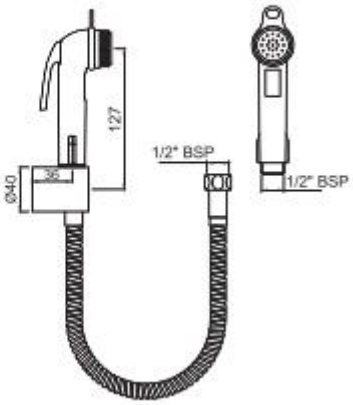
- Rimless Wall Hung WC with UF soft close slim seat cover and Hinges,
- Accessories set complete with Concealed cistern with Frame & Finish Plate
- Finish with an antibacterial ceramic glaze
- Noise reduction gasket
- Ceramic
- Meets EU declaration of conformity certificate



AS JAQUAR MMODELS FLS-WHT- 5953UFSM, JCP- CHR-392415 & JCS- WHT-2400FS OR EQUIVALENT

HEALTH FAUCET KIT

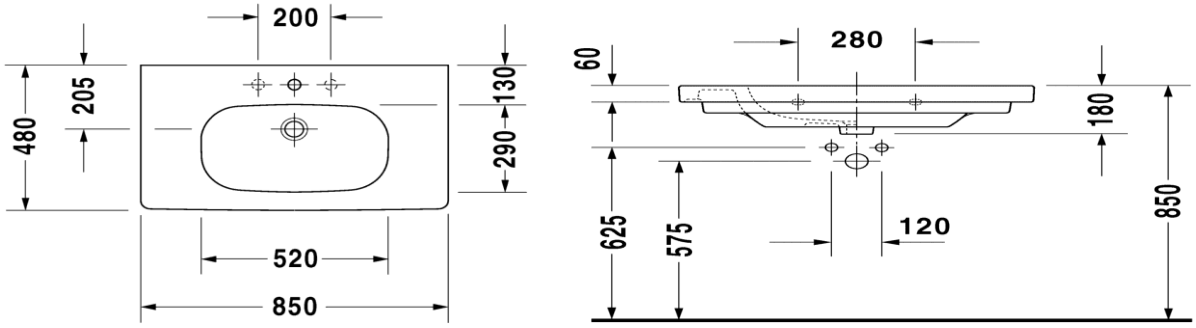
- Flexible Chrome Hose, Handset, ABS Body & Bracket
- For water pressure between 1.0 Bar - 3.0 Bar
- Finish Plating: Nickel-10.0 micron Chromium-0.3 micron, Salt Spray (500 hrs +Validated) and Adhesion (Pass)
- with preferred dimensions as indicated

AS JAQUAR HEALTH KIT ALE-ESS-593 OR EQUIVALENT

WASH HAND BASIN

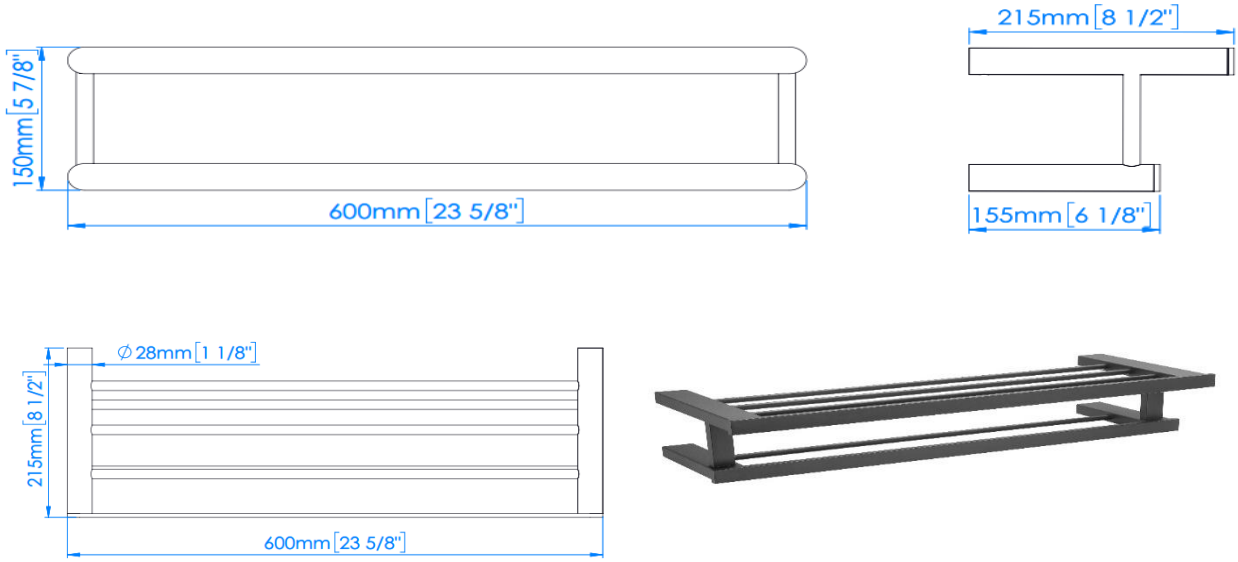
- Without overflow
- with tap platform
- square tube 14 mm
- Ceramic
- Meets EU declaration of conformity certificate



AS D-CODE COUNTER MOUNTED DURAVIT MODEL 03528500002 OR EQUIVALENT

TOWEL RACK

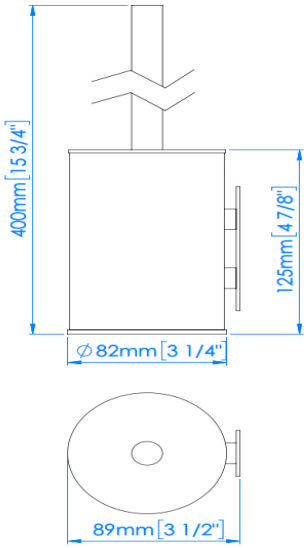
- Towel rack made of AISI 304 stainless steel with a hidden wall mounting system with stainless steel hardware to install on brick walls
- TOWEL SHELF: composed of a straight front bar and 3 Ø 12mm cylindrical bars, all made of AISI 304 stainless steel
- TOWEL RAIL: made of cylindrical AISI 304 stainless steel tube of Ø 12mm and attached with two screws to the two upper wall supports.
- WALL BRACKETS: 4 units, made with 1.8mm thick AISI 304 stainless steel square tube.
- WALL ANCHORS: 4 units, made of aluminum. Attached to the wall bracket by means of two screws.
- Dimensions 600 x 150 x 215 mm Shelf bar tube diameter 12 mm Towel rail tube diameter 12 mm Wall bracket diameter 1.8 mm



AS MEDICLINIC MODEL AI1423B OR EQUIVALENT

TOILET BRUSH SET

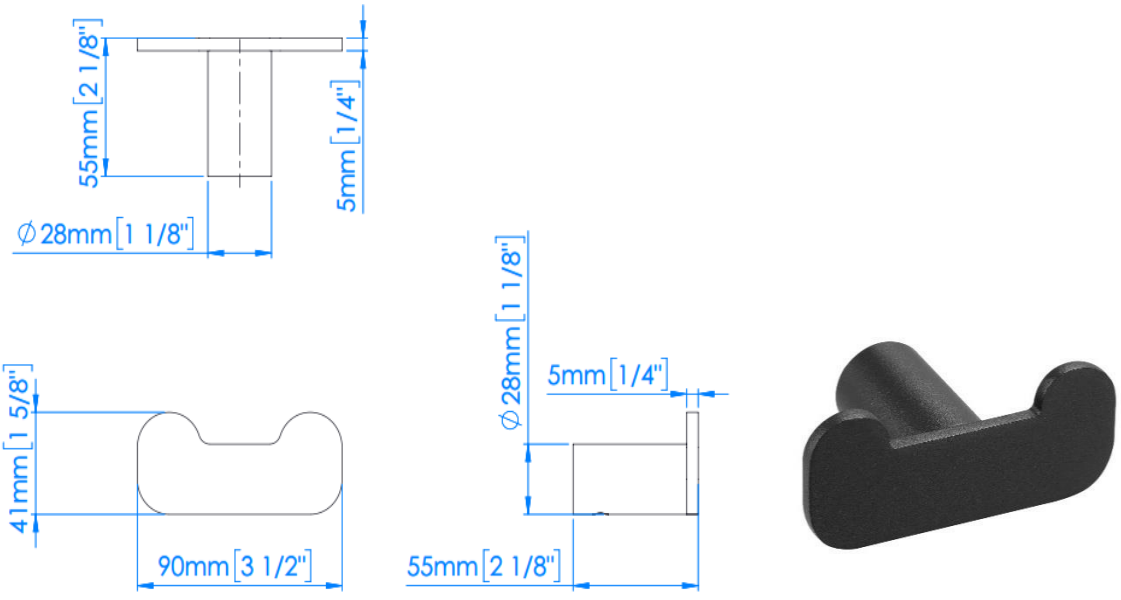
- Toilet brush set for fixing to the bathroom wall, made of AISI 304 stainless steel 1 mm thick
- Resistant to humidity and corrosion
- Circular lid with an airtight seal that prevents the spread of bad odors and protects hands from getting dirty or splashed while cleaning the toilet.
- Comes with stainless steel hardware for fixing it to a brick wall
- WALL BRACKET: made of AISI 304 stainless steel, 2 mm tick. Allows quick removal of the brush holder for cleaning, without tools.
- INNER RECIPIENT: to collect water and prevent body rust. Made of black thermoplastic to prevent oxidation of the body.
- HANDLE: made with AISI 304 stainless steel rod and is 27.5 cm in length, which for ease of reach and clean the toilet bowl.
- LID: made of black circular rubber seal, 2.0 mm thick. •
- BRUSHES: long, dense and soft



AS MEDICLINIC MODEL ES1002B OR EQUIVALENT

ROBE HOOK

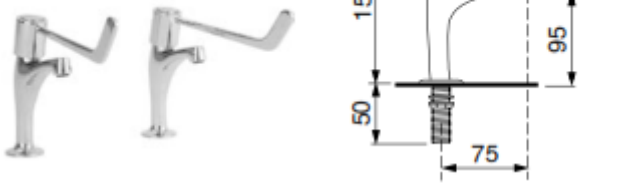
- Double-ended bathroom robe hook, made of AISI 304 stainless steel black finish
- Made with anti-corrosive and highly resistant stainless steel.
- With hidden wall mounting system
- With stainless steel hardware kit for installing on brick walls.
- DOUBLE HOOK: made of 5 mm thick AISI 304 stainless steel plate.
- WALL BRACKETS: two units, made with AISI 304 stainless steel cylindrical tube of Ø 28mm and 1.2mm thick. Attached to the bar by means of a threaded stud and nut.
- WALL ANCHORS: two units made of AISI 304 stainless steel tube of Ø 22mm and 1.0mm thick.

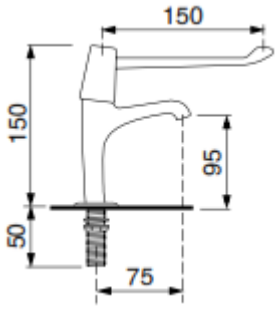


AS MEDICLINIC MODEL AI2318B OR EQUIVALENT

ELBOW ACTION PILLAR TAP

- For connecting to hot and cold water.
- with 150mm long levers which
- Can be operated by either the elbows or wrists using a quarter turn action.
- Manufactured from chromium plated brass.
- Mounting: Deck mounted
- Spout projection: 75mm
- To conform to WRAS standards

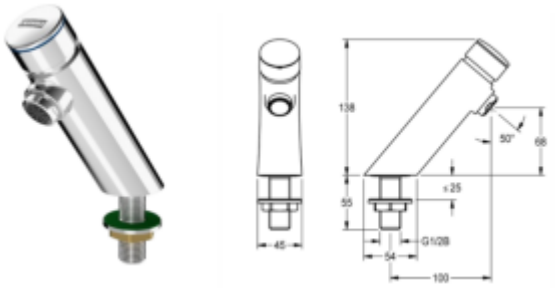




AS FRANKE TAP MODEL F1074 208.0000.019 OR EQUIVALENT

SELF CLOSING WASH HAND BASIN PILLAR TAP

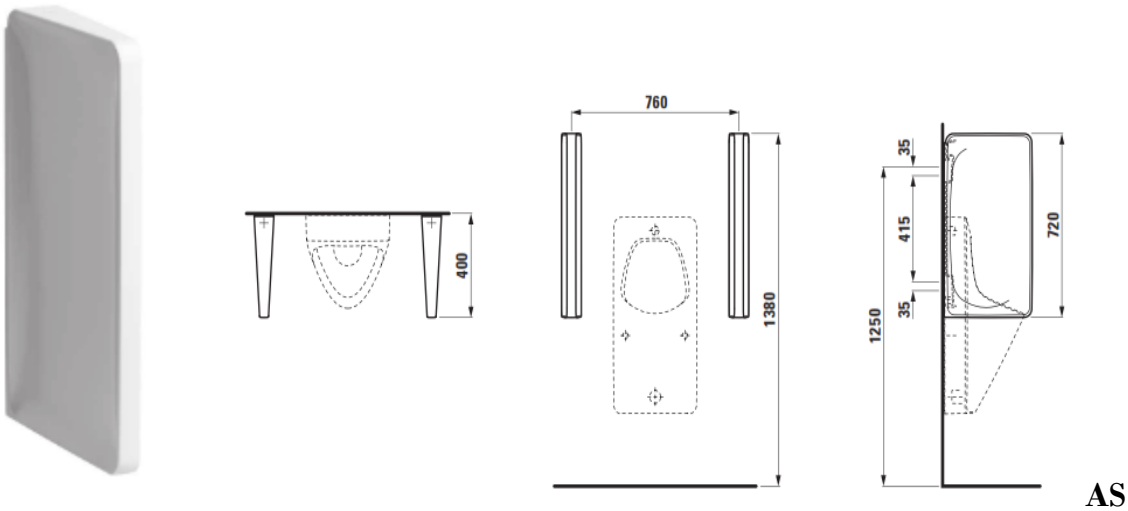
- F3S Self-closing pillar tap DN 15
- Self-closing cartridge, hydraulically controlled, piston-free design, self-closing, stepless adjustment of flow duration.
- With Aerator with an integrated flow regulator 3.0 l/min
- With adjustable flow time
- Maximum flow time 20.00 seconds
- Minimum flow time 5.00 seconds
- Chromised Surface finish fitting
- Volume flow rate at 3 bar 0.05 litre per second
- with preferred dimensions as indicated



AS FRANKE MODEL NO 3 F3SV1001 OR EQUIVALENT

URINAL DIVIDER

- Urinal division
- dimensions 400mm x 720mm
- Inclusive of fixing devices



AS LAUFEN CINTO 0829300007 OR EQUIVALENT

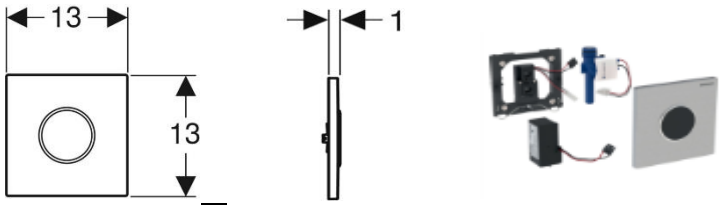
URINAL BOWL

- concealed inlet
- includes jet nozzle, inlet-set, waste, bottle trap Ø 32 mm and fixings with inlet adapter for 1/2" inlet connection
- Meets EU declaration of conformity certificate

AS JAGUAR MODEL URS-WHT-13253N OR EQUIVALENT

<u>MAINS OPERATION URINAL FLUSH VALVE</u>

- Urinal flush control with electronic flush actuation, mains operation
- Cover plate with securing bar
- Water-saving hybrid mode can be set with Adjustable interval flush
- Mains operation and Power failure control unit
- Valve-closing function when power fails
- Flush volume can be reduced to 0.5 l per flush with regulating screw of installation set
- Includes all accessories including Cover plate type 10 with IR window Infrared control, premounted on mounting frame, Solenoid valve ,Power supply unit and Fastening material, Plate in Die-cast zinc material with Protection degree IP45
- Flow pressure 1-8 bar, With flow regulator and Detection time, adjustment range 3-15 s
- Allow for pre wall carriers



AS TAPIS INFRA RED URINAL FLUSH VALVES MODEL MC-8512 OR EQUIVALENT

SINGLE LEVER SHOWER MIXER

- Single lever shower mixer
- for concealed installation
- four way
- Can operate upto operating pressure: 10 bar
- ceramic cartridge ·
- temperature limitation adjustable
- diverter with automatic resetting

AS JAGUAR MODEL ARI-CHR-39065 OR EQUIVALENT

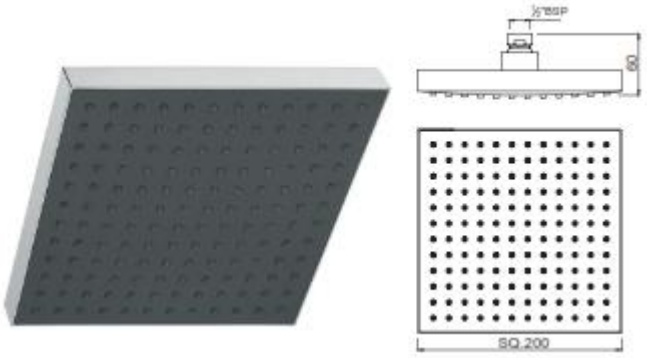
SHOWER SPOUT

Shower spout 8" (203 mm) diverter bath spout with 1/2" NPT connection.
Finish Material resist corrosion and tarnishing.

