

Tender Package — Request for Bid (RFB)



1. Invitation to Tender:

Tender Name: Construction of Water Schemes	Tender No: NIG/BIU/TEN13
Locations: Biu, Kwaya-kusar and Shani LGAs – Borno State	Correspondence Language(s): English
Brief Summary Description of Project: <p>Mercy Corps, an International Non-Governmental Humanitarian Organization, under Small-Town Water, Sanitation, and Hygiene (STWASH) Activity is a five-year, initiative funded by the United States Agency for International Development (USAID), covering the states of Adamawa, Yobe, and Borno in Northeast Nigeria. The Activity is to support the sustainable improvements in access to basic water and sanitation that are necessary to facilitate ongoing recovery, peace building, and economic development across the region.</p> <p>The goal of the program is to facilitate the economic recovery of some crisis-affected communities and bolster the capacity of the state governments in providing essential WASH services and creating and sustaining enabling environments for Small Towns Water Supply and Sanitation Agencies (STWSSAs) and Water Consumers Associations (WCAs) to operate effectively. The program has two broad components; expanded access to water and for sanitation facilities and strengthening capacity for small town water governance.</p> <p>Mercy Corps chooses to hold competitive bidding process for the selection of companies/contractors who will implement our requirements. We believe that competitive bids are the only way to fairly select the best company for the job while ensuring good prices and preventing collaboration and corruption.</p>	

Tender Package Available from: 9th November 2021 @ 8:00am WAT	Tender Package Pickup Location: Tenders can be accessed on https://www.mcnigeria.com/tenders/
Deadline for Offer Submission: 24th November 2021 @ 5:30pm WAT	Submit Offers to: <ol style="list-style-type: none">For Physical submissions: Full bidding document with attachments in sealed envelope to <i>Mercy Corps Office in Biu, Nigeria located at; Behind BOSADP Office, Tse-Tse, Adjacent PS House, Biu, Borno State, Nigeria</i>For electronic submissions: Email a full bid document with attachments to tenders@mercy Corps.org <p>Note: Envelopes or emails should be marked;</p> <p><i>Tender No. NIG/BIU/TEN13</i> <i>Tender Name: Construction of Water Schemes in Biu, Kwaya-kusar & Shani LGAs, Borno State, Nigeria.</i></p>

Mercy Corps reserves the right to accept or reject any late offers

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Questions and Answers (Q&A)

If any, Submit Questions in writing to: questions-biu@mercycorps.org

Last Day for Questions:
20th November 2021;

Questions will be answered by:
22nd November 2021;

Questions will be answered through: <https://www.mcnigeria.com/tenders>

Documentation Checklist

These documents are contained within this tender package:	✓	Invitation to Tender
	✓	General Conditions for Tender
	✓	Criteria and Submittals
	✓	Price Offer Sheet
	✓	Supplier Information Form
	✓	Technical Specifications/BoQ
	✓	Sample Contract

2. General Conditions for Tender

Mercy Corps invites offers for the goods described and summarized in these documents, and in accordance with procedures, conditions and contract terms presented herein. Mercy Corps reserves the right to vary the quantity of work/materials specified in the Tender Package without any changes in unit price or other terms and conditions and to accept or reject any, all, or part of submitted offers. The supplier will be responsible to deliver the entire order to Mercy Corps Designated sites within Borno State.

2.1 Mercy Corps' Anti-Bribery and Anti-Corruption Statement

Mercy Corps strictly prohibits:

- Any form of bribe or kickback in relation to its activities
This prohibition includes any *request* from any Mercy Corps employee, consultant or agent for anything of value from any company or individual in exchange for the employee, consultant or agents taking or not taking any action related to the award of a contract or the contract once awarded. It also applies to any *offer* from any company or individual to provide anything of value to any Mercy Corps employee, consultant or agent in exchange for that person taking or not taking any action related to the award of the contract or the contract.
- Conflicts of interests in the awarding or management of contracts
If a company is owned by, whether directly or indirectly, in whole or in part, any Mercy Corps employee or any person who is related to a Mercy Corps employee, the company must ensure that it and the employee disclose the relationship as part of or prior to submitting the offer.
- The sharing or obtaining of confidential information
Mercy Corps prohibits its employees from sharing, and any offerors from obtaining, confidential information related to this solicitation, including information regarding Mercy Corps' price estimates,

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competing offerors or competing offers, etc. Any information provided to one offeror must be provided to all other offerors.

- *Collusion between/among offerors*

Mercy Corps requires fair and open competition for this solicitation. No two (or more) companies submitting bids can be owned or controlled by the same individual(s). Companies submitting offers cannot share prices or other offer information or take any other action intended to pre-determine which company will win the solicitation and what price will be paid.