AS JAGUAR MODEL ALD-065N OR EQUIVALENT

SQUARE SHOWER HEAD

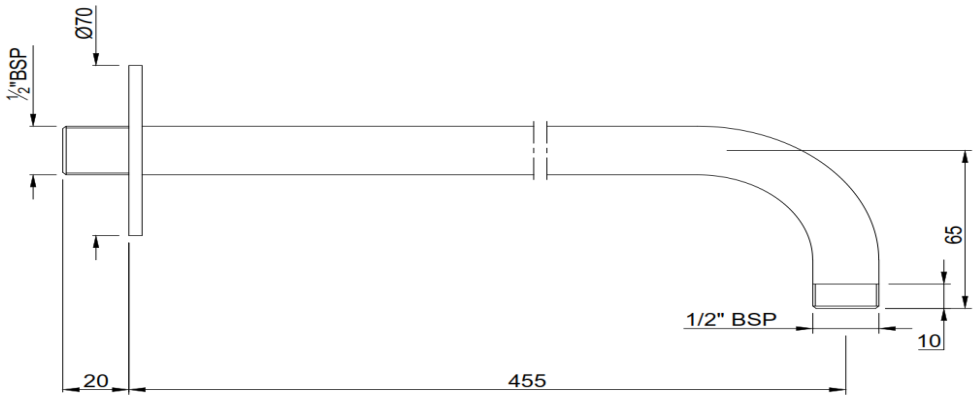
- Single Function 200X200mm Square Shape Overhead Shower
- 24.15 LPM @ 3 bar
- Mount Type Wall Mounting
- Chrome finish
- with preferred dimensions as indicated below



AS JAQUAR MODEL NO. OHS-CHR-35497 OR EQUIVALENT

LONG NECK SHOWER ARM

- length: & 450mm Long Round Shape with 90º Bend
- For wall-mounted ·showers with flange
- installation type: exposed installation ·
- connection thread ø20mm
- to complement the shower head
- With filter packing
- finish in chrome

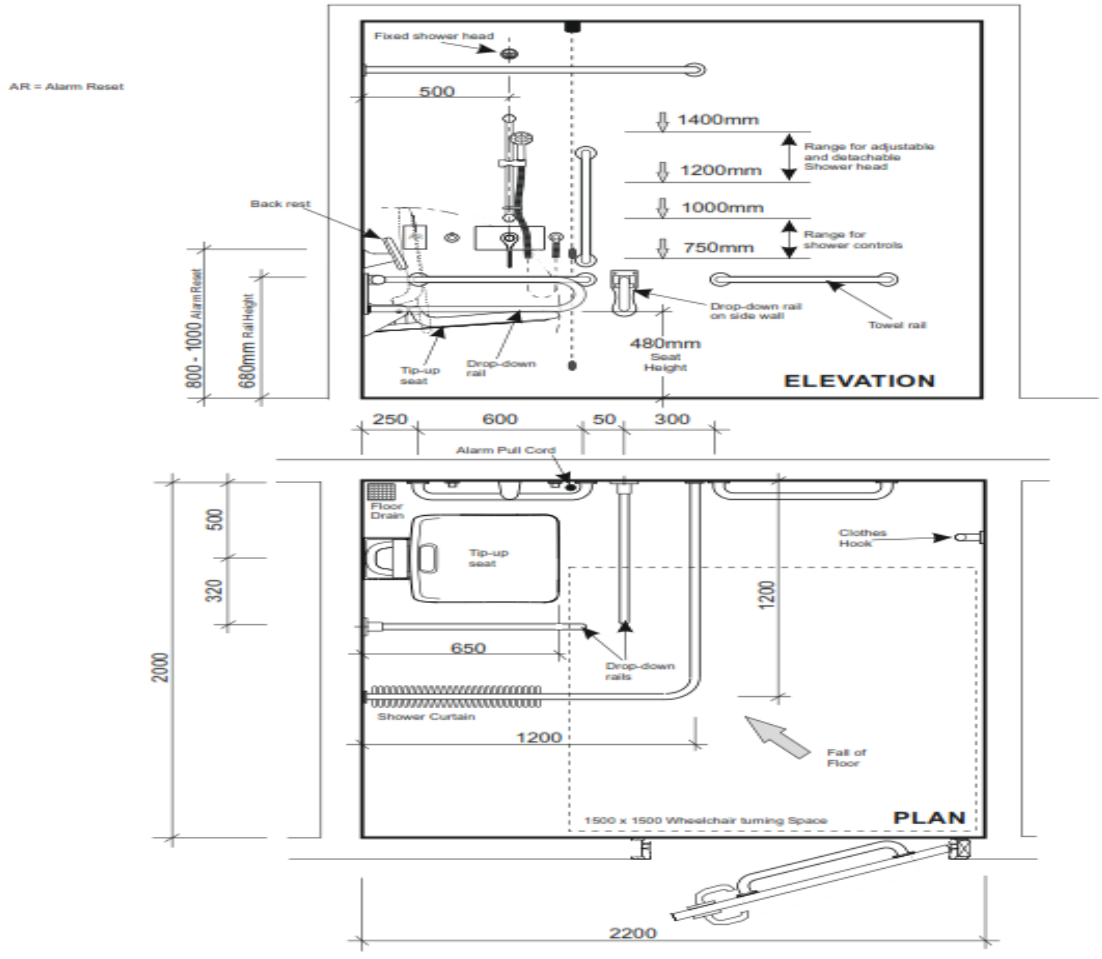


AS JAQUAR MODEL NO. SHA-WHM-479L450 OR EQUIVALENT

PHSICALLY CHALLENGED SHOWER

Physically challenged shower with all accessories including

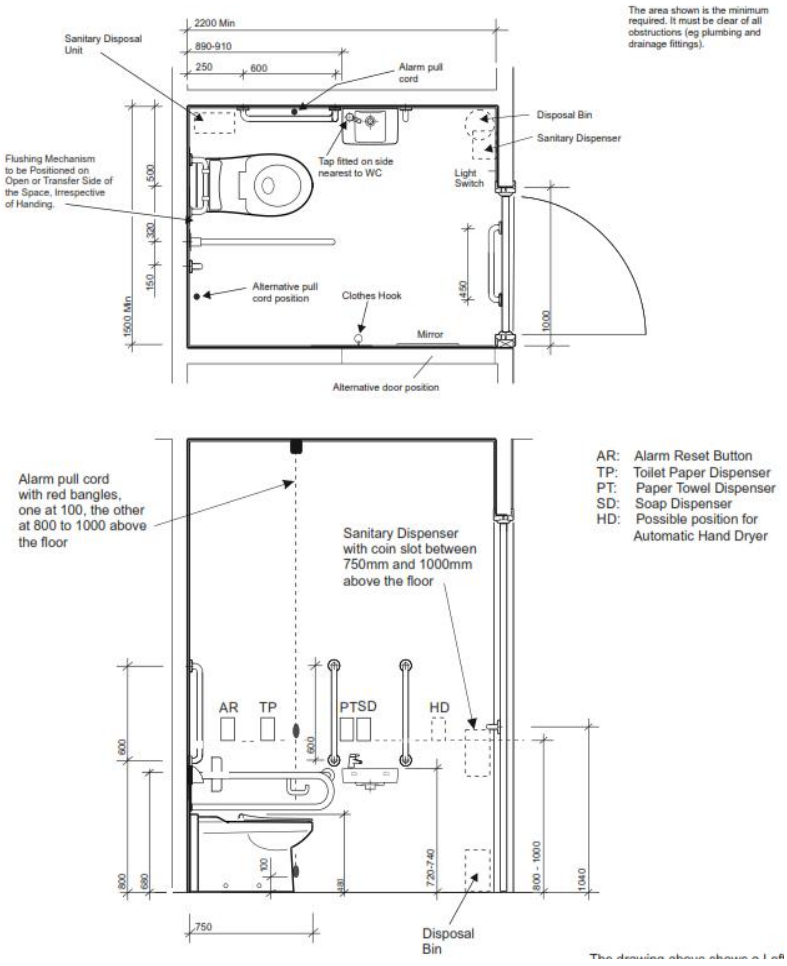
- Shower rail 1200 x 1200mm
- Shower curtain 1800 x 2000mm x 2
- Concealed shower valve to be **thermostatic concealed shower valves**
- Shower rail, hose and vandal resistant fixed head
- Shower diverter
- 3 x 600mm support rail concealed fixings and 2 x hinged support rail concealed fixings
- seat and back rest
- Grab rails in powder coated aluminium.
- WRAS and TMV3 Approved



AS TWYFORD DOC M SHOWER PACK MODEL PK7010BE OR EQUIVALENT

PHSICALLY CHALLENGED WATER CLOSET

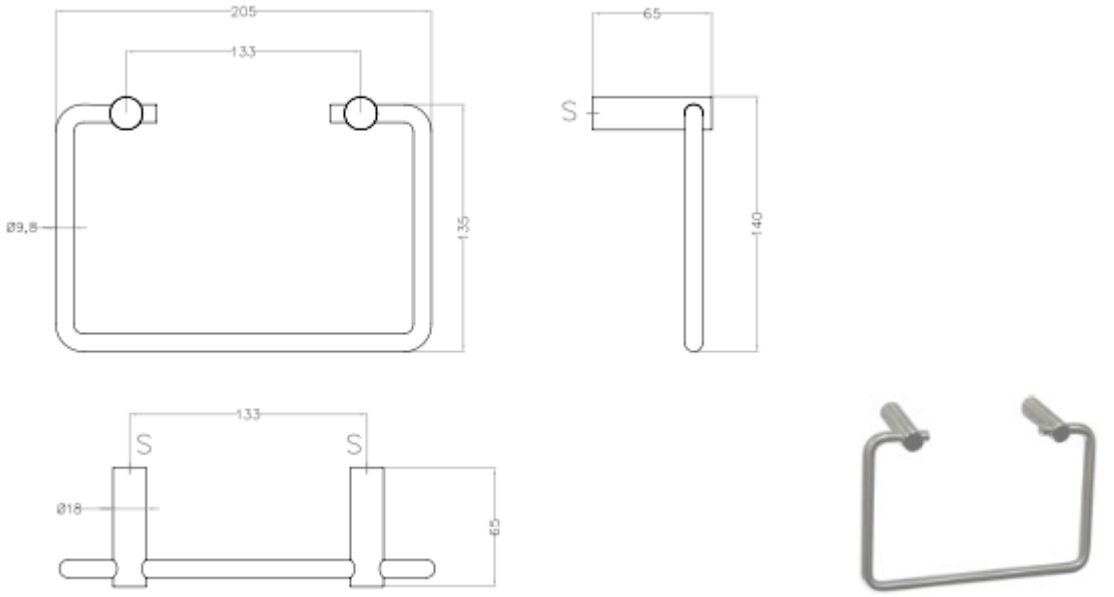
- 700mm projection Rim free pan
- Concealed cistern, single flush lever, 4 litre flush
- Seat ring, stainless steel bar hinge, top fix and stability buffers
- back support with cushion
- hand rinse basin 400, no overflow 1 tap
- thermostatic basin mixer with fixed spout and copper tails
- 4 x 600mm grab rails concealed fixings,1 x 450mm grab rail concealed fixings,1x Hinged support rail and toilet roll holder concealed fixings
- Material to be Vitreous china.
- Grab rails in powder coated aluminium.
- WRAS Approved and TMV3 Approved



AS TWYFORD DOC M PACK MODEL PK8357BE OR EQUIVALENT

TOWEL RING

- Stainless steel AISI 304 ring, square form, 0.8 mm, satin finish.
- Stainless steel AISI 304 arm, 0.8 mm thick, satin finish.
- Completely welded construction.
- Mounting on the wall by means of two screws.
- Size 135mmx205mmx65 mm
- To meet ISO 9001:2008.



AS MEDICLINIC TOWEL RING MODEL AI0090CS OR EQUIVALENT

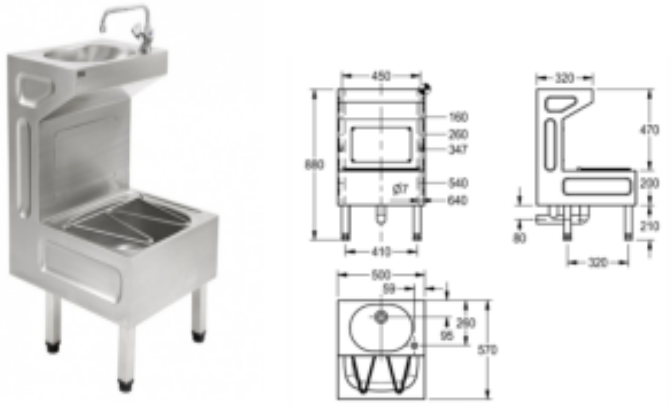
MIRROR

- Size 600mm diameter

AS VADO ELEMENTS MIRROR MODEL ELE-187-RO OR EQUIVALENT

JANITORIAL SINK

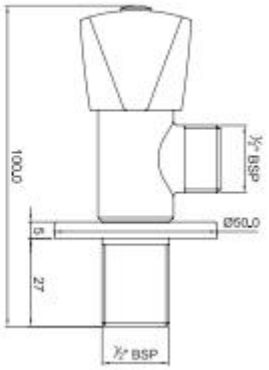
- Floor standing janitorial unit manufactured from grade 1.4301 (304) stainless steel
- 1.2mm material thickness throughout except for lower bowl which is 0.9mm.
- With monoblock mixer, 32mm flush grated waste (for top wash bowl) and 38mm domed waste outlet (for lower bowl).
- The janitorial unit to be fixed with 4 legs for floor standing
- WRAS Approved
- Bowl height 180mm,width 360mm and Bowl depth 420 mm
- Overall depth 570.00 mm, Overall height 880.00 mm and Overall width 500.00 mm
- Surface finish Satin finish With Tap ledge



AS FRANKE JANITORIAL UNIT MODEL G20050N 207.0000.058 OR EQUIVALENT

ANGLE VALVE

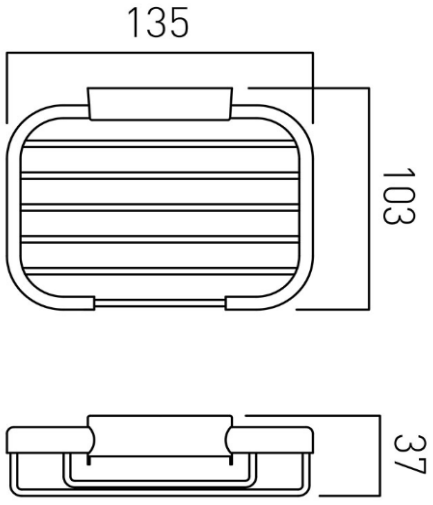
- Angle Valve with Triangular Handle & Wall Flange
- Recommended Water Pressure 0.5 – 5 bar
- Flow Rate 21.00 LPM @ 3 bar
- Components have WRAS Approved for food grade conformity with Brass Housing and Spindle
- Finish Plating: Nickel-10.0 micron Chromium-0.3 micron



AS JAGUAR MODEL AQT-CHR-3057P OR EQUIVALENT

BATHROOM SHELF

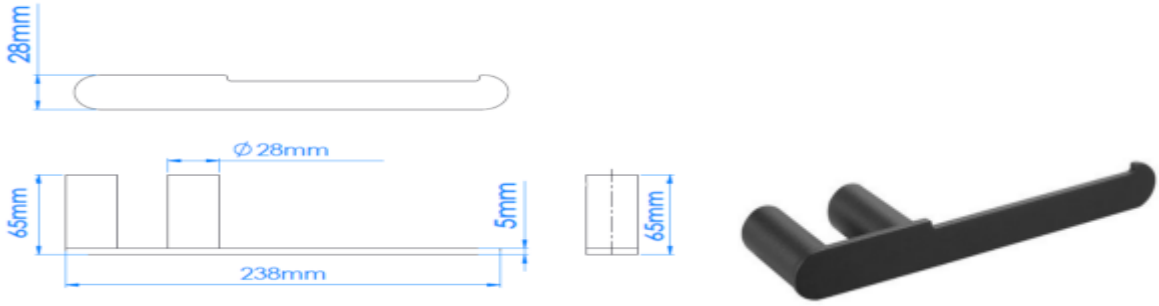
- small rectangular basket
- wall mounted
- In chrome finish
- With preferred dimensions as below



AS VADO BASKET MODEL BAS-2001-C/P OR EQUIVALENT

TOILET ROLL HOLDER

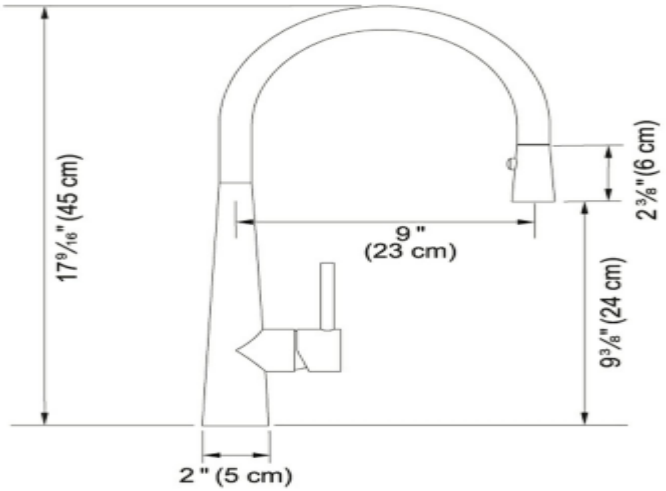
- Toilet roll holder made of AISI 304 stainless steel black finish.
- Roll axis made of 5 mm thick AISI 304 stainless steel sheet.
- Wall brackets of two units, made with AISI 304 stainless steel cylindrical tube of Ø 28mm and 1.2mm thick and attached to the bar by means of a threaded stud and nut.
- Wall anchors made of two units, made of AISI 304 stainless steel tube of Ø 22mm and 1.0mm thick. Attached to the wall bracket by means of a screw. It has two oval holes (one vertical and one horizontal) to facilitate wall mounting.



AS MEDICLINIC TOILET ROLL HOLDER MODEL AI1321B OR EQUIVALENT

KITCHEN SINK TAP

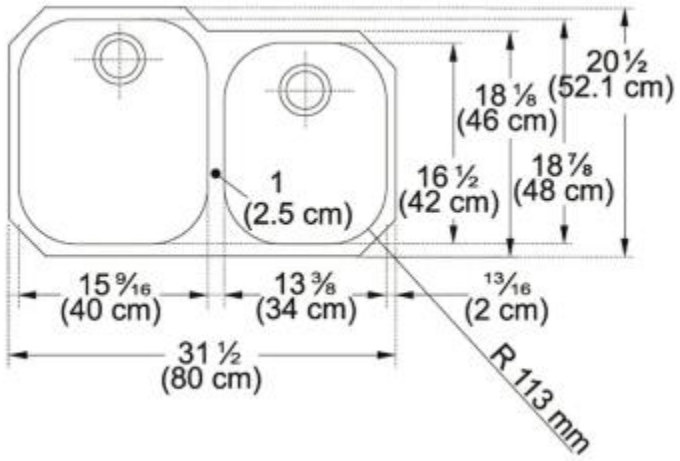
- Solid 304 stainless steel construction
- Side lever Pull down 360 degrees swivel spout
- Dual functioning head spray to provide spray and stream type
- Flowrate of 1.75gpm



AS FRANKE FF3450 OR EQUIVALENT

KITCHEN SINK

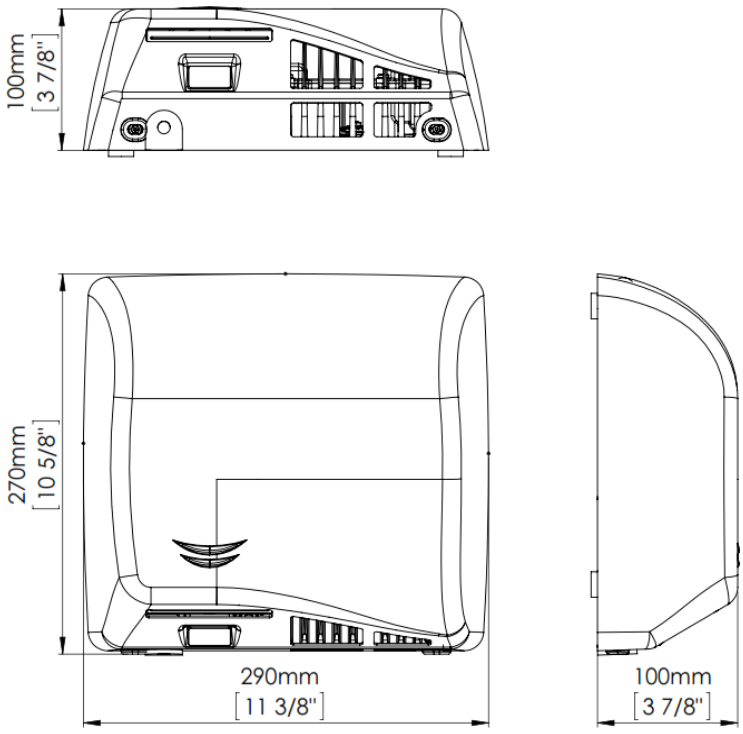
- Solid 304 stainless steel construction
- One ad a half bowl
- With preferred dimensions as shown



AS FRANKE REGATTA RGX 160 OR EQUIVALENT

HAND DRIER

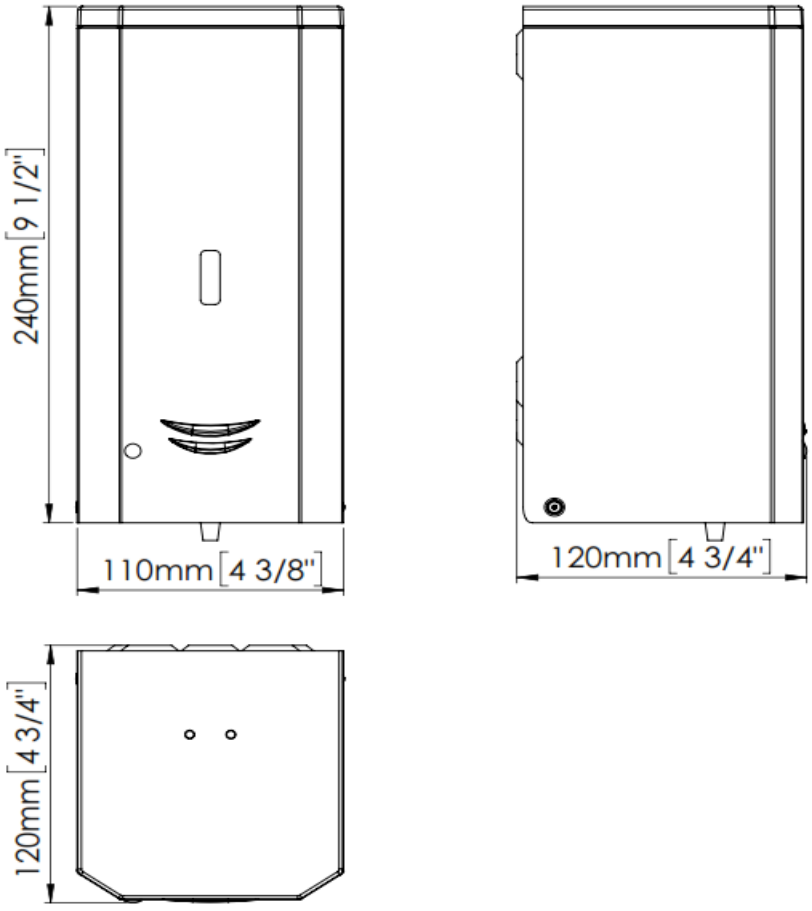
- Consumes less than 2.8 watts per drying cycle and less than 0.4 watts in stand-by mode
- Maximum air speed 400 km / h)
- Noise level less than 65 dBA
- Adjustable power motor
- Micro-switch "ON/OFF" located on the electronic board
- Detection of fixed targets.
- With an ionizer that purifies the air through negatively charged particles
- With an HEPA filter media
- With 30 second maximum continuous running time.
- Complies with the requirements of ADAAG for accessibility of public washrooms
- Compliance with RoHs, ISO and C.E standards
- With preferred dimensions as shown



AS MEDICLINIC MODEL M17AB-I OR EQUIVALENT

AUTOMATIC SOAP DISPENSER

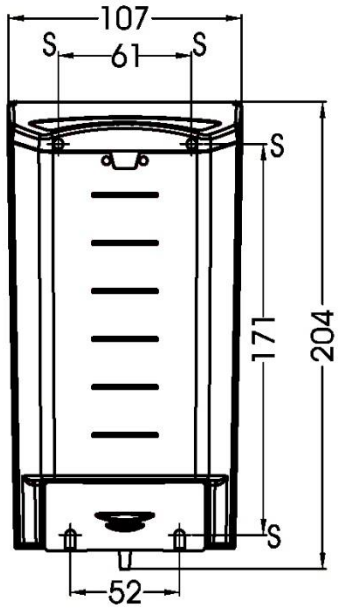
- Automatic wall-mounted liquid soap dispenser of 1 L capacity,
- Manufactured in stainless steel AISI 304, 0.8 mm thick.
- Level display located in the front part of the soap dispenser.
- Operates with an AC adapter.
- Compliance with RoHs,ISO and C.E standards
- With preferred dimensions as shown

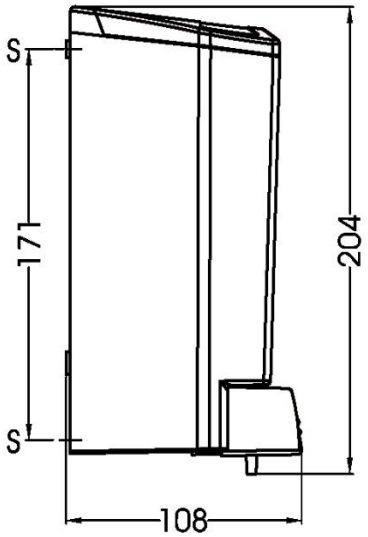


AS MEDICLINIC MODEL DJ0037AB OR EQUIVALENT

PUSH BUTTON SOAP DISPENSER

- Wall mounted liquid soap dispenser
- capacity of 1.1 litres
- manufactured in 3 mm thick thermoplastic ABS
- hand operated by means of a push-button
- Quantity dispensed per pump 1.2 ml
- Compliance with ISO and C.E standards
- With preferred dimensions as shown

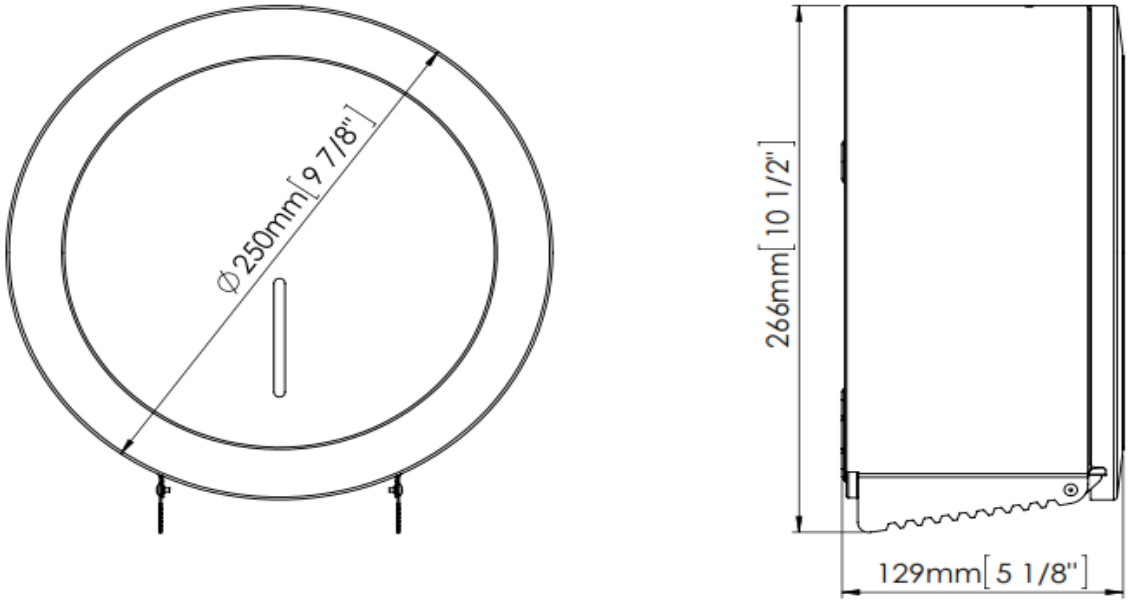




AS MEDICLINIC MODEL DJ0020F OR EQUIVALENT

TOILET PAPER ROLL DISPENSER

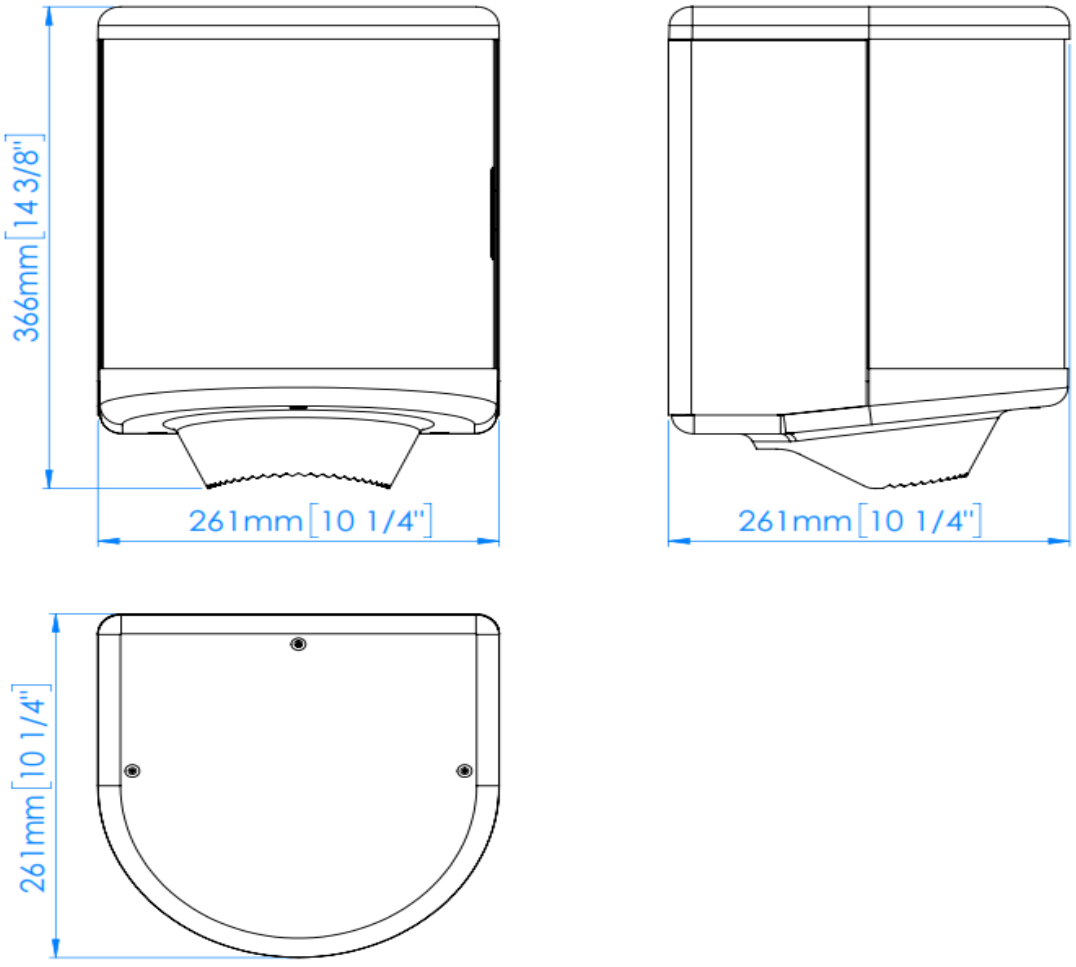
- Circular toilet paper dispenser for industrial rolls of 250/300 m, surface mounted
- One-piece body, 0,8 mm thick, round Ø 250 mm, fully sealed and with a catch system to prevent the opening of the door.
- It includes a lock system with standard key that allows opening the lid for replenishment.
- PA6 plastic shaft, for standard Ø45mm paper rolls tube, with inertial anti-spin retainer. This shaft is to be removable with 2 different positions to allow variety of paper rolls. It also allows the use of a standard paper roll in case of need.
- One-piece seamless lid, 0.8 mm thick, fully sealed. Fixed to the body by means of rivets that allow swinging down the lid for the replenishment.
- Slot at the front with a plastic viewer that indicates the content level
- Back-plate, 0.6 mm thick, with multiple slots
- With preferred dimensions as shown