Violations of these prohibitions, along with all evidence of such violations, should be reported to:

integrityhotline@mercy Corps.org

Mercy Corps will investigate allegations fully and will take appropriate action. Any company, or individual that participates in any of the above prohibited conduct, will have its actions reported to the appropriate authorities, will be investigated fully, will have its offer rejected and/or contract terminated, and will not be eligible for future contracts with Mercy Corps. Employees participating in such conduct will have his/her employment terminated.

Violations will also be reported to Mercy Corps' donors, who may also choose to investigate and debar or suspend companies and their owners from receiving any contract that is funded in part by the donor, whether the contract is with Mercy Corps or any other entity.

2.2 Tender Basis:

- All offers shall be made in accordance with these instructions, and all documents requested should be furnished, including any required (but not limited to) supplier-specific information, technical specifications, drawings, bill of quantities, and/or delivery schedule. If any requested document is not furnished, a reason should be given for its omission in an exception sheet.
- No respondent should add, omit or change any item, term or condition herein.
- If suppliers have any additional requests and conditions, these shall be stipulated in an exception sheet.
- Each offeror may make one response only.
- Each offer shall be valid for the period of [120 days] from its date of submission.
- All offers should indicate whether they include taxes, compulsory payments, levies and/or duties, including VAT, if applicable.
- Suppliers should ensure that financial offers are devoid of calculation errors. If errors are identified during the evaluation process, the unit price will prevail. If there is ambiguity on the unit price, the Selection Committee may decide to disqualify the offer.
- Any requests for clarifications regarding the project that are not addressed in written documents must be presented to Mercy Corps in writing. The answer to any question raised in writing by any offeror will be issued to that offeror. In some cases Mercy Corps may choose to issue clarifications to all offerors. It is a condition of this tender that no clarification shall be deemed to supersede, contradict, add to or detract from the conditions hereof, unless made in writing as an Addendum to Tender and signed by Mercy Corps or its designated representative.
- This Tender does not obligate Mercy Corps to execute a contract nor does it commit Mercy Corps to pay any costs incurred in the preparation and submission of bids. Furthermore, Mercy Corps reserves the right to reject any and all offers, if such action is considered to be in the best interest of Mercy Corps.

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1 Contract Terms

Mercy Corps intends to issue a contract to one or several company(ies) or organization(s). The successful offeror(s) shall be required to adhere to the statement of work and terms and conditions of the resulting contract. The anticipated contract is incorporated in [Section 6](#) herein. By submitting an offer, offerors certify that they understand and agree to all of the terms and clauses contained in [Section 6](#).

3.2 Specific Eligibility Criteria

In keeping with Mercy Corps' guiding principle for procurement, Mercy Corps Nigeria Uses only responsible suppliers who possess the ability to perform successfully under the terms and conditions of a proposed procurement. In addition to the ability to perform, Mercy Corps also consider minimum standards of responsibility to determine which suppliers Mercy Corps will do business with. These standards include;

- Being eligible business under applicable laws and regulations of the Federal Republic of Nigeria
- Being in good standing with any taxation or legal authority in Nigeria
- Having a satisfactory record of performance and business and ethics based on information available to Mercy Corps.

3.3 Tender Submittals

Documents and required information listed in tender submittals are necessary in order to support the eligibility criteria and to conduct technical evaluations of received offers (and due diligence). While absence of these documents and/or information does not denote mandatory disqualification of suppliers, the lack of these items has the potential to impact the technical evaluation of an offer severely and negatively.

Documents supporting the Eligibility Criteria:

- Legal Business Registration (**Copy of Certificate of Business Registration with Corporate Affairs Commission for companies or businesses operating in Nigeria**)
- Copy of Tax Registration Certificate (**From FIRS or Board of Internal Revenue**)
- A copy of relevant certificate of membership of a professional body (COREN, NMGS etc.) (**Please attach evidence to bid document**)

Documents to conduct the Technical Evaluation and additional Due Diligence:

- Company Profile, 2-page max.
- Items Technical Specifications (refer to section 5.2 for the list of specifications).
- Document confirming supplier agrees to delivery Time/Project Schedule (maximum delivery or completion time for suppliers to pass 15 calendar days from the date of signing purchase order).
- Document confirming Corporate Capabilities. (Required minimum experience is at least 5 years).
- Evidence of financial capability/banking statement to execute the contract if successfully selected
- Verifiable evidence of experience and relevant qualification of key personal, copies of certificates
- Verifiable evidence of relevant projects successfully executed in Nigeria and evidence of knowledge of relevant industry, this is to include letters of award, certificates of completion, references letter, list of projects and addresses of site locations.

Price Offer:

The Price offer is used to determine which offer represents the best value and serves as a basis of negotiation before award of a contract. As a Fixed-Price contract, the price of the contract to be awarded will be an all-inclusive fixed price basis, either in the form of a total fixed price or a per-unit/deliverable fixed price. No profit, fees, taxes, or additional costs can be added after contract signing. Offerors must show unit prices, quantities, and total price, as

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displayed in the Offer Sheet in Section 4. All items must be clearly labeled and included in the total offered price. The transportation cost should be included to total price up to.

3.4 Currency

Offers should be submitted in: **Nigeria Naira (NGN)**.

Payments will be made in: **Nigeria Naira (NGN) through wire transfer.**

Mercy Corps designated sites, Borno State - Nigeria.

2.3 Supplier Eligibility

Suppliers may not apply, and will be rejected as ineligible, if they:

- Are not registered companies
- Are bankrupt or in the process of going bankrupt
- Have been convicted of illegal/corrupt activities, and/or unprofessional conduct
- Have been guilty of grave professional misconduct
- Have not fulfilled obligations related to payment of social security and taxes
- Are guilty of serious misinterpretation in supplying information
- Are in violation of the policies outlined in Mercy Corps Anti Bribery or Anti-Corruption Statement
- Supplier (or supplier's principals) are on any list of sanctioned parties issued by; or are presently excluded or disqualified from participation in this transaction by: The United States Government or United Nations by the United States Government, the United Kingdom, the European Union, the United Nations, other national governments, or public international organizations.

Additional eligibility criteria, if applicable, are stated in section 3.2 of this tender package.

2.4 Response Documents

Offerors must submit an offer in their own format and ensure it contains all the required documents and information specified in this tender. Where an itemized Price Offer Sheet is included in the tender package, the offeror must complete and submit it with the rest of their offer.

2.5 Acceptance of Successful Response

Documentation submitted by offerors will be verified by Mercy Corps. The winning offeror will be required to sign a contract for the stated, agreed upon amount.

2.6 Certification Regarding Terrorism

It is Mercy Corps' policy to comply with humanitarian principles and the laws and regulations of the United States, the European Union, the United Nations, the United Kingdom, host nations, and other applicable donors concerning transactions with or support to individuals or entities that have engaged in fraud, waste, abuse, human trafficking, corruption, or terrorist activity. These laws and regulations prohibit Mercy Corps from transacting with or providing support to any individuals or entities that are the subject of government sanctions, donor rules, or laws prohibiting transactions or support to such parties.

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3. Criteria & Submittals

3.5 Tender Evaluation (LPTA Selection Method)

Based on the above submittals, a Mercy Corps Tender Committee will conduct a tender evaluation process. Mercy Corps reserves the right to accept or reject any or all bids, and to accept the offer(s) deemed to be in the best interest of Mercy Corps. MC will not be responsible for or pay for any expenses or losses which may be incurred by any Offeror in the preparation of their tender.

Evaluations will be conducted as described in the following subsections:

3.5.1 Technical Evaluation

Lowest Price, Technically Acceptable (LPTA)

Mercy Corps Tender Committee will conduct a technical evaluation which will grade technical criteria on a pass/fail basis. Supplier's bids **must meet the minimum technical standard** established here to receive a passing mark. Any offerors who receive a failing mark on any criteria will be automatically disqualified from the tender process.

Only offerors who pass all criteria will move on to the next round of evaluation.

Pass/fail technical criteria are as follows:

Technical Criteria	Pass or fail?
Evidence of previously done similarly project and experience working with an INGOs (service completion report, verifiable relevant contracts successfully executed within Borno State or the Northeast in general)	
Delivery Time/Project Schedule/work plan (maximum delivery or completion time for suppliers to pass 60 working days from the date of signing the contract).	
The company's technical team should comprise at a minimum; Civil Engr, Geologist, Water Engineering, or any other relevant field (Attach CV of each of the technical team member – 3-page max for each person)	
Evidence of financial capacity/banking support to execute the contract if successfully selected (Corporate bank account statement of the company must be recent/ the audited financial report should 2018 upward).	
A copy of relevant certificate of membership of an Engineering or relevant Professional Body (COREN, COMEG, NMGS etc.)	
At least 7 years of experience in the planning, designing, and overseeing WASH related construction and maintenance of building structures, and At least 5 years' experience of implementing and/ or rehabilitation, upgrading and construction of WASH related projects; (service completion report, verifiable relevant contracts successfully executed within Borno State or the Northeast in general)	
Financial Offer of the bidder (Only realistic and reasonable offer will be considered)	

3.5.2 Financial Evaluation and Price/Cost Analysis

All suppliers who passed all technical criteria will move on to the financial evaluation where the lowest price offer(s) will be accepted as the winning offeror(s) assuming the price is deemed fair and reasonable and subject to the additional due diligence in section 3.5.3.