AS MEDICLINIC MODEL PR2783B OR EQUIVALENT

PAPER TOWEL DISPENSER

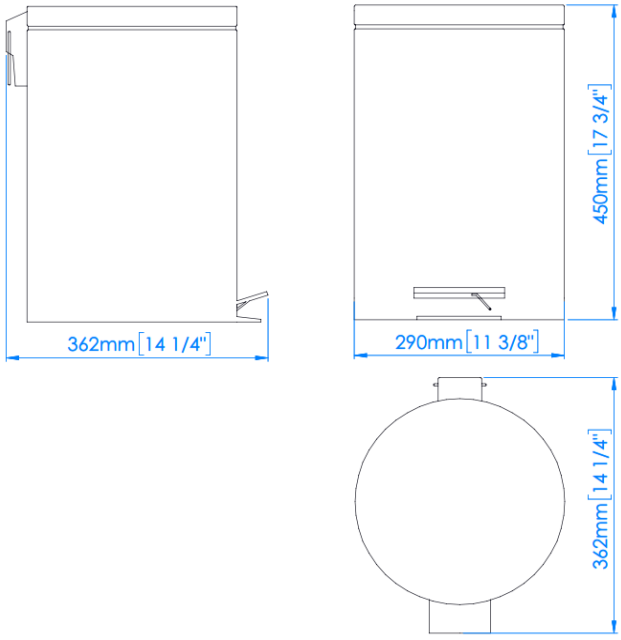
- Manual center feed paper towel dispenser, surface mounted,
- Supplied with a lock and special key for opening and screws.
- Seamless one-piece basis, 0.8 mm thick, welded to the body includes a teeth opening for the paper.
- Seamless one-piece sliding door, 0.8mm thick.
- Polyamide lid ring jointed to the top lid
- Polyamide door ring joint
- High density polyethylene ring placed over the basis with a slot to put out the paper
- With preferred dimensions as shown



AS MEDICLINIC MODEL DT0303CS OR EQUIVALENT

INDOOR CIRCULAR WASTE BINS

- Indoor circular body waste bins 20L capacity, operated by means of a pedal, to rest directly on the floor.
- LID: circular. Silent and anti-odors. Lid opening based on hinge system made of thermoplastic material.
- BASE: made of black thermoplastic, non-slip, insulates the cube bottom of moisture and makes the cube remain stable in place.
- INNER BUCKET: made of polypropylene with metal handle, for easy removal and capacity of 20 L
- PEDAL: metallic with a piece of non-slip black thermoplastic attached on its top. Activates the opening of the lid by pressing.
- HANDLE: metallic and located in the upper rear part of the bin to facilitate the transport.
- Made of stainless steel, 0.5 mm thick and the subject is embossed in black on the stainless steel.
- The signs are all circular and have a diameter of 116 mm and they are fixed to the wall by means of a double side tape



AS MEDICLINIC MODEL PP1321CS OR EQUIVALENT

BATHROOM SIGNS

- Made of stainless steel, 0.5 mm thick and the subject is embossed in black on the stainless steel.
- The signs are all circular and have a diameter of 116 mm and they are fixed to the wall by means of a double side tape

WOMEN'S WASHROOM SIGN

AS MEDICLINIC MODEL PP1321CS OR EQUIVALENT

MEN'S WASHROOM SIGN

AS MEDICLINIC MODEL PS0003CS OR EQUIVALENT

ADAPTED WASHROOM SIGN

AS MEDICLINIC MODEL PS0004CS OR EQUIVALENT

SECTION NAME:

PIPING SPECIFICATIONS

PARTICULAR SPECIFICATIONS FOR PLUMBING AND DRAINAGE INSTALLATION WORKS

GENERAL

This section specifies the general requirements for plant, equipment and materials forming part of the plumbing and drainage installations.

MATERIALS AND STANDARDS

Pipework and Fittings

Pipework materials are to be used as follows:

a) Galvanized Steel Pipework

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

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

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

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

b) Copper Tubing

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

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

Short copper connection tubes between galvanized pipe work and sanitary fitments shall not be used because of the risk of galvanic action.

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

c) P.V.C. (Hard) Pressure Pipes and Fittings

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

Jointing

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

Testing

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

b) HDPE Pressure Pipes and Fittings

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

Jointing

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

Testing

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

c) A.B.S. Waste System

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

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

Jointing of pipes shall be carried out by means of solvent welding, the manufacturer's instructions and B.S. 5572: 1978.Jointing of pipes shall be carried out by means of solvent welding. The manufacturer's recommended method of joint preparation and fixing shall be followed.

Standard brackets, as supplied for use with this system, shall be used wherever possible. Where the building structure renders this impracticable the Sub-contractor shall provide purpose made supports, centers of which shall not exceed one meter.Expansion joints shall be provided as indicated. Supporting brackets and pipe clips shall be fixed on each side of these joints.

e) PVC Soil System

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

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

The soil system shall incorporate synthetic rubber gaskets as provided by the manufacturer whose fixing instructions shall be strictly adhere to.Connections to WC pans shall be effected by the use of a WC connector, gasket and cover, fixed to suit pan outlet. Suitable supporting brackets and pipe clips shall be provided at maximum of one metre centres.

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

Valves

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

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

Gate Valves

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

All gate valves required for fitting to buried water mains shall be of cast iron construction in accordance with the requirements of B.S.1218.

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

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

Globe Valves

All globe valves up to and including 65mm nominal bore shall be of bronze construction in accordance with the requirements of B.S.3061.
The pressure classification of all globe valves shall depend upon the pressure conditions pertaining to the site of works.

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-Syphon Traps

Where anti-syphon traps are specified, these shall be similar or equal to the range of traps manufactured by Greenwood and Hughes Limited, Deacon Works Littleshampton, Sussex, England.
The trade name for traps manufactured by this company is 'Grevak'.

Pipe Supports

a) General

This sub-clause deals with pipe supports securing pipes to the structure of buildings for above ground application.
The variety and type of support shall be kept to a minimum and their design shall be such as to facilitate quick and secure fixings to metal, concrete, masonry or wood.
Consideration shall be given, when designing supports, to the maintenance of desired pipe falls and the restraining of pipe movements to a longitudinal axial direction only.

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

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

b) Steel and Copper Pipes and Tubes

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

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

Size Nominal Bores	**Copper Tube to B.S. 659**	**Steel Tube to B.S. 1387**
15mm	1.25m	2.0m
20mm	2.0m	2.5m
25mm	2.0m	2.5m
32mm	2.5m	3.0m
40mm	2.5m	3.0m
50mm	2.5m	3.0m
65mm	3.0m	3.5m
80mm	3.0m	3.5m
100mm	3.0m	4.0m
125mm	3.0m	4.5m
150mm	3.5m	4.5m

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

c) 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

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

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

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

Sanitary Appliances

All sanitary appliances supplied and installed as part of the Sub-contract works shall comply with the general requirements of B.S. Code of Practice 305 and the particular requirements of the latest B.S. Specifications.

Pipe Sleeves

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

INSTALLATION

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.

Above Ground Installation

a) Water Services

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

Where falls are not shown on the Contract Drawings or stated elsewhere in the Specification, pipework shall be installed parallel to the lines of the buildings and as close to the walls, ceilings, columns, etc., as is practicable.

All water systems shall be provided with sufficient drain points and automatic air vents to enable them to function correctly.

Valves and other user equipment shall be installed with adequate access for operation and maintenance. Where valves and other operational equipment are unavoidably installed beyond normal reach or in such position as to be difficult to reach from a small step ladder, extension spindles with floor or wall pedestals shall be provided.

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

Full allowances shall be made for the expansion and contraction of pipework, precautions being taken to ensure that any force produced by the pipe movements are not transmitted to valves, equipment or plant. All screwed joints to piping and fittings shall be made with P.T.F.E. tape.
The test pressure shall be maintained by the pump for about one hour and if there is any leakage, it shall be measured by the quantity of water pumped into the main in that time. A general leakage of 4.5 litres per 25mm of diameter, per 1.6 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 system 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 waste fittings are discharged to a gully trap before passing to the sewer via a manhole.

The Sub-contractor shall provide all necessary rodding and inspection facilities within the draining system in positions where easy accessibility is available.Where a branch requires rodding facilities in a position to which normal access is unobtainable, then that branch shall be extended so as to provide a suitable purpose made rodding eye in the nearest adjacent wall or floor to which easy access is available.

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

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

c) Sanitary Appliances

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

Underground Water Mains

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

A long main shall be tested in sections as the work of laying proceeds and all joints shall be exposed for inspection during the testing. The open end of the main may be temporarily closed for testing under moderate pressure by fitting a water pipe expanding plug, of which several types are available.

The end of the main and the plug should be secured by struts or otherwise, 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 a socket valve with a plug and the wedge shall be placed in the open position while testing.

The Contractor shall provide suitable end supports to withstand the end thrust of the water pressure in the main.

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 Contractor may test the Pipelines in sections.

Any such section found to be satisfactory need not be the subject of a further test when system has been completed, unless specifically requested by the Engineer. During the test, each branch and joint shall be examined carefully for leaks and any defects revealed shall be made good by the Contractor and the section retested.

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

Underground Drainage System

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

Short branch drains connected to a main drain between manholes shall be tested as one system with a 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 this 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 10.36mm head at any point in the section.

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

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

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

TESTING AND INSPECTION

Site Tests – Pipework Systems

a) Above Ground Internal Water Services Installation

All water service pipe system installed above ground shall be tested hydraulically for a period of one hour to not less than one and half times to design working pressure. If preferred, the Sub-contractor may test the pipelines in sections. Any such section found to be satisfactory need not be the subject of a further test when 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.

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

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 pre-formed fibre glass lagging to a thickness of 25mm where the pipe runs above a false ceiling or in areas where the ambient temperature is higher than normal with the result that pipe "sweating", due to condensation will cause nuisance.

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

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

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

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

In all respects, unless otherwise stated, the hot and cold water installation shall be carried out in accordance with the best standard of modern practice 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 of large diameter, by a power driven test pump which shall not be left unattended. In either case precautions shall be taken to ensure that the required pressure is not exceeded.

Pressure gauges should be recalibrated before the tests.

The Sub-contractor shall be deemed to have included in his price for all test pumps, and other equipment required under this specification.

The test pressure shall be one and a half times the maximum working pressure except where a pipe is manufactured from a material for which the relevant B.S. specification designates a maximum test pressure.

STERILISATION OF HOT AND COLD WATER SYSTEM

All water distribution system shall be thoroughly sterilised and flushed out after the completion of all tests and before being fully commissioned for handover.

The sterilisation procedures shall be carried out by the Sub-contractor in accordance with the requirements of B.S. Code of Practice 301, Clause 409 and to the approval of the Engineer.

PLUMBING PIPES SPECIFICATION

- Impact Strength of over 45 avg ft/lbs tested by ASTM D2444 Standard Practice for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings
- Biofilm Formation Potential of less than 120 pg ATP/cm2
- integrates specialized additives that protect the pipe from UV
- To meet the requirement of having a flame spread index of 0-25 and a smoke developed index of 0-50 (25/50 rating) when tested in accordance with ASTM E84/UL723

Item	Parameter	Required
A	Material	Chlorinated Polyvinyl Chloride
B	Tensile Strength (MPa at 23°C)	High.55 MPa
C	Flow Rate	High due to higher ID
D	Jointing	cold fusion as done by solvent joint
E	Scale Formation/ Calcination	No scale formation, pitting and corrosion
F	Fire Retardance	LOI = 60%. Self extinguishes
G	Bacterial Growth	Less than 5000Kbe/cm
H	Thermal Conductivity	0.14W/MK Less energy loss
I	Coefficient of Thermal expansion	0.7x10 mm/mk less supports, less snaking.
J	Effect of UV	Dehydrochlorination reaction. Temp and pressure bearing capacity remains unaffected
K	Oxygen Permeation	Less than 1 cm3 /m day atmosphere (at 70°C) No corrosion risk
L	Reliability	Being in production for at least 20 years
M	Maximum Temperature	93 degrees centigrade
N	Resistance to water disinfectant (Chlorine)	Not affected by chlorine in water supply or by pH of Water

Certified to

- EN ISO 15877, which specifies the material is approved for use in hot and cold water distribution systems
- ASTM F656, standard for using a primer for potable water and sewer pipe
- NSF-61 Annex G certification, which verifies the material leaches almost no lead into the water.

PIPE SCHEDULE

Temperature and Pressure Tolerance

Item	Temperature (degrees centigrade)	Working Pressure for PN16(bar)	Working Pressure for PN20(bar)	Working Pressure for PN25(bar)
A	20	16	20	25
B	40	11	14	17
C	60	6	8	10
D	80	4	5	6
E	95	2	3	4

HANGERS AND SUPPORT

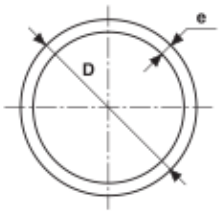
- Piping should not be anchored tightly to supports, but rather secured with smooth straps or hangers that allow for movement caused by expansion and contraction.
- Hangers should not have rough or sharp edges which come in contact with the tubing.

Item	Pipe size(mm)	Hangers Spacing			
		Horizontal			Vertical
		20 ° C	60 ° C	80 ° C	
A	16	850	700	600	1000
B	20	950	850	750	1200
C	25	1050	950	850	1300
D	32	1200	1100	1000	1400
E	40	1300	1150	1150	1500
F	50	1500	1450	1350	1700
G	63	1700	1650	1550	2000

PIPES

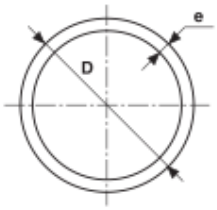
CPVC pipes SDR-11 for 15 mm (½") to 50 mm (2")
CPVC Schedule 40 pipes to ASTM F-441

PN 16



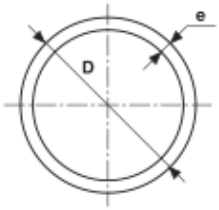
Diameter D	e/mm	PN	Description	Unit	Weight per meter (Kg)	Internal Diameter (mm)
16	1,4	16	TUBE CPVC	ML	0,111	13,20
20	1,5	16	TUBE CPVC	ML	0,151	17,00
25	1,9	16	TUBE CPVC	ML	0,234	21,20
32	2,4	16	TUBE CPVC	ML	0,379	27,20
40	3	16	TUBE CPVC	ML	0,590	34,00
50	3,7	16	TUBE CPVC	ML	0,910	42,60
63	4,7	16	TUBE CPVC	ML	1,460	53,60
75	5,6	16	TUBE CPVC	ML	2,100	63,80
90	6,7	16	TUBE CPVC	ML	2,900	76,60
110	8,1	16	TUBE CPVC	ML	4,310	93,80
125	9,2	16	TUBE CPVC	ML	5,460	106,60
140	10,3	16	TUBE CPVC	ML	6,850	119,40
160	11,8	16	TUBE CPVC	ML	9,070	136,40

PN 20



Diameter D	e/mm	PN	Description	Unit	Weight per meter (Kg)	Internal Diameter (mm)
16	1,5	20	TUBE CPVC	ML	0,115	13,00
20	1,9	20	TUBE CPVC	ML	0,187	16,20
25	2,3	20	TUBE CPVC	ML	0,270	20,40
32	2,9	20	TUBE CPVC	ML	0,470	26,20
40	3,7	20	TUBE CPVC	ML	0,701	32,60
50	4,6	20	TUBE CPVC	ML	1,090	40,80
63	5,8	20	TUBE CPVC	ML	1,720	51,40
75	6,8	20	TUBE CPVC	ML	2,420	61,40
90	8,2	20	TUBE CPVC	ML	3,750	73,60
110	10	20	TUBE CPVC	ML	5,130	90,00
125	11,4	20	TUBE CPVC	ML	6,620	102,20
140	12,7	20	TUBE CPVC	ML	8,200	114,60
160	14,6	20	TUBE CPVC	ML	10,800	130,80

PN 25

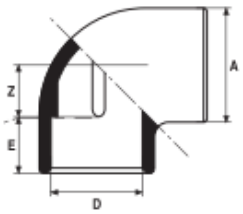


Diameter D	e/mm	PN	Description	Unit	Weight per meter (Kg)	Internal Diameter (mm)
16	1,8	25	TUBE CPVC	ML	0,140	12,40
20	2,3	25	TUBE CPVC	ML	0,220	15,40
25	2,8	25	TUBE CPVC	ML	0,330	19,40
32	3,6	25	TUBE CPVC	ML	0,490	24,80
40	4,5	25	TUBE CPVC	ML	0,830	31,00
50	5,6	25	TUBE CPVC	ML	1,290	38,80
63	7,1	25	TUBE CPVC	ML	2,020	48,80
75	8,4	25	TUBE CPVC	ML	2,880	58,20
90	10,1	25	TUBE CPVC	ML	4,250	69,80
110	12,3	25	TUBE CPVC	ML	6,160	85,40
125	14	25	TUBE CPVC	ML	7,90	97,00
140	15,7	25	TUBE CPVC	ML	9,920	108,60
160	17,9	25	TUBE CPVC	ML	12,910	124,20

PIPE FITTINGS

- CPVC pipes SDR-11 fittings to per ASTM D2846 for pipes Sizes 15 mm (½") to 50 mm (2")
- Schedule 40 fittings to ASTM F-438 for pipe Sizes above 50 mm (2")

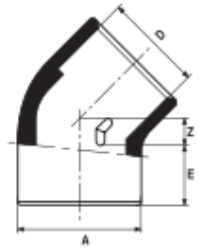
Elbow 90°



Dn	Reference	A(min)	D(avg)	Z(avg)	E(min)
16	GIC 16	21,2	16,2	9,0	14,0
20	GIC 20	26,6	20,2	11,0	16,0
25	GIC 25	32,95	25,35	13,5	25,0
32	GIC 32	40,35	32,35	17,0	30,0
40	GIC 40	50,35	40,35	21,0	35,0
50	GIC 50	62,95	50,35	26,0	41,0
63	GIC 63	76,15	63,35	32,5	50,0
75	GIC 75	90,65	75,45	38,5	60,0
90	GIC 90	108,65	90,45	46,0	72,0
110	GIC 110	132,45	110,45	56,0	88,0

Notes: All dimensions are in mm

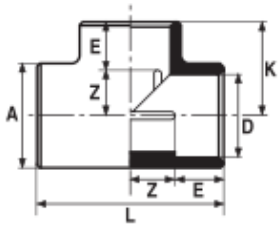
Elbow 45°



Dn	Reference	A(min)	D(avg)	Z(avg)	E(min)
16	HIC 16	21,2	16,2	4,5	14,0
20	HIC 20	26,6	20,2	5,0	16,0
25	HIC 25	32,8	25,2	6,0	18,5
32	HIC 32	40,35	32,35	7,5	30,0
40	HIC 40	50,35	40,35	9,5	35,0
50	HIC 50	60,35	50,35	11,5	41,0
63	HIC 63	76,15	63,35	14,0	50,0
75	HIC 75	90,65	75,45	16,5	60,0
90	HIC 90	108,65	90,45	19,5	72,0
110	HIC 110	132,45	110,45	24,0	88,0

Notes: All dimensions are in mm

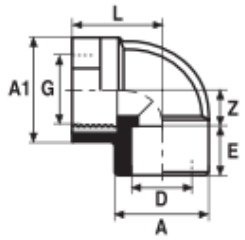
Tee 90°



Dn	Reference	A(min)	D(avg)	Z(avg)	E(min)	K	L
16	TIC 16	21,2	16,2	9,0	14,0	23,0	46,0
20	TIC 20	26,6	20,2	11,0	16,0	27,0	54,0
25	TIC 25	32,95	25,35	13,5	25,0	38,5	77,0
32	TIC 32	40,35	32,35	17,0	30,0	47,0	94,0
40	TIC 40	50,35	40,35	21,0	35,0	56,0	112,0
50	TIC 50	62,95	50,35	26,0	41,0	67,0	134,0
63	TIC 63	76,15	63,35	32,5	50,0	82,5	165,0
75	TIC 75	90,65	75,45	38,5	60,0	98,5	197,0
90	TIC 90	108,65	90,45	46,0	72,0	118,0	236,0
110	TIC 110	132,45	110,45	56,0	88,0	144,0	288,0

Notes: All dimensions are in mm

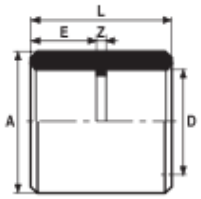
Elbow Metal Reduced and Threaded



Dn	Reference	A(min)	D(avg)	Z(avg)	E(min)	G	A1	L
16x½"	GIRC 16x½"	21,2	16,2	9,0	14,0	½"	39,8	28,5
20x½"	GIRC 20x½"	26,75	20,35	11,0	20,0	½"	42,0	27,5
25x¾"	GIRC 25x¾"	32,95	25,35	13,5	25,0	¾"	43,0	33,8
32x1"	GIRC 32x1"	40,35	32,35	17,0	30,0	1"	49,3	39,7

Notes: All dimensions are in mm

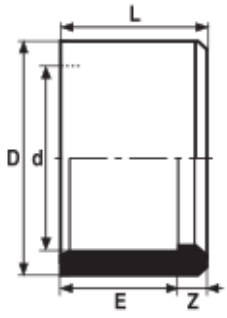
Sleeves



Dn	Reference	A(min)	D(avg)	Z(avg)	E(min)	L
16	MIC 16	21,2	16,2	3,0	14,0	31,0
20	MIC 20	26,6	20,2	3,0	16,0	35,0
25	MIC 25	32,95	25,35	3,0	25,0	53,0
32	MIC 32	40,35	32,35	3,0	30,0	63,0
40	MIC 40	50,35	40,35	3,0	35,0	73,0
50	MIC 50	62,95	50,35	3,0	41,0	85,0
63	MIC 63	76,15	63,35	3,0	50,0	103,0
75	MIC 75	90,65	75,45	4,0	60,0	124,0
90	MIC 90	108,65	90,45	5,0	72,0	149,0
110	MIC 110	132,45	110,45	6,0	88,0	182,0

Notes: All dimensions are in mm

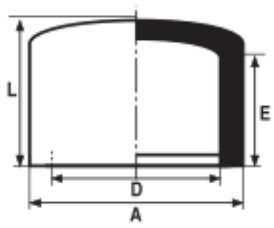
Reduction



Dn	Reference	D(min)	d(avg)	Z(avg)	E(min)	L(min)
20/16	DIC 20/16	20,0	16,35	4,0	16,0	20,0
25/20	DIC 25/20	25,0	20,35	5,0	20,0	25,0
32/20	DIC 32/20	32,0	20,35	10,0	20,0	30,0
32/25	DIC 32/25	32,0	25,35	5,0	25,0	30,0
40/20	DIC 40/20	40,0	20,35	15,0	20,0	35,0
40/25	DIC 40/25	40,0	25,35	10,0	25,0	35,0
40/32	DIC 40/32	40,0	32,35	5,0	30,0	35,0
50/20	DIC 50/20	50,0	20,35	15,0	20,0	35,0
50/25	DIC 50/25	50,0	25,35	16,0	25,0	41,0
50/32	DIC 50/32	50,0	32,35	11,0	30,0	41,0
50/40	DIC 50/40	50,0	40,35	6,0	35,0	41,0
63/32	DIC 63/32	63,0	32,35	20,0	30,0	50,0
63/40	DIC 63/40	63,0	40,35	15,0	35,0	50,0
63/50	DIC 63/50	63,0	50,35	9,0	41,0	50,0
75/50	DIC 75/50	75,0	50,35	19,0	41,0	60,0
75/63	DIC 75/63	75,0	63,35	10,0	50,0	60,0
90/75	DIC 90/75	90,0	75,45	12,0	60,0	72,0
110/90	DIC 110/90	110,0	90,45	16,0	72,0	88,0

Notes: All dimensions are in mm

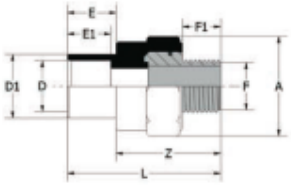
End Cap



Dn	Reference	A(min)	D(Avg)	E(min)	L(min)
16	CIC 16	21,2	16,2	14,0	19,5
20	CIC 20	26,6	20,2	16,0	22,2
25	CIC 25	32,8	25,2	18,5	25,3
32	CIC 32	40,35	32,35	30,0	37,0
40	CIC 40	50,35	40,35	35,0	43,0
50	CIC 50	62,95	50,35	41,0	50,3
63	CIC 63	79,15	63,35	50,0	60,9
75	CIC 75	93,85	75,45	60,0	73,2
90	CIC 90	112,65	90,45	72,0	88,1
110	CIC 110	137,45	110,45	88,0	107,5

Notes: All dimensions are in mm

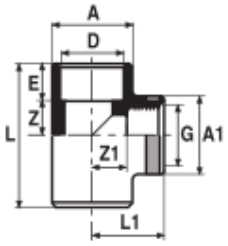
Reduced Metal Sleeve



Dn	Reference	D1(min)	D(avg)	A	E1	E	F	F1	L	Z
25x½"	KRGC 25x½"	32,95	25,35	40,8	25,0	28,0	½"	13,7	59,5	43,0
32x¾"	KRGC 32x¾"	40,35	32,35	47,5	30,0	33,0	¾"	16,6	65,0	47,5

Notes: All dimensions are in mm

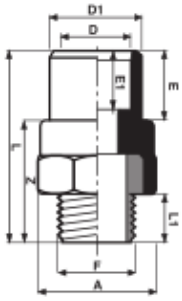
Tee Metal Threaded



Dn	Reference	A(min)	D(avg)	Z(avg)	E(min)	L	G	A1	Z1	L1
16x½"	TIRC 16x½"	21,2	16,2	9,0	14,0	46,0	½"	39,5	15,0	30,0
20x½"	TIRC 20x½"	26,75	20,35	11,0	20,0	62,0	½"	42,5	13,5	30,0
25x¾"	TIRC 25x¾"	32,95	25,35	13,5	25,0	77,0	¾"	43,0	16,5	34,5
32x1"	TIRC 32x1"	40,35	32,35	17,0	30,0	94,0	1"	49,2	20,0	40,5

Notes: All dimensions are in mm

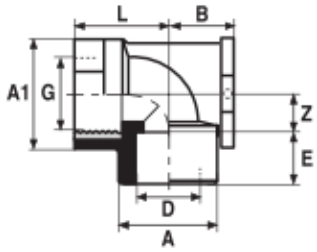
Metal Sleeves Male



Dn	Reference	D1(min)	D(avg)	A	E1	E	F	L1	L	Z
16x½"	KIGC 16x½"	21,2	16,2	39,5	14,0	16,0	½"	12,0	46,7	30,5
20x½"	KIGC 20x½"	26,75	20,35	34,9	20,0	19,0	½"	12,0	48,0	29,5
25x¾"	KIGC 25x¾"	31,75	25,35	40,8	25,0	15,6	¾"	13,7	59,5	43,0
32x1"	KIGC 32x1"	40,35	32,35	47,5	30,0	17,0	1"	16,6	65,0	47,5
40x1¼"	KIGC40x1¼"	48,55	40,35	59,5	35,0	19,5	1¼"	22,0	75,5	56,0
50x1½"	KIGC50x1½"	60,35	50,35	69,0	41,0	26,5	1½"	20,0	81,0	54,5
63x2"	KIGC 63x2"	76,15	63,35	81,0	50,0	33,7	2"	26,5	98,5	64,0

Notes: All dimensions are in mm

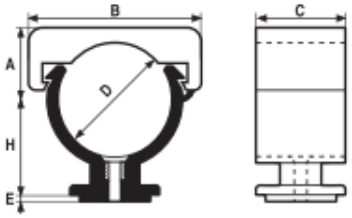
Wall Mount Elbow



Dn	Reference	A(min)	D(avg)	Z(avg)	E(min)	G	A1	L	B
20x½"	20x½"	26,75	20,35	11,0	20,0	½"	42,0	27,0	12,5
25x¾"	25x¾"	32,95	25,35	13,5	25,0	¾"	46,5	34,0	17,5

Notes: All dimensions are in mm

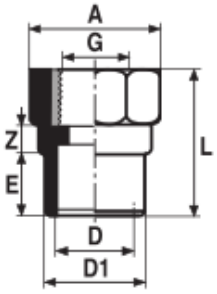
Bracket for Pipe



Dn	Reference	D	A	B	C	E	H
20	MDC 20	20,5	10,0	31,5	16,0	1,9	18,0
25	MDC 25	25,5	11,0	38,0	16,0	1,9	21,0
32	MDC 32	32,8	15,0	48,0	18,0	2,7	25,5

Notes: All dimensions are in mm

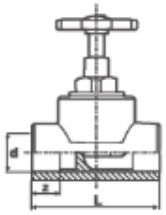
Sleeve Female Metal Threaded



Dn	Reference	D1(min)	D(avg)	A	E(min)	G	Z	L
16x½"	MIRC 16x½"	21,2	16,2	39,5	14,0	½"	3,0	34,5
20x½"	MIRC 20x½"	26,75	20,35	39,5	20,0	½"	3,0	35,2
25x¾"	MIRC 25x¾"	32,95	25,35	45,5	25,0	¾"	3,0	48,0
32x1"	MIRC 32x1"	40,35	32,35	50,5	30,0	1"	3,0	48,5
40x1¼"	MIGC 40x1¼"	48,55	40,35	60,0	35,0	1¼"	3,0	54,5
50x1½"	MIGC 50x1½"	60,35	50,35	69,0	41,0	1½"	3,0	61,0
63x2"	MIGC 63x2"	76,15	63,35	81,0	50,0	2"	3,0	72,0

Notes: All dimensions are in mm

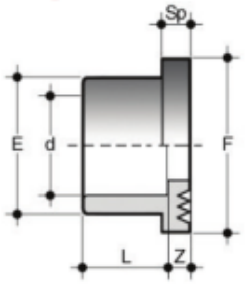
Stop Valve



Dn	Reference	d(avg)	Z(min)	L
20x½"	VKIK 20x½"	20.35	20.0	62.0
25x¾"	VKIK 25x¾"	25.35	25.0	77.0
32x1"	VKIK 32x1"	32,35	30.0	94.0

Notes: All dimensions are in mm

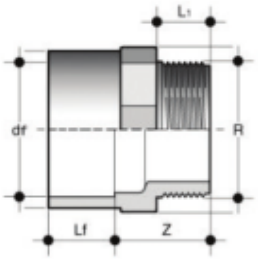
Flange Hub



Dn	Reference	d(avg)	E(min)	L	Z	SP	F
63	Colet 63	63.35	82.0	41.0	3.0	9.0	90.0
75	Colet 75	75.45	89.5	43.5	3.0	10.0	105.0
90	Colet 90	90.45	107.5	49.0	5.0	11.0	125.0
110	Colet 110	110.45	131.0	63.0	5.0	14.0	158.0

Notes: All dimensions are in mm

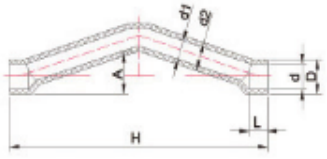
Sleeve Male Threaded



Dn	Reference	df(avg)	Lf(min)	L1(min)	Z	R
25x¾"	KIFC 25x¾"	25.35	25.0	16.3	27.0	¾"
32x1"	KIFC 32x1"	32.35	30.0	19.1	30.5	1"
40x1¼"	KIFC 40x1¼"	40.35	35.0	21.4	35.0	1¼"
50x1½"	KIFC 50x1½"	50.35	41.0	21.4	35.0	1½"
63x2"	KIFC 63x2"	63.35	50.0	25.7	41.0	2"
75x3"	KIFC 75x3"	75.45	60.0	34.5	46.5	3"
90x4"	KIFC 90x4"	90.45	72.0	41.0	52.0	4"

Notes: All dimensions are in mm

Step over bend



Dn	Reference	d(avg)	D(min)	L(min)	H(min)	A	d1	d2
20	SOBC 20	20.2	28.0	16.0	160.0	26,5	14,0	21,8
25	SOBC 25	25.2	34.8	18.5	180.0	29,5	17,7	26,7
32	SOBC 32	32.2	42.0	22.0	220.0	32,5	22,2	32,0

Notes: All dimensions are in mm

Elbow 45°

Expansion Loop

Coupler

Elbow 90°

Tee (Brass)

Cross Tee

Powder Coated
Metal Clamp

Union

Male Adaptor
Plastic Threaded
(MAPT)

Female Adaptor
Plastic Threaded
(FAPT)

End Cap

Equal Tee

Female Adaptor Brass
Threaded (FABT)

Step Over Bend

Reducer Elbow 90°

Tank Nipple

Reducer Tee

Flange Open

Flange Closed

Reducing Bush

Elbow 90° Brass

Reducer Coupler

Converter Bushing

INSTALLATION

Cutting

- CPVC pipe can be cut with a wheel-type plastic tube cutter, a hack saw or other fine toothed hand or power saw.
- Use of ratchet cutters is permitted, provided blades are sharpened regularly. A miter box should be used to ensure a square cut when using a saw.
- Pipes to be cut as squarely as possible to provide an optimal bonding area within the joint.
- If any indication of damage or cracking is evident at the pipe end, cut off at least 5 cm beyond any visible crack.

Deburring / Beveling

- Burrs and filings can prevent proper contact between pipe and fitting during assembly, and should be removed from the outside and inside of the pipe.
- A chamfering tool is preferred for this purpose. A slight bevel on the end of the pipe will ease entry of the pipe into the fitting socket and minimize the chances of pushing solvent cement to the bottom of the joint.

Fitting Preparation

- Any dirt or moisture must be wiped from the fitting socket and pipe end.
- Check the dry fit of the pipe and fitting.
- The pipe should make contact with the socket wall 1/3 to 2/3 of the way into the fitting socket.
- Pipe should not bottom out in the socket.