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3.5.3 Additional Due Diligence

Upon completion of both the technical and financial evaluations Mercy Corps may choose to engage in additional due diligence processes with a particular offeror or offeror(s). The purpose of these processes is to ensure that Mercy Corps engages with reputable, ethical, responsible Suppliers with solid financials and the ability to fulfill the contract. Additional due diligence may take the form of the following processes (though it is not limited to):

- Reference Checks
- Supplier's facility visits
- Analysis of audited financial statements
- Determination of relations and affiliations between offerors
- Other appropriate documented method giving Mercy Corps increased confidence in the supplier's ability to perform.

4. Offer Form

Offerors must submit their own independent offer including at least (but not limited to):

- All documents requested in the "Eligibility Criteria" section of this Tender Package
- All documents requested in the "Tender Submittals" section of this Tender Package
- All information listed in the "Documents Comprising the Bid" section below

All offers must be duly signed (including position and full name of the signer) and stamped, with the date of completion.

Documents Comprising the Bid

The following information must be included in the offer of any potential offeror:

- Cover Letter** explaining interest to be a contracted vendor or supplier. The content of the cover letter shall include the following information:
 - A detailed specification of the offered items if vary from the required specifications
 - Warranty.
 - Delivery time
 - Price validity date (for this purpose and as stated on the advertisement, quote given shall remain unchanged for 180 working days)
- A Price Offer detailing the unit price only using the **Price Offer Sheet** template provided in section 7
- Completed and signed Mercy Corps **Supplier Information Form** (template provided in section 7)
- Other important documents offeror feels need to be attached to support their bid

The original bid shall be signed by the offeror, or a person or persons duly authorized to bind the offeror to the contract. Financial offer pages of the bid shall be initialed by the person or persons signing the bid and stamped with the company seal.

Any interlineations, erasures, or overwriting shall be valid only if they are initialed by the person or persons signing the bid.

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5.1 PRELIMINARIES

5.1.2 Scope of Works

This General Specification refers to the works involved in the project to give a basic standard for implementation.

The Contract comprises works listed in the Bill of Quantity and Particular Specification.

The works are to be executed in 3 small towns within focal three LGAs in Borno State namely; Kwayakusar, Shani and Biu small towns in Kwayakusar, Shani, Biu LGAs respectively, The general works expected to be carried out in each of the selected location is to rehabilitate existing borehole water facilities, drill new or additional boreholes and or upgrade the water facility where necessary to meet water demand of the population within the vicinity of the water source location.

5.1.3 Requirements of Specifications

The Contractor shall fulfil all requirements and obligations under all Clauses of these Specifications. Neither the following clauses of the Specifications nor the description and quantities in the bills of quantities shall limit the obligations of the Contractor as indicated in the Conditions of Contract.

Where items are not included in the Bill of Quantities for any such requirements or obligations, the cost of such requirements or obligations shall be deemed to have been included in the items provided in the Bills of Quantities.

5.1.4 Definitions

In the Specification (as hereinafter defined) the following words and expressions shall have the meanings hereby assigned to them:

- (a) **“Specification”** means this Specification together with the technical details given in the Bill of Quantities and, subject to the Supervisor’s Representative’s approval, the Contractor’s Drawings, Specifications and technical details.
- (b) **“Supply”** and its derivatives means the complete design, manufacture, delivery to site, inclusive of such ancillary services as inspection and witnessed testing at the places of manufacture and shipment, workshop painting and of all such other services as are noted in the Specification or reasonably necessary for the safe, reliable and efficient completion of the Contract.
- (c) **“Install”** and its derivatives means complete installation, on site painting and adjustments, testing and commissioning of the works and of all such other services as are noted in the Specification or reasonably for the safe, reliable and efficient completion of the Contract.
- (d) **“Provide”** and its derivatives means the complete design, manufacture, delivery, installation, testing and commissioning of the works, inclusive of such ancillary services as inspection and witnessed testing at the places of manufacture, workshop and site painting, handling on site, site trials and of all such other services as are noted in the Specification or reasonably necessary for the safe, reliable and efficient completion of the Contract.
- (e) **“Replacement”** and its derivatives means exchange of equipment, parts or similar with the latest model of the installed equipment or technically equivalent one of another manufacturer, inclusive of dismantling and removal of the existing equipment to the employer’s central store or off site as directed and all such other services as are noted in the Specification or reasonably necessary for the safe, reliable and efficient completion of the Contract.
- (f) **“Overhaul”** and its derivatives where not detailed for specific items of plant, means dismantling, checking and testing to identify defective components, replacement of defective components, reassembly, commissioning and testing. Overhaul shall include the item covered under “servicing”.

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- (g) **“Repair”** and its derivatives where not detailed for specific items of plant, means, in addition to an overhaul, additional works such as diagnosis, machining, welding, etc.
- (h) **“Service”** and its derivatives where not detailed for specific items of plant, means the replacement of normally wearing items such as bearings, bushes, seals, gland packings, gaskets, voltmeters, ammeters, etc.
- (i) **“Spares”** and its derivatives where not detailed for specific items of plant, mean replaceable wearing parts and lubricants as required for normal maintenance of the plant.
- (j) **“Supervisor”** is the client’s representative which in this case is the Mercy Corps Limited.
- (k) **“Supervisor Representative (SR)”** the Engineer or any representative appointed by the supervisor to oversee the implementation of the works programme.
- (l) **“Quantities”** the quantities required for each item specified herein shall be as stipulated in the relevant BOQ.

5.1.5 Extent of Contract

The Contract comprises the following summarised works required in 3 small towns in the 3 LGAs of Kwayakusar, Shani and Biu and as listed in the Bill of Quantity under small town works.

- Geophysical investigation of new borehole
- Drilling of new borehole
- Installation of solar submersible pumps
- Construction of Elevated Storage Reservoir
- Laying of distribution pipeline
- Construction of water stand post
- Construction toilet facility

5.1.6 Documentation to be provided

During the execution of the Contract the Contractor shall furnish two copies of each of the following contract records to the Supervisor.

- (a) Sub-orders for plant, materials and services. Except as otherwise approved by the Supervisor, the Contractor shall employ only those specialist manufacturers or sub-contracts declared in the Tender and sub-orders to them shall be confined to those for materials, plant and services in respect of which the Supervisor's approval has been given. Two copies of each sub-order, (inclusive of supporting documents to which it may refer), and of any amendments thereto, shall be furnished to the Supervisor immediately upon issue and each shall state clear the contract title and the item or drawing reference, or other means of identification.
- (b) Monthly progress reports of work in hand under the Contract, at manufacturer's work and elsewhere. The reports shall be in an agreed format, shall be issued before the 14th of each month and shall give full details of progress with the Contract during the preceding month, including production status of drawings, manufacture, orders, stocks of materials, shipping, delivery, erection, testing and commissioning.
- (c) Progress schedules, to the Supervisor's requirements, indicating the planned dates of commencement and completion of installation for each portion of the works. These schedules, submitted at the Supervisor's request, shall be furnished at agreed time intervals, such intervals to be not less than 14 days.

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- (d) Day to day diary sheets recording plant, etc. delivered to, and work executed on Site.

5.1.7 Drawings and Documents - Format

The Book of Drawings and other contract documents are to be read in conjunction. However, the Contractor may be required to furnish the supervisor with updated drawings in accordance with the Conditions of Contract and the Specifications.

The Contractor shall carefully check the drawings provided to him and shall bring any omissions, errors or discrepancies to the attention of the Supervisors Representative (SR), who will then re-issue the corrected drawings. Failure to discover and/or notify the SR of any omissions, errors or discrepancies in the drawings shall not relieve the Contractor of the responsibility for unsatisfactory works resulting there from and obligations to rectify the works at their own expense.

All drawings, dimensions, calculations and information furnished in connection with the Contract shall be expressed in SI units.

The drawings shall be sized to designations A3 and A4 of section 2, BS 3429: Sizes AO, A1 and A2 and above shall not be used. Each drawing shall carry the project title, the name of the Supervisor, the Contractor and the Employer, together with the drawing title and number and other relevant data, in the lower right-hand corner.

Prior to Taking Over of the completed works, the Contractor shall furnish the SR with “As-Built” drawings in the same format as the construction drawings issued to him. The cost for preparation of these drawings shall be deemed to be included in the rates for the works.

The Supervisor's approval of the Working Drawings, Contract Records etc and of the Workshop test records etc. shall not relieve the Contractor of the obligation to meet the terms of the Specification and any of the Plant which upon delivery to site is found to be incorrect or unsatisfactory, or which fails to perform its duty satisfactorily during commissioning or during the Defects Notice Period shall be replaced to the Supervisor's satisfaction.

5.1.8 Contractor's Staff

The Contractor and any Sub-contractor engaged upon the execution of the Works shall be deemed to employ, or to procure the employment of, staff skilled and experienced in works of a similar nature to the Works and jointly and severally they shall be responsible for the provision of safe, reliable and efficient Plant such as will ensure its precise and safe operation under all conditions, and shall provide all plant and services reasonably necessary for the complete setting to work and performance of the works whether or not specifically mentioned in the Specification Bill of Quantities or indicated in the Drawings.