Solvent Cement Application

- Only CPVC approved cement to be used

Assembly

- Immediately insert the pipe into the fitting socket, rotating the pipe 1/4 to 1/2 turn while inserting. This motion ensures an even distribution of cement within the joint. Properly align the fitting. Hold the assembly for approximately 10 seconds, allowing the joint to set.
- An even bead of cement should be evident around the joint. If this bead is not continuous around the socket edge, it may indicate that insufficient cement was applied. In this case remake the joint to avoid potential leaks.

ALL PIPE AN FITTINGS TO BE AS CPVC FLOWGUARD OR EQUAL

PLUMBING PIPES SPECIFICATION
EXTERNAL PLUMBING

Item	Parameter	Required
A	Material	PE100 raw material
B	Tensile Strength	High.55 MPa
C	Flow Rate	High due to higher ID
D	Jointing	cold fusion as done by solvent joint
E	Scale Formation/ Calcination	No scale formation, pitting and corrosion
F	Fire Retardance	Less than 0.14W/MK Less energy loss
G	Bacterial Growth	Less than 5000Kbe/cm
H	Thermal Conductivity	
I	Thermal Expansion	Low. 0.7x10 mm/mk less supports, less snaking.
J	Effect of UV	Dehydrochlorination reaction. Temp and pressure bearing capacity remains unaffected
K	Oxygen Permeation	Less than 1 cm3 /m day atmosphere (at 70°C) No corrosion risk
L	Reliability	Being in production for at least 20 years
	Maximum Temperature	93 degrees centigrade
	Jointing	Fittings can be fabricated for butt welding, extrusion welding (butt fusion) and electrofusion welding.

- Manufactured to ISO 4427 standards, and carry the KEBS KS-ISO 4427
- Fittings can be fabricated for butt welding, extrusion welding (butt fusion) and electrofusion welding.

HDPE COMPRESSION FITTINGS

Polypropylene (PP) Compression fittings are approved for use in contact with drinking water. These fittings offer joint security for metric OD polyethylene (PE) pipes and form a seal without distorting the pipe or restricting the pipe bore. The PP Compression fittings range is suitable for potable water distribution mains and irrigation systems

- Joints Body: black Polypropylene
- Lock-nut: blue Polypropylene (RAL 5012)
- Gasket: 75 Shore (NBR) nitric rubber
- Locking ring: white polyacetale
- Reinforced rings: Stainless steel AISI 430
- Clamp Saddles Body and gasket: black Polypropylene

COUPLING

Size (mm)
16
20
25
32
40
50
63
75
90
110

FLANGED JOINT WITH METAL FLANGE

Size (mm)
50
63
75
90
110

FEMALE ADAPTOR

Size (mm)
16
20
25
32
40
50
63
75
90
110

45° ELBOW WITH THREADED MALE OFFTAKE

Size(mm)
25
32
40
50
63
120

END CAP

Size (mm)
16
20
25
32
40
50
63
75
90
110

90° REDUCING ELBOW

Size(mm)
20 - 15
25 - 20

MALE ADAPTOR WITH THREADED METAL-GI

Size(mm)
20
25
32
40
50
63

MALE ADAPTOR WITH THREADED METAL-BRASS

Size(mm)
20
25
32
40
50
63

45° ELBOW

Size(mm)
20
25
32
40
50
63

FEMALE ADAPTOR WITH METAL OFFTAKE (BRASS)

Size (mm)
20
25
32
40
50
63

90° MALE ELBOW WITH THREADED METAL (NICKELED BRASS)

Size(mm)
20
25
32
40

FEMALE ADAPTOR WITH METAL-(NICKELED BRASS)

Size(mm)
20
25
32
40
50
63

BLANKING PLUG

Size (mm)
20
25
32
40
50

METAL TIGHTENING WRENCH

Size(mm)
16 - 32
40 - 63
75 - 110

90° MALE ELBOW WITH THREADED METAL (BRASS)

Size(mm)
20
25
32
40
50
63

90° TEE

Size
16
20
25
32
40
50
63
75
90
110

REPAIRING COUPLING(WITHOUT PIPE STOP)

Size
120
25
32
40
50
63
75
90
110

MALE ADAPTOR

Size
16
20
25
32
40
50
63
75
90
110

90° TEE WITH THREADED FEMALE OFFTAKE

Size
16
20
25
32
40
50
63
75
90
110

90° REDUCING-INCREASING TEE

Size
20 - 16 - 20
20 - 25 - 20
25 - 20 - 25
25 - 32 - 25
32 - 25 - 32
40 - 32 - 40
50 - 32 - 50
50 - 40 - 50
63 - 32 - 63
63 - 50 - 63

REDUCING COUPLING

Size
20 - 16
25 - 16
25 - 20
32 - 20
32 - 25
40 - 25
40 - 32
50 - 32
50 - 40
63 - 50
110 - 90

90° ELBOW WITH THREADED FEMALE OFFTAKE

Size
16
20
25
32
40
50
63
75
90
110

90° ELBOW WITH THREADED MALE OFFTAKE

Size
16
20
25
32
40
50
63
75
90
110

90° ELBOW

Size
16
20
25
32
40
50
63
75
90
110

Specifications Size
63 x 1/ "
63 x 3/4 "
63 x 1"
63 x 1 1/2 "
63 x 1 1/2 "
75 x 1/2"
75 x 3/4 "
75 x 1"
75 x 1 1/4 "
75 x 1 1/2"
75 x 2"

Specifications Size
90 x 1/2 "
90 x 3/4 "
90 x 1"
90 x 1 1/4"
90 x 1 1/2 "
90 x 2"
110 x 1/2"
110 x 3/4 "
110 x 1"
110 x 1 1/4 "
110 x 1 1/2"

Mechanical joint

PRESSURE TEST RECORD

Site name

Date

Address

Contractor Name

Plumber Name

Floor level

Floor/Wing

Room/Office

Starting Time of the Procedure……..

Testing Pressure ……

Duration	**Time**	**Recorded Pressure Readings (Bar)**	**Comment**
Starting Time			
1 hour			
2 hours			
4 Hours			
6 Hours			
8 Hours			
12 Hours			
24 Hours			

Certification

Plumber Name……..……..Date……

Engineers Rep (COW) Name…….……Date……..

Testing Procedure

- Disconnect ancillary equipment that may not be designed to withstand test pressures, e.g. shower, boiler, etc. Manufacturer's data should be consulted.
- Check all system high points for location of air vents.
- Blank or plug any open ends including float valves. Close valves where sub-sections only are being tested.
- Open all valves in the enclosed section under test.
- Attach test pump to a convenient point with non-return valve and testing gate valve
- Start filling the system by pump priming and replenishing the pump water reservoir.
- Ventilate air from high points until water shows.
- When the system is full, raise the pressure as required.
- Remove the pump and leave the system primed
- If pressure falls, check joints, valves, etc. for leakage.
- When the test is satisfied, ensure the appropriate documentation is signed.
- Physical examination of the system for any leakages

Test requirements

Test required test pressure is applied and maintained for initial 30 minutes for bleeding air out of the pipeline/system.
Test is satisfied if: there is no visible leakage and the pressure drop is a maximum of 5% of the start testing pressure.

Testing Notes

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 or the design pressure. Testing shall be carried out as soon as practical after laying and when the pipeline is adequately anchored. Precautions shall be taken to eliminate all air from the test section and to fill the pipe slowly to avoid risk of damage due to surge. All water service pipe system installed above ground shall be tested hydraulically for a period of one hour to not less than one and half times to design working pressure.

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

The test pressure shall be applied by means of a manually operated test pump or, in the case of long main or mains of large diameter, by a power driven test pump which shall not be left unattended. In either case precautions shall be taken to ensure that the required pressure is not exceeded. Pressure gauges should be recalibrated before the tests. The Sub-contractor shall be deemed to have included in his price for all test pumps, and other equipment required under this specification.

The test pressure shall be one and a half times the maximum working pressure except where a pipe is manufactured from a material for which the relevant B.S. specification designates a maximum test pressure.
Note: If further testing is required, it should be done in intervals of 1hour up to 8hours (working hours). For overnight testing, the last recorded pressure before close of business and the first reading in the morning should be captured.

DRAINAGE PIPING

- Drainage Piping shall be with specifications as follows
    - Raw material - **100% VIRGIN Polyvinyl chloride (PVC-U)**
    - Stabilizers - Non-lead/ Organic
    - Jointing method - Rubber ring or Solvent Weld
    - Density (g/cm3) - 1.40
    - Yield strength (N/mm2) - 50 – 55
    - E-modulus (N/mm2) - 3000
    - Melting point - Ca. 90ºC
    - Vicat softening point - 80ºC
    - Specific heat - 1.00 kJ/kg • K
    - Colour Light Grey to BS EN 1329-1:2000 and quality to BS 5255
    - Colour Brown to BS EN 1401-1:1998 and quality to BS 4660
    - Coefficient of heat conduction - 0.16 W/mK
    - Tensile Strength : Min. 45 N/mm2
- Jointing by Rubber Ring/Solvent Weld
- With all associated fittings
    - WC Connectors
    - Vent pipes and caps
    - Air admittance valves
    - Traps/siphons
    - Floor gullies
    - Access fittings
    - Connectors and reducers
- 15° chamfer is applied to all spigot ends for rubber ring pipe.

Item	Parameter	Value	Test method
A	Impact Resistance	TIR ≤ 10%	EN 744
B	Vicat Softening	≥ 79°C	EN 727
C	Longitudinal Reversion	≤ 5%	EN 743
D	Dichloromethane Acid Resistance	No attack	EN 580
E	Water Tightness of Rubber Ring Joint	No leakage	EN 1277
F	Elevated Temp. Cycling	No leakage	EN 1055
G	Long Term Performance of TPE Seals	90 days ≥ 1.3 bar	EN 1989
		100 years ≥ 0.6 bar	EN 1989
H	Resistance to Internal Pressure	No failure during the test 10.0MPA for 1000 hours, at 60°C	EN 921

Item	Pipe Size (mm)	Mean outside diameter(mm)	Wall thickness (mm)
A	36	36.5	3.5
B	43	43.1	3.5
C	56	56.1	3.5
D	82	82.3	3.5
E	110	110.3	3.5
F	160	160.4	3.8

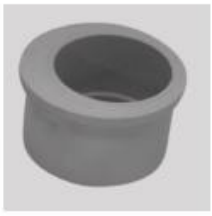
PIPE FITTINGS

BEND 90° - SWR

Sizes
11/4"
11/2"
2"
3" (82mm)

BEND 45° - SWR

Sizes
4" (110mm) Bend 45°



REDUCING BUSH - SWR

Sizes
11/4"
11/2"
2"
3" (82mm)

W.C. CONNECTOR - SWR

Sizes
W.C. Connector Straight 4" (110mm)

SHOWER TRAP - SWR

Sizes
4" (110mm) Tee

BOSS CONNECTOR - SWR

Sizes
4' (110mm) x 11/4"
4' (110mm) x 11/2"
4' (110mm) x 2"

FLOOR TRAP - SWR

Description
Complete with Grill and Tile
Grill and Tile (inlet)
Main Trap
Grill

INSPECTION BEND 90° - SWR

Sizes
4" (110mm) Inspection Bend 90°

VENT COWL - SWR

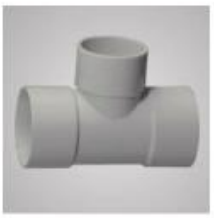
Description
4' (110mm)

ACCESS PLUG - SWR

Sizes
11/4"
11/2"
2"

TEE SWR

Sizes
11/4"
11/2"
2"
3" (82mm)



TEE SWR

Sizes
4" (110mm) Tee

INSPECTION TEE

Sizes
4" (110mm) Bend 90°

SECTION NAME:

FIRE HOSEREEL SPECIFICATIONS

FIRE HOSEREEL SPECIFICATION

PARTICULAR SPECIFICATIONS FOR PORTABLE FIRE EXTINGUISHER AND HOSE REEL INSTALLATIONS

1.0.1 GENERAL

The particular specification details the requirements for the supply and installation and commissioning of the Portable Fire Extinguishers and Boosted Hose Reel System.

The Sub-contractor shall include for all appurtenances and appliances not necessarily called for in this specification or shown on the contract drawings but which are necessary for the completion and satisfactory functioning of the works.

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

1.0.2 SCOPE OF WORKS

The Sub-contractor shall supply, deliver, erect, test and commission all the portable fire extinguishers and Hose Reel which are called for in these Specifications, Bills of quantities and as shown on the Contract Drawings.

1.0.3 WATER/CO2 EXTINGUISHERS

These shall be 9-litre water filled CO2 cartridge operated portable fire extinguishers and shall comply with B.S. 1382: 1948 and to the requirements of B.S.4523: 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 manufacturer 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 24.1 bar (350 psi.).

h) The number of British Standard 'B.S' 1382 or B.S. 5423: 1977.

1.0.4 CARBON DIOXIDE FIRE EXTINGUISHERS

These shall be portable carbon dioxide fire extinguishers and shall comply with B.S. 3326: 1960 and B.S. 5423: 1977.

The body of extinguisher shall be a seamless steel cylinder manufactured to one of the following British Standards; B.S. 401 or B.S. 1288.

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

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

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

The following markings shall be applied to the extinguishers:-

a) The words "Carbon Dioxide Fire Extinguisher" and to include the appropriate nominal gas content.

b) Method of operation.

c) The words "Re-charge immediately after use".

d) Instructions for periodic checking.

e) The number of the British Standard B.S. 3326: 1960 or B.S. 5423.

f) The manufacturers name or identification markings

1.0.5 DRY CHEMICAL POWDER PORTABLE FIRE EXTINGUISHER

The portable dry powder fire extinguishers shall comply with BS3465: 1962 and BS 5423. The body shall be constructed to 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 not-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 1,060mm 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 word "Dry Powder Fire Extinguisher"

b) Method of operation in prominent letters.

c) The working pressure and the weight of the powder charge in Kilogramme.

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.

1.0.6 AIR FOAM FIRE EXTINGUISHER

These shall be of 9 litres capacity complete with refills cartridges and wall fixing brackets and complying with B.S. 5423 with the following specifications:-

Cylinder: to B.S. 1449

Necking: to be 76mm outside diameter steel EN 3A $2^3/_4$ X 8TPI female thread**.**

Head cap: to be plastic moulding acetyl resin.

CO_2 Cylinder: to be 75gm P.V.C coated.

Internal Finish: to be polythene lining on phosphate coating.

External finish: to be phosphated - One coat primer paint and one coat stove enamel B.S. 381 C.

1.0.7 FIRE BLANKET

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

1.0.8 BOOSTED HOSE REEL SYSTEM

1.0.8.1 General

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

1.0.8.2 Hose Reel Pumps

The fire hose reel pumps shall consist of a duplicate set of multi-line centrifugal pumps from approved manufacturers. The pumps shall be capable of delivering **AS PER THE SPECIFICATIONS.**

The pump casing shall be of cast iron construction with the impeller shaft of stainless steel with mechanical seal.

1.0.8.3 Control Panel

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

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

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

(b) Green indicator light for indicating control panel live.

(c) Duty / Stand-by pump auto change over.

(d) Duty pump run green indicator light.

(e) Stand-by pump run green indicator light.

(f) Duty pump fail red indicator light.

(g) Stand-by pump fail red indicator light.

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

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

1.0.8.4 Hose Reel

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

The hose reel shall comply with B.S. 5274: 1975 and B.S 3161: 1970 and is to be installed to the requirements of C.P. 5306 Part 1: 1976.

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

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

The hose reels shall be installed complete with electro-galvanised cabinet recessed on the wall.

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

1.0.8.5 Pipe Work

The pipe work for the hose reel installation shall be galvanised wrought steel tubing heavy grade Class C to B.S 1387: 1967 with pipe threads to B.S 21. The pipe work and all associated fittings shall be in approved colour for fire fittings.

1.0.8.6 Pipe Fittings

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

1.0.8.7 Non-return Valves

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

1.0.8.8 Gate Valves

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

1.0.8.9 Sleeves

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

1.0.8.10 Earthing

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

1.0.8.11 Finish Painting

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

1.0.8.12 Testing and Commissioning

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

1.0.8.13 Instruction Period

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

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

1.0.8.14 Signage-Fire Instruction /Fire Exit

10.8.1 Fire Instruction Notice

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

FIRE INSTRUCTION NOTICE

In the event of fire;

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

10.8.2 Fire Exit Sign

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

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

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

10.8.3 Hose Reel Label

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

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

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

10.8.4 Cabinets

FIRE EXTINGUISHER CABINET

- Size of 560mm width by 710mm high and 260mm deep
- Surface Mounted
- Paint Finish in epoxy powder red (Minimum 70 micron)
- To host 2No.Portable 9kg Extinguisher
- Material Mild steel minimum 0.9mm thick

TO BE AS SRI FEX145-MS-090-RD

FIRE HOSEREEL CABINET

- Size of 1050mm width by 800mm high and 400mm deep
- Surface Mounted
- Paint Finish in epoxy powder red (Minimum 70 micron)
- To host Swing Type Hosereel and 1No.Portable 9kg Extinguisher

TO BE AS SRI HRS003-MS-400RD

SECTION NAME

SOLAR HOT WATER HEATING SPECIFICATIONS

GENERAL SOLAR WATER HEATING SPECIFICATIONS

1.1.0 QUALITY OF MATERIALS AND WORKMANSHIP

1.1.1 General

All materials, equipment and accessories are to be new and in accordance with the requirements of the current rules and regulations where such exist, or in their absence with the relevant British/European standard.