5.1.9 Bench Marks

The SR will on request indicate benchmarks and points or origin for survey to the Contractor on site. Where deemed appropriate or necessary the SR or its staff may place Temporary Benchmarks (TBMs) to direct the Contractor in setting out the works. Upon the Contractor being shown the location on site of any TBM, the responsibility of protecting and preserving the same shall from that time onwards rest with the Contractor and the Contractor shall at his own expense re-locate and replace any such TBM which shall for any reason be displaced or removed from its original location.

5.1.10 Levels and Dimensions

The levels of the ground and the levels and dimensions of the natural features are believed but are not guaranteed to be correct. Wherever dimensions or levels are marked on the Drawings, such dimensions or levels shall take precedence over dimensions scaled from Drawings and scaled dimensions shall be used only in the absence from the Drawings and/or elsewhere of other information and then only on the written instruction to do so from the SR. Large scale Drawings shall be taken in preference to Drawings of a smaller scale.

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5.1.11 Programme, Work Sequence and Records

The Contractor shall submit a programme of activities for execution of the works. No physical work shall commence before submission of the work programme and acceptance/approval by the Supervisor.

The Contractor shall adhere to the approved Work Programme and shall inform the SR of any intended change.

In addition, and as a compliment to the Programme the Contractor shall submit at the same time schedules of Contractor's Equipment and labour indicating the projected numbers and types of Contractor's Equipment and labour to be utilised on the Works to enable compliance with the Programme. The schedules shall be itemised under the same heads of items of work as are used in the Programme.

The Programme shall include as a minimum the following activities:

- (a) Confirmation of Quantities and Placing of Orders
- (b) Erection of materials storage facilities
- (c) Local procurement of major materials
- (d) Offshore procurement of major materials:
 - (i) Manufacture/Preparation for shipping
 - (ii) Shipping
 - (iii) Clearing at Port, transport to site and offloading to appropriate storage facilities.
- (e) Mobilisation to commence Works on Site
- (f) Sequence of work for pipe pigging and jetting
- (g) Major elements of work on Site, in sufficient itemisation to allow for continuous monitoring of progress of Works
- (h) Tests on Completion

The Contractor shall submit a detailed proposal for each component of the work, including working/workshop drawing, sequence and method of execution and testing, which shall be approved by the SR prior to commencement of the work component. Works for which such proposal are not received and approved by the supervisor will be rejected in the event of subsequent defects found by the supervisor.

Where an existing scheme in operation is to be rehabilitated or expanded, the works shall be carried in such manner as to reduce plant shut down time during rehabilitation/expansion works to the minimum. Where completely new electro-mechanical equipment is proposed, full shut-down may not be avoidable during the M & E installation, but this shall be kept to a minimum.

The Contractor shall provide a day-to-day diary sheet recording plant, staff, materials delivery, work done, tests, rainfall and any other event which might influence the works and any other records as agreed upon.

The Contractor shall provide the SR with documentary evidence of material orders for the project and shall inform the SR of progress if assembly or manufacture is not on site.

It is noted that the Client wishes to complete the works within the shortest possible time.

The Contractor shall avail his Agent at all site and progress meetings called by the SR. The Contractor shall be deemed to have allowed for the above in all aspects of the tender.

5.1.12 Notice of Operations

The Contractor shall give full and complete written notice of all important operations to the SR sufficiently in advance to enable the SR to make such arrangements as the SR may consider necessary for inspection or for any other purpose. The Contractor shall not start any important operation without the written approval of the SR.

5.1.13 Provision of Facilities for Supervisors Representative's (SR) Inspection

The Contractor shall provide the necessary tackle, access and labour to enable the SR conveniently to carry out such inspections, as they deem necessary at all times during the currency of the Contract.

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5.1.14 Provision of Labour for Supervisor's Representative (SR)

The Contractor shall provide all such labour and assistance as required by the SR and his staff.

5.1.15 Facilities for the Supervisor's Representative (SR) to Take Samples

The Contractor shall provide all facilities and equipment for the SR to take samples for testing of any of the materials. Such samples may be taken before incorporation into the works or at any time during Construction, at the discretion of the SR.

No claims for delays due to the taking of samples by the SR will be allowed.

The taking of any samples by the SR shall not relieve the Contractor of his responsibility that all materials and workmanship comply with the specification, nor shall it relieve the Contractor for any of his duties under the Contract.

5.1.16 Contractor's Office

The Contractor shall provide and maintain an office on or near the Works on Site approved by the SR for the use of his Agent, where written instructions may be delivered by the SR and in such cases, will be deemed to have been delivered to the Contractor. This office shall be open during the Contractor's working hours and shall, when open, have at least one person present whom the Contractor has authorised to receive on his behalf correspondence or written messages.

5.1.17 Supervisor's Representative Site Office

The Contractor shall provide and maintain an office on or near the Works on Site approved by the SR for himself or his representative. This office shall be constructed and furnished as specified in the specification.

5.1.18 Precautions Against Contamination of the Works

The Contractor shall at all times take every precaution against contamination of the Works. He shall give strict instructions to all persons employed by him to use the sanitary accommodation provided. The relevant Article of the Conditions of Contract will be rigidly enforced in any case where these instructions are disobeyed.

5.1.19 Supply of Electricity

Save as is otherwise provided for in the Contract, the Contractor shall make his own arrangements for the provision of electricity for use in the execution of the Works, both Temporary and Permanent, for the work of any Sub-Contractors.

5.1.20 Supply of Water

The position of the Employer or his Agent as a supplier of water shall be identical with that of other suppliers and quite separate from his position as Employer under the Contract. As in the case of a supplier, a failure on the part of the Employer (or his Agent) to supply water will not relieve the Contractor of any of his obligations under the Contract nor, in respect of any such failure, shall the Contractor have any claim under the Contract against the Employer.

Save as is otherwise provided for in the Contract, the Contractor shall provide at his cost and arrange for all water required for the execution of the Works and ensure that it is of such quality that will have no deleterious effects on the Works.

The Contractor shall submit proposals to the SR for the provision and maintenance of the supply of potable water and the SR shall approve these proposals before any Works are commenced.

5.1.21 First Aid Outfits

During the progress of the Works the Contractor shall at each place of work provide an adequate First Aid Outfit which shall be easily accessible at all times, and which shall include the following: -

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Range of bandage sizes	plasters
Antiseptic ointment	thermometers
Scissors	cotton wool
Aspirins	safety pins
Anti-malaria tablets	sticking plasters

and shall replenish and maintain as use demands, at his own cost. The provision of these kits shall be considered part of the Contractor's obligations in setting up his camp. The first aid kits shall be available for use by the SR's staff as well as the Contractor's staff on site.

5.1.22 Access Roads

Having regard to the relevant section of the Conditions of Contract, the Contractor shall at his own cost undertake such improvements to or construction of drainage culverts on the unsurfaced roads and shall be responsible for maintaining these roads for the duration of the Contract in so far as these improvements or the maintenance is necessary for compliance with the Condition.

All such improvements, constructions and maintenance shall be to the satisfaction of the SR and the relevant authorities, and no improvement or construction shall be carried out without prior approval of the Contractor's proposals by the SR. At the end of the Contract, the unsurfaced roads shall be brought back to a standard not less than that existing at the beginning of the Contract.

The Contractor shall construct and maintain such additional temporary access roads and shall make any improvements to the standards of existing roads (subject to the approval of the relevant authorities) as may be necessary for carrying out the Works, the cost of which is to be included in his rates.

5.1.23 Flagging, Lighting and Watching

The Contractor shall be responsible for properly watching and lighting the Works even where they are on enclosed land, and shall allow for the same within his rates.

In this matter and as to flagging and traffic control he shall comply with the requirements of the Employer, the Police and/or the competent Authority. Prior to the commencement of any works across or alongside public roads the Contractor shall obtain the approval of the SR of his plans for flagging and traffic control.

5.1.24 Temporary Works

The Contractor shall provide, maintain and remove on completion of the Works all temporary Works including roadways, sleeper tracks and staging, etc. over roads, footpaths, streams or unstable ground and he shall make them safe and suitable in every respect to carry all Plant required for the Work or for providing access or for any other purpose.

Details of temporary Works shall be submitted in advance to the SR for his approval, which when approved, shall not relieve the Contractor of complete responsibility for their safety and satisfactory operation.

5.1.25 Survey Beacons

During the progress of the Works, the Contractor shall not remove, damage, alter or destroy in any way whatsoever, any plot or survey beacons. He shall notify the SR of the need to interfere with any beacon. The SR shall be responsible for any removal and reinstatement that he considers necessary. Should any beacon be found to be above or below the level of the finished Work, the Contractor shall immediately report the same to the SR.

Should any beacon be damaged or destroyed by the Contractor he shall forthwith report the damage to the SR and the relevant authorities and shall be held liable for the cost of reinstatement thereof.

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5.1.26 Access to Lands for the Project

All land access for the project, such as area required for headworks, boreholes, reservoirs and access for pipe laying shall be provided by the Community or State Government. Compensation shall not be paid in any form under the Contract.

5.1.27 Reinstatement of Roads and Footways

The opening up of public roads and reinstatement of the same shall in all respects be carried out to the requirements of the relevant authority. The Contractor shall be responsible for liaison, co-ordination and arrangements with the relevant authority in the obtaining of approvals and/or consents, payment of fees and all manner of things necessary to comply with the lawful orders of the relevant authorities and the Contractor shall allow for the same within his rates.