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

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

Where particular manufacturers are specified herein, alternative makes will be considered, and the Engineer shall be allowed to reject any other makes.

The tenderer will be entirely responsible for all the materials, apparatus, equipment, etc in connection to his work, and shall take special care to protect all parts of finished work from damage until handed over to the Employer.

The work shall be carried out by competent workmen under skilled supervision. The Engineer shall have authority to have any of the work taken down or changed, which is executed in any unsatisfactory manner.

The works shall be carried out strictly in accordance with:

a) British Standard B.S. 5918, Domestic hot water supply and solar water heating system
b) "British code of Practice" C.P. 310: Water Supply
c) British Standard code of Practice" C.P. 342: Centralized hot water supply
d) All other relevant British standard Specifications and Codes of Practice (herein
after referred to as B.S and C.P respectively.)
e) By-Laws of the Local Authority
f) The "Specification" and the "Particular Specification"
g) The tender/working drawings
h) The engineer's Instructions.

The drawings and specifications are to be read as a whole and are to explain each other. Work shown on the drawings and not described in the specifications or vice versa shall be duly executed under the contract.

1.1.2 Solar Panel – Construction

Solar panels shall be flat plate solar collectors. The structure of the collector and its components must withstand local extreme environmental conditions including winds, storm etc.

1.1.2.1 Solar Panel – External Construction

a) Glazing material shall be transparent and non-reflective to solar radiation. Total surface heating area of the solar panel shall be as specified elsewhere. The top of the panel shall be a single transparent glazed glass sheet. The glazed glass shall be as low-iron tempered glass or equivalent. The thickness of the glazed glass shall be 3 mm.

The glazing and the holding construction shall have thermal characteristics to withstand extreme local temperatures and also thermal shock due to storms etc. Gasket for the glazing shall be EPDM gasket or similar.

During accidental breakage of the glazing, the glazed glass sheet shall be replaceable at site.

b) Solar panel collector casement shall be rigid, structurally sound and corrosion resistant. Sides and bottom of panel shall be 24 gauge galvanized mild steel sheet or 2mm aluminium sheet.

Galvanized mild steel sheet shall be etched primed and applied with two coats of approved oil-base paint. 4 mm to 6 mm breathing hole shall be provided on the galvanized mild steel casing for the removal of moisture content formed due to condensation within the panel.

c) The panel/glass construction shall be weather proof. Pipework joints and collector interconnection shall be water proof. Approved silicone gasket or similar to be used at the panel connections.

1.1.2.2 Solar Panel - Internal Construction

a) **Absorber -** Shall be located directly beneath the glass sheet and fully cover the internal area of the panel.

Absorber shall be made of copper sheet or aluminium with a selective surface chemically treated similar to the black chrome finish or similar. The selective surface shall achieve 95% absorptivity of solar radiation and 15 to 20% emissivity of infra-red radiation. The absorber and the selective surface shall not be affected during life span of the absorber.

b) **Heat Exchanger**

Copper tubes and fittings shall be utilized for internal panel pipe work and in accordance with B.S. 2871 or similar. All joints and connections between the riser and header tubing's shall be leak proof and stand to hydraulic pressure tests.

The collector to be pressure tested to withstand a pressure of 8 kg/cm^2. In general, collectors shall be pressure tested at 15 times the rated operating gauge pressure of 8kg/cm^2.

A certificate of pressure testing to be issued when required and requested by the Engineers.

c) **Insulation**

The underside of the absorber, inclusive headers and the outer casing internal sides shall be insulated with 50 mm fibre glass insulation, minimum density 64 kg/m^3. The insulation shall be non-combustible and shall withstand maximum continuous operating temperature of 200^{o}C (and minimum operating temperature of –50^{o}C).

1.1.2.3 Hot Water Solar Cylinder

a) The hot water solar cylinder shall have a nominal capacity as specified on the contract drawing and particular specification to the designed highest water level. The hot water cylinder shall have a separate feed tank attached to it.

b) The cylinders and the feed tanks shall comply with B.S. 417, 699, 2777, 4214, 1565, 1566 and 3198. Refer also Water Storage tanks as specified elsewhere. The Cylinder and tanks shall be supplied complete with screwed BSPF parallel thread flanged connections for flow, return, vent, overflow and drain pipes.

c) Cylinder shall be provided with a magnesium electrode as corrosion protection, weight: minimum 1.5 kg. and have an inspection cover to facilitate renewal of the electrode.

d) The cylinder shall be galvanized, after manufacture in accordance with the requirements of BS. 729 Part 1 and pressure tested in accordance with the above B.S.

A certificate of pressure testing to be issued when required and requested by the Engineers/Project Manager's Representative. Refer also to "Protection of Metal surface" as specified elsewhere in the specification.

e) Insulation

The cylinder shall be insulated on all the sides with 100 mm fiberglass, or 100 mm thick foam injected polyurethane. At the inspection cover the insulation shall be easily removable.

f) Cladding

The insulation shall be fully laded with 24 gauge galvanized M.S. Sheet.

1.1.2.4 Flow and Return Pipework

Pipework shall be galvanized mild steel medium duty and in accordance with BS. 1387 and insulated as specified.

1.1.3 INSTALLATION

1.1.3.1 Solar panel

a) Location

The solar panel shall where physically possible be installed facing south. Where it is not practical for the solar panel to face due south, the maximum allowance variation shall be 45^0.

b) Angle of Inclination

The solar panels for maximum efficiency should be fitted at an angle equal to the latitude of the installation area. Minimum angle of inclination should be 5^0.

c) Solar panel shall be mounted on angle frame and rise to flow outlet according to manufacturer's specifications.

1.1.3.2 Solar Cylinder

a) For Standard Thermo-syphon

The solar cylinder shall maintain a minimum horizontal distance of 300 mm above the highest point of the solar panel installation

b) For low Thermo-syphon

The solar cylinder shall maintain a flow line up grade of 1:20 minimums where the low profile thermo-syphon system is utilized.

1.1.3.3 Flow and Return Pipework

(a) Joints

All joints between ferrous and copper piping shall be made with dielectric pipe unions for the prevention of electrolytic corrosion.

(b) Penetration through Roof decking.

Where pipes penetrate the roof decking, they shall be provided with a sleeve that fits around the pipe making a weather proof joint between roof and pipe.

(c) Insulation

All pipework between solar panel and storing tank to be insulated with 25 mm fibreglass where exposed to weather, covered with 24 gauges galvanized M.S. sheet cladding and weather proofed.

All insulation for supply and return pipework in roof space shall be covered with cotton canvas.

All insulation shall be in accordance with BS. 1334 unless otherwise specified.

1.1.3.4 Drain, overflow and Vent Pipework

(a) The drain and overflow pipework from the solar cylinder shall terminate approximately 75 mm away from the nearest drain outlet.

(b) Vent pipe from the solar cylinder shall terminate approximately 150 mm over the top water level in the solar cylinder feed tank.

(c) Provided drain valve for the solar panel. Drain valve shall be firmly clamped in order to avoid leaks at the joints during operation

1.1.3.5 Valves

(a) Copper alloy gate valves complying with BS.1952 shall be installed on flow and return pipework prior to it being connected to the solar cylinder.

(b) The solar cylinder and panel shall be supplied with stop valves for draining and to comply with BS 1010.

1.1.3.6 Inter connection of solar panels

It shall be done utilizing Neoprene tubing or Stainless Steel connector or equivalent, fitted with clamps and able to withstand the working pressure.

1.1.3.7 Precaution

Solar panel glass shall be adequately protected against cracking and the protection removed only when the solar system is commissioned.

1.1.4 Alternate Solar Heating System

Should the contractor intend utilizing an alternate equivalent solar heating system to the one specified under this contract, he shall when submitting his tender provide the Engineer with all necessary information such as material used, construction detail, installation procedure etc. for his approval.

1.1.5 Test and Efficiency Certificates

The Contractor shall provide test and efficiency certificates for the solar panels proposed for the installation in accordance with methods outlined in ASHRAE 2377.

Certificates for the following tests shall be provided:

1. No flow 30 day exposure
2. Peak exposure test
3. Solar collector Thermal Shock/Water spray test
4. Solar Collector Thermal Shock/Cold Fill test
5. Solar Collector leak and pressure test
6. Thermal efficiency/performance test.

The Contractor shall also provide documentary evidence regarding the absorber sheet, the selective coatings and its optical performances (absorptivity and emissivity factors).

1.1.6 Pipework above Ground

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

Where falls are not shown on the contract drawings or stated elsewhere in the specification, pipework shall be installed parallel to the lines of the building.

All water systems shall be provided with sufficient drain points and automatic air vents to enable them to function correctly. Valves and other user equipment shall be installed with adequate access for operation and maintenance.

Where valves and other operational equipment are unavoidably installed beyond normal reach or in such a position as to be difficult to reach from a short step ladder, extension spindles wit floor or wall pedestals shall be provided.

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

Full allowance shall be mad for the expansion and contraction of pipework, pre cautions being made to ensure that any forces produced by pipe movements are not transmitted to valves, equipment or plant.
All tubing exposed on faces of walls shall, unless otherwise specified, be fixed at least 25mm clear of adjacent surfaces with approved holder bats built into the walls, cut and pinned to walls in cement mortar. Where fixed to woodwork, suitable clips shall be used.

All tubing's specified as chased into walls shall have the wall face neatly cut and chased, the tubing wedges and fixed and plastered over.

All tubing specified as fixed to ceilings, roofs of roof structures shall be fixed with approved mild steel hangers cut and pinned to ceilings, roofs or roof strictures.

Where three or more tubes are fixed to the ceilings, roofs or roof structures close to each other, they shall be fixed in positions, which leave the lower surfaces at the same horizontal level, unless otherwise specified.

Tubes fixed to steel work shall be fixed with clips and tap screws.Tubes shall be fixed to true lines parallel to adjacent lines of the building unless otherwise specified.

Where insulated, tubing shall be fixed with the insulation at least 25mm clear of the adjacent surfaces.

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 the pipe clips without prior approval of the Engineer.

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

Size	**Maximum support**
Nominal Bores	**Spacing**
15mm	2.0m
20mm	2.5m
25mm	2.5m
32mm	3.0m
40mm	3.0m
50mm	3.0m
65mm	3.5m
80mm	3.5m
100mm	4.0m

Each support shall take its due proportion of the weight of the pipe and shall allow free movement for expansion and contraction.

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

Sleeves shall be provided where pipes pass through walls and solid floors to allow movement of the pipes without damage to the structure. The overall length of the sleeve shall be such that it projects at least 2mm beyond the finished thickness of the wall or partition.

Sleeves passing through the structure shall be of mild steel. Elsewhere they shall be of PVC. The sleeves shall have 5-15mm clearance all round the pipe, or for insulated pipework, all round the insulation. The sleeves shall be packed with slag wool or similar.

Unless anything else is stated in the specification, the tenderer must include in his tender for all protective and finish painting of the works including colour coding of special requirements, if any, are specified in the text of the particular specification. The painting shall be carried out by skilled painters.

1.1.6.1 Galvanised Mild steel Tubing

Galvanized mild steel tubing shall be in accordance with B.S 1387 with screwed and socketed joints.Fittings for the same shall be galvanized malleable iron to B.S 143 & 1256 threads to BS 21.
Joints shall be made with fine hemp and an approved jointing compound or with Teflon sealing tape. Compound containing red lead must be used, unless otherwise specified
All changes of direction shall be obtained by use of proper fittings. Formed bends shall not be accepted.

Long screw connectors and flat-faced unions shall not be used, unless otherwise specified.
Where chased into walls or cast in concrete, galvanized mild steel tubing carrying hot water shall be wrapped with hair felt secured by copper wire.

The fixing of galvanized mild steel tubing shall be done using:

a) Malleable iron “school board” pattern brackets for building in or screwing to structure or
b) Malleable pipe rings, with either back plate, plugs or girder clips or
c) Purpose made straps to Engineer’s Approval.

1.1.6.2 Copper Tubing

Copper tubing shall be light gauge conforming to B.S. 2871 and the fittings shall be capillary or compression fittings to B.S. 864 of approved manufacture. Joints on tubing up to and including 50 mm diameter shall be compression or capillary joints or direct joints using zinc-free self-fluxing silver brazing alloys. Joints on tubing above 50 mm diameter shall be welded or blazed joints.

Copper tubing shall be jointed to steel cisterns by the use of copper-alloy connector having a shoulder to bear on the outside of the cistern and secured by a back nut inside. Washers shall be used both inside the cistern.

Where chased into walls or cast in concrete, copper tubing shall be wrapped with corrugated cardboard or hair felt secured by copper wire.

The fixing of copper tubing shall be done by using:-

a) Copper-alloy holder bats for building in, or screwing to structure.
   or
b) Strap clips of copper, copper-alloy or other suitable material.
   or
c) Gunmetal holder bats similar to "YORKSHIRE",

Iron or steel supports shall not be used for copper tubing.
All bends and sets shall be formed without diminishing the internal diameter in any part or causing fracture or weakness of the tube walls.

1.1.6.3 Valves, Cocks, Taps etc.

a) Gate Valves

All gate valves up to and including 65mm nominal bore and above, other than those required for fitting to be buried. Water mains shall be of bronze construction in accordance with the requirements of B.S. 5154. The pressure classification of all gate valves shall depend upon the pressure conditions pertaining to the site of the works.

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

b) Globe Valves

All globe valves up to and including 65 mm nominal bore shall be of bronze construction in accordance with B.S. 2060.

All globe valve 80 mm nominal bore and above shall be of cast iron construction in accordance with the requirements of B.S. 3961.

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

c) Check or Non-Return Valves

All check or non-return valves up to and including 65 mm nominal bore shall be of the swing check type of bronze construction in accordance with B.S. 1953.

All check or non-return valves 80 mm nominal bore and above shall be of the swing check type of cast iron construction in accordance with the requirements of B.S. 4090.

The pressure classification of all check or non-return valves shall depend on the pressure conditions pertaining to the Site of work

d) Ball Float Valves

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

(i) Low pressure – 3.588 bar maximum
(ii) Medium pressure – 7. 725 bar maximum.
(iii) High pressure – 12. 620 bar maximum.

The pressure Classification required for each ball valve will be designated in the description of its associated equipment.

e) Safety Valves

Safety valves for thermal storage water heaters shall comply with B.S. 759

Draw-Off Taps and Stop Valves (up to 50 mm nominal bore)

Draw-off taps and stop valves up to 50 m nominal bore, unless otherwise stated or specified, for attachment or connection to sanitary fittings shall be manufactured in accordance with the requirements of B.S. 1010.
Mixing valves for shower fittings and other appliances shall be manufactured in accordance with the requirements of B.S. 1415 from bronze or other corrosion resistant materials

1.1.6.4 Thermal Insulation

Insulation shall be installed by tenderer specializing in this type of work.

All primary hot (flow and return pipes) and secondary hot water and circulation pipes shall be insulated. Thermal insulating material for hot water supply insulation shall conform to B.S. 1334 unless otherwise specified. Materials shall have fire retardant qualities.Insulation shall be fiberglass, minimum density 64 kg/m^3. Pre-moulded fittings shall be used, or if unavailable, metered sections or built-up blanket insulation shall be used.Insulation shall be fastened in concealed locations with aluminium bands or soft annealed wires and shall be fastened in exposed locations with aluminium bands, 30 cm. (12inches).

Each pipe item shall be insulated separately. Insulation must be carried through or around hangers. All insulating materials, however fixed, shall be in close contact with the surface to which it is applied and all joints shall be sealed after ensuring that edges or ends of any section built up close to one another. Edges or ends shall be cut or sharpened on site as necessary.All surfaces to be insulated shall be cleaned carefully before fixing the insulating material. Whereby, subject to outside weather or other potentially damp or wet conditions, the insulation shall be adequately protected against moisture pick-up with weather proof jacketing. Elsewhere, the insulation shall be finished with open weave glass cloth and finish coats of adhesive or paint to approval.

Fixing of insulating material shall suit the progress of other installation works in the building.

All thermal insulating materials shall be delivered to the site in a dry condition and housed in a store until drawn upon for use. If nothing else is specified, the minimum thickness of insulating material for hot water pipes shall be 25 mm.

Equipment, such as tanks, shall be insulated with 50 mm fibre glass board and finished with open weave glass cloth and finish coats of adhesive or paint to approval.