5.1.28 Privately Owned Services

If any privately owned service, on, about or through the Site will be affected by the Works, the Contractor shall provide a satisfactory alternative service in full working order to the satisfaction of the owner of the service and the SR, before the cutting off of the existing services.

5.1.29 Additional Land

The Contractor shall select and arrange at his own expense for any temporary occupation of land outside the Site, which he requires for the efficient execution of the Works. The Contractor must comply fully with all Byelaws and Regulations currently in force in the area.

5.1.30 Submission of Samples

Before the supply of any materials or articles which he intends to incorporate into the Permanent Works, the Contractor shall submit to the SR for his approval a sample of each respective material or article, and such samples shall be delivered to and kept at his Office for reference. Should the samples be considered by the SR to be unsuitable for the purpose intended, or not to comply with the Specification or the nominated Standard Specification the Contractor shall submit samples of the materials or articles from a different source for approval. All the respective kinds of materials and articles used in and upon the Works shall be at least equal in quality to the approved samples. Each and every sample shall be a fair average of the bulk material or of the article it represents. The SR may decide the method by which each sample to be taken from the bulk shall be obtained and the number of such samples. The Contractor shall allow for complying with the provisions of this Clause within his rates.

5.1.31 Procurement of Materials and Manufactured Articles

The responsibility for so ordering and delivering materials and manufactured articles and samples so that they may be tested sufficiently far in advance of the Work so as not to delay it, shall rest upon the Contractor, and he shall not be entitled to any time credit for delay occasioned by his neglect to order sufficiently well in advance or to payment of any costs he may incur as the result thereof.

With regard to any item in the Bills of Quantities, which is the subject of a Provisional Sum, the SR shall notify the Contractor of his requirements in ample time for the Contractor to make any necessary arrangements so that no delay occurs in the progress of the Works.

The Contractor shall be deemed to have allowed for compliance with the provisions of this clause within his Tender.

5.1.32 Testing of Materials and Manufactured Articles Before Use

Any or all of the materials and manufactured articles supplied by the Contractor for use on any of the Works throughout this Contract shall be subject in advance to such tests as may be specified in the relevant Specification or Standard Specification or as may from time to time be deemed necessary by the Engineer. Samples of all such materials and manufactured articles together with all the necessary labour, materials, equipment and apparatus for sampling and for carrying out of tests on the Site on all such materials and

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manufactured articles shall be supplied by the Contractor at his own expense. The cost of special tests ordered by the SR to be carried out by an independent person at a place other than the Site or place of manufacture or fabrication shall be borne by the Employer, provided the tests show that the materials, articles or workmanship are in accordance with the Specification, otherwise the cost of such special tests shall be borne by the Contractor.

5.1.33 Rejected Materials

Should any materials or manufactured articles be brought on to the Site of the Works by the Contractor which are in the judgement of the SR unsound or of inferior quality including defects or damage sustained in transit or in any way unsuited for the Works in which it is proposed to employ them, such materials or manufactured articles shall not be used upon the Works but shall be branded if, in the opinion of the SR this is necessary, and shall forthwith be removed from the Site of the Works, all at the Contractor's expense and in each case as the SR shall direct.

5.1.34 Quality of Materials and Workmanship

The materials and workmanship shall be of the best of their respective kinds and shall be to the approval of the SR. In the reading of this Specification the word "to the approval of the SR" shall be deemed to be included in the description of all materials incorporated in the Works, whether manufactured or natural and in the description of all operations for the due execution of the Works.

5.1.35 Standards

The Contractor shall observe these Specifications and shall carry out all work in a skilled and workmanlike manner in keeping with the customs of the trade, and modern methods of construction engineering.

In addition, the Contractor shall conform to all conditions, regulations, laws and by-laws currently in force in Nigeria with regard to the execution of construction work and shall follow all instructions issued by the competent Authorities and the SR.

The Bidder shall at his discretion base his bid on Standard Specifications generally used or approved save that where a relevant Standard Specification issued by the Nigeria Bureau of Standard exists at the date of submission of bids such a Standard should as a minimum be complied with. Where no Nigeria Standard Specification exists, then the relevant standard specification issued by the International Standard Organisation (ISO), if any, shall be the minimum to be complied with. Where a national standard other than a Nigerian Standard is referred to in addition to ISO this indicates that such national standard may expand or strengthen further the requirements of ISO.

The Contractor shall have indicated in the appropriate Tender Schedule the Standard Specification to which the particular item to be supplied complies, or where it meets the requirements of a national standard not so specified, this standard shall be indicated in the same schedule. In this event two copies in English of the alternative standard offered should have accompanied the tender and shall be subject to the approval of the SR.

In the event that at the time of tender the Contractor had neglected to nominate