1.1.7 Water Storage Tanks

1.1.7.1 Cold Water Storage Tanks

Where specified as galvanized mild steel, water storage tanks shall comply with B.S. 417. Galvanizing shall take place after manufacture.

Pressed steel sectional water storage tanks shall comply with B.S. 1564, and shall be similar in manufacture to “BRAITH-WAITE”.

Water storage tanks shall be mosquito proofed by means of well fitting bolted cover bedded on a thick gasket of felt or bitumen.

Overflow pipes from tanks shall discharge into air or floor gullies where nearby positioned, with splay cut ends mosquito proofed by means of wire gauze tightly bound on with stout galvanized wire or soldered on.

1.1.7.2 Thermal Storage Water Heaters

The pressure and low pressure type's domestic electric water heaters shall comply with B. S. 843; high pressure types shall be of a Standard not less than the appropriate B.S.

Domestic heaters shall, if nothing else is specified, be supplied with 50 mm thick fibre glass lagging.

Electric thermostatically controlled immersion heaters shall comply with B.S. 3456: Section 2:21 and C.P. 324.202.

Purpose made storage water heaters of the specified size 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.

1.1.7.3 Pressure Vessels

Pressure vessels shall be manufactured in accordance with B.S. 1500 A for the specified pressure and be fitted with all necessary openings and connections.

1.1.8 Protection of metal surfaces

Machinery, equipment, etc. shall be tropicalized and with protective treatment fully suitable for application and in the prevailing climatic conditions.

Full details of tropicalization and comprehensive paint treatments, to a dry film thickness of nowhere less than 200 microns, shall be submitted for the approval of the Consultant.

All metalwork shall be protected by either:-

(a) Hot dip galvanizing; where painted treatment shall be 50 microns epoxy primer or 5-10 microns wash-primer; 30 microns modified alkyd undercoat and 30 microns enamel finish or,
(b) Metallic lead epoxy primer, epoxy micaceous iron oxide, micaceous iron oxide modified alkyd undercoat and enamel finish, layers minimum 30 microns each.

Surfaces of metalwork shall be thoroughly brushed down with wire brushes to remove all scale, rust, etc., and structural steelwork shall be grit blasted before protective treatment. All paint shall be applied fully in accordance with the manufacturer's instructions.

All water tanks inclusive covers, machinery casings, claddings and whosesoever specified shall be protected by hot dip galvanizing.

Hot dip galvanized coatings shall be executed in accordance with British Standard BS 729.The values for coating weight shall be as follows to B.S 729:-

5 mm thick and over - 610 to 630 g/m (87 –90 um)

Under 5 mm but not less than 2 mm - 460 to 490 g/m (66 – 70 um)

Under 2 mm but not less than 1 mm - 335 to 350 g/m (48 – 50 um)

Grey and malleable iron castings - 610 to 630 g/m (87 – 90 um)

Threaded work and other articles

which are centrifuged - 305 to 315 g/m (44 –45 um)

For conversion to coating thickness unit weight of zinc shall be assumed 7 g/cm^3. The values stated shall be taken as minimum average values for a set of samples. Individual minimum values shall be introduced as the above mentioned minus 10%.

When galvanized coats are damaged, e.g. threaded pipe connections made on site, the exposed parts shall be repaired with same paints as for additional coating. Colour grey.

1.1.9 Instrumentation

Instrumentation shall be provided as indicated on the drawings and specified in the specifications.

Pressure gauges shall be installed on the pipe at both sides of pumps.

Pressure gauges shall be fitted with shutoff cock, read in the pressure range of system, minim 12 cm. (4 1/2 inch) dial, adjustable angle face, white face with black figures and pointer.

Thermometers shall be installed with separable sockets. Bronze sockets shall be used in nonferrous systems and stainless steel in ferrous systems. Thermometers shall be mercury actuated, 12 cm (4 1/2 inch) dial, adjustable angle face with black figures and pointer.

Where recording thermometers are required, they shall have chart 25 cm.(10 inches) in diameter, shall operate with one pen on 24 hour charts, with a range 10^0C to 105^0C (50^0F to 220^0F).

1.2 COMMISSIONG AND MAINTENANCE

1.2.1 Commissioning and Testing

The tenderer for solar heating system shall be responsible for testing and commissioning of the solar installation. The testing and commissioning shall be done in the presence of the Engineer. The tenderer shall be held responsible for any damage to the builder's work, during the installation, initial system testing etc.When installation is completed, an acceptance test shall be carried out on the tenderer's own expense.

All hot water pipes, including flow and return, solar absorbers, cylinders, cisterns, tanks, calorifiers, pumps, etc. shall be thoroughly sterilized and flushed out after the completion of all tests and before being fully commissioned for handover.The sterilization procedure shall be carried out by the tenderer or specialists employed by the tenderer in accordance with the requirements of B.S. Code of Practice 310, Clause 409, to the approval of the Engineer.

Before handing over, the tenderer shall confirm that the installation has been examined, tested, is ready for use, that it will operate and can be maintained efficiently. The whole of the solar heating installation shall be tested to the satisfaction of the Engineer and the Local Authority.

The tenderer shall provide all necessary testing apparatus and facilities for testing the installations and any defective work shall be replaced immediately and shall be the subject of re-testing until found satisfactory.

Where pipes are to be lagged, chased into walls or otherwise concealed, the work shall be tested prior to lagging, making good chases, etc.The complete solar heating installations, including flow and return pipes shall, if nothing else is specified, be tested to a cold water pressure of not less than 1.5 times the working pressure, minimum 8 kg/cm^2.The test pressure shall be applied by means of a manually operated test pump or, by a power-driven test pump. Pressure gauges shall be recalibrated before the test.The test pressure shall be maintained by the pump for about one hour and a leakage as specified in C.P 310, Section 502 J shall be approved, but any visible individual leak shall be repaired.

Valves, cocks and taps shall be absolutely tight under the test pressure for the corresponding pipes as well as under a small pressure. Upon completion of the work, including re-testing if necessary, the installations shall be thoroughly flushed out and water pipes refilled with clean water ready for use. Any defects revealed by the tests shall be made good by the tenderer and the test repeated to the approval of the Engineer. In all other respects, test shall comply with the requirements of B.S. Code of Practice 304.

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

1.2.2 Spare Parts

The tenderer shall submit with the tender a guarantee that he will hold a sufficient number of spare parts for the maintenance of the equipment.

If specific requirements for supply of spare parts are specified in the bill of quantities or schedule of prices, these spare parts shall be supplied to the client/employer, when the installations are handed over.

The tenderer shall submit with his tender a priced list of any optional extras, which he recommends should be purchased for the plants and are not supplied as standard with the unit.

1.2.3 Defects Liability and Contractual Maintenance Period

The tenderer shall maintain the complete installation in the total defects liability period and shall be responsible for the initiation and execution of the clients/employer planned programme of maintenance during this period.

During this maintenance period the tenderer shall carry out all necessary adjustments and repairs, cleaning and lubricating, etc. A report of any work shall be submitted to the Client and incorporated in the maintenance records.

The tenderer shall be held responsible for and shall make good all defects in materials that appear during the maintenance period; he shall supply expendable items, such as gaskets, filters, indicator lamps, etc. The period of liability shall not end until all defects which appear during the maintenance period have been rectified.

The tenderer shall allow in his Contract price for this maintenance and inspection service and shall provide for all tools, instruments, plant and scaffolding, and the transportation thereof, as required for the correct and full execution of these

obligations, and the provision, use or installation of all materials whether they are normal maintenance materials such as oils, greases, sandpaper, etc. and parts which are periodically renewed such as relay contracts or parts which are faulty for any reason whatsoever excepting always Acts of God such as a storm, tempest or flood, lightning and earthquake; civil revolt, acts of war and vandalism.

1.2.4 Maintenance Manual

Upon completion the tenderer shall furnish to the Client four copies of a manual size A4 of loose leaf type containing all the following items:-

a. Description of equipment
b. Full operation and maintenance instructions
c. Valve operation
d. Fault-finding chart
e. Emergency procedure

f. Maintenance and service periods
g. Lubricating instruction
h. Colour code legend
i. Schedule of primary and secondary spares
j. Record drawing – Folded to size A4.

The manual must be specially written and not standard manufacturers manual unless approved by the Engineer.

Tags giving instructions are not permitted. All instructions must be written into the manual with reference to the drawings.

All valves, terminals and controls on the plant shall be labelled to correspond with the maintenance and operation manuals.

1.2.5 Maintenance and Service After Expirations of the Contractual Maintenance Period

The tenderer shall if required, enter into a maintenance and service agreement with the employer for the complete installation, for a period of up to five years from the day of expiration of the contractual maintenance period.

The terms of any such agreement shall not be less beneficial to the Client, than the terms of agreement for other similar installations.

PARTICULAR SPECIFICATIONS FOR SOLAR SYSTEMS

Products to have Solar Key mark certification mark for solar thermal products

SPECIFICATION FOR SOLAR PANEL

ITEM	DESCRIPTION	VALUE
A	Gross Area	2.51 m2
B	Clearing	2.34 m2
C	Absorbing Surface Area	2.34 m2
D	Absorbing Surface Type	Aluminum
E	Absorbing Surface Coating Type	Selective
F	Transmittance	95 %
G	Emission / Reflection	Less than 6 %
H	Chassis	Black Anodized Aluminum
I	Glass Type	Low-Iron, Tempered, Sandy Patterned Solar Glass
J	Glass Thickness	4 mm
K	Daylight Transmittance	At least 91.6 %
L	Solar Energy Transmittance	At least 90.5 %
M	Glass Seal	Vulcanized EPDM
N	Isolation	Rockwool (40 mm)
O	Back Plate	Aluminum
P	Number of Riser Pipes	12
Q	Riser Pipe Diameter Ø mm	10 mm
R	Manifold Diameter Ø mm	18 mm (3/4")
S	Connection Type	Compression Fitting
T	Water Volume	At least 2 liter
U	Working Pressure	Can absorb 10 bar
V	Test Pressure	Minimum 15 bar
V	Maximum Temperature	Upto 200 °C
X	Stagnation Temperature	Upto 163 °C
Y	Length	1500mm-2500mm(2180 mm)
Z	Width	800-1200mm(1150 mm)

AA	Height	60-90mm(80 mm)
AB	Weight	Maximum 50 kg
AC	Efficiency	Above 80 %

AS BAYMAK ESSENTIAL BLACK XL SERIES OR EQUIVALENT

SPECIFICATION FOR CALORIFIER

ITEM	DESCRIPTION	VALUE
A	Capacity	2000 litres
B	Height	Maximum 2.5m
U	Working Pressure	Minimum 8 bar
V	Test Pressure	Minimum 13 bar
V	Maximum Temperature	Upto 200 °C
X	Stagnation Temperature	Upto 163 °C
Y	Coil	Double Serpentine

- Protected against corrosion by magnesium oxide
- Interior with high tech titanium doped with enamel coating
- With external coating Capable of withstanding unsheltered weather

TO BE AS BAYMAK AQUA DOUBLE COIL HOT WATER STORAGE TANK MODEL T2000L WITH CUSTOM EXTERIOR COVER.

SECTION NAME:

SCHEDULE OF UNIT RATES

SCHEDULE OF UNIT RATES			
Item	**Description**	**Unit**	**Rate**
A	Close Coupled Water Closet suite	No	
B	Pedestal Wash Hand Basin	No	
C	Tabletop Wash Hand Basin	No	
D	Single Lever High Neck Basin Mixer Tap	No	
E	Sensor Type High Neck Basin Mixer Tap	No	
F	Circular Shower Head	No	
G	Short Neck Shower Arm	No	
H	Physically Challenged Grab Rails 600mm	No	
I	Urinal Bowl complete with cistern flush unit	No	
J	Press urinal flush valve	No	
K	Frosted Glass urinal partition/Division	No	
L	Dual Flow Hand Dryer	No	

SECTION NAME:

TECHNICAL SCHEDULE

TECHNICAL SCHEDULE OF ITEMS TO BE SUPPLIED

CONTENTS

TECHNICAL SCHEDULE

1. General Notes to the Tenderer

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

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

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

1.4 The tenderer **MUST** complete in full the technical schedule.

1.5 Apart from the information required in the technical schedule, the tenderer **MUST SUBMIT** comprehensive manufacturer's technical brochures and performance details for all items listed in this schedule (fill forms attached).

TECHNICAL SCHEDULE

Item	Description	Maufacturer	Brand	Model/part
A	Water Closet pan			
B	Water Closet Flush Valve			
C	Counter Top Wash Hand Basin			
D	Self closing pillar Tap			
E	Single Lever Shower Mixer			
F	Square Shower Head			
G	Towel Rack			
H	Physically Challenged Water Closet			
I	Physically Challenged shower pack			
J	Urinal Bowl			
K	Mains operated urinal flush valve			
L	Ceramic urinal partition/Division			
M	Hand Dryer			
N	Automatic Soap dispenser			
O	Push Button Soap dispenser			
P	Paper Towel Dispenser			
Q	Toilet Paper Roll dispenser			
R	Indoor Circular Waste Bins			
S	Floor standing janitorial unit			
T	kitchen sink			
U	Kitchen sink Mixer tap			
V	CPVC pipes			
W	Gate Valves			
X	Hosereel			
Y	Portable Fire Extinguisher			

SECTION J:

STANDARD FORMS

STANDARD FORMS

CONTENTS

NOTE: **ALL FORMS IN THIS SECTION MUST BE FILLED AS THEY SHALL BE PART OF THE EVALUATION CRITERIA**

TENDER QUESTIONNAIRE

Please fill in block letters.

1. Full names of Tenderer:

   ……

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

   ……

3. Telephone number (s) of Tenderer:

   ……

4. Name of Tenderer's representative to be contacted on matters of the tender during the tender period:

   ……

_____

Signature of Tenderer

CONFIDENTIAL BUSINESS QUESTIONNAIRE

You are requested to give the particulars indicated in Part 1 and either Part 2 (a), 2 (b) or 2(c) and (2d) whichever applies to your type of business.

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

Part 1 – General

Business Name ……

Location of business premises: Country/Town…….

Postal Address…… Tel No……..

Nature of Business……..
Current Trade Licence No…… Expiring date…….
Maximum value of business which you can handle at any time:
Kenya Shillings……

Name of your bankers……
Branch……

Part 2 (a) – Sole Proprietor

Your name in full…… Age……
Nationality…… Country of Origin……

Part 2 (b) – Partnership

Give details of partners as follows:

	Name in full	*Nationality*	*Citizenship Details*	*Shares*
1.	……	…….	……..	……..
2.	……	…….	……..	……

Part 2(c) – Registered Company

Private or Public

……

State the nominal and issued capita of the company:

Nominal KShs. ……..

Issued KShs. ……..

Give details of all directors as follows:

	Name in full	*Nationality*	*Citizenship Details* Shares*	
1.	……..	……	……..	…….
2.	……..	……	……..	…….
3.	……..	……	……..	…….
4.	……..	……	……..	…….

KEY PERSONNEL

Qualifications and experience of key personnel proposed for administration and execution of the Contract.

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

I certify that the above information is correct.

…….. …….. ……. ……

Title Signature Date

CONTRACTS COMPLETED IN THE LAST FIVE (5) YEARS

Work performed on works of a similar nature and volume over the last five years.

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

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

……. ……. ……

Title Signature Date

FINANCIAL REPORTS FOR THE LAST FIVE YEARS
(Balance sheets, Profits and Loss Statements, Auditor's reports, etc.
List below and attach copies)

1. ._____.

2. ._____.

3. ._____.

4. ._____.

5. ._____.

6. ._____.

7. ._____.

8. ._____.

9. ._____.

10 ._____.

EVIDENCE OF FINANCIAL RESOURCES TO MEET QUALIFICATION REQUIREMENTS

(Cash in Hand, Lines of credit, e.t.c. List below and attach copies of supportive documents.)

1. ._____.

2. ._____.

3. ._____.

4. ._____.

5. ._____.

6. ._____.

7. ._____.

8. ._____.

9. ._____.

10 ._____.

NAME, ADDRESS AND TELEPHONE,
(This should be for banks that may provide reference if contacted by the employer)

NAME	ADDRESS	TELEPHONE	EMAIL	ACCOUNT STATION

DETAILS OF LITIGATIONS OR ARBITRATION PROCEEDINGS IN WHICH THE TENDERER IS INVOLVED AS ONE OF THE PARTIES

1. ._____.

2. ._____

3. ._____.

4. ._____.

5. ._____.

6. ._____.

7. ._____.

8. ._____.

9. ._____.

10 ._____.

SCHEDULE OF MAJOR ITEMS OF CONTRACTOR'S EQUIPMENT PROPOSED FOR CARRYING OUT THE WORKS

ITEM OF EQUIPMENT	DESCRIPTION, MAKE AND AGE (Years)	CONDITION (New, good, poor) and number available	OWNED, LEASED (From whom?), or to be purchased (From whom?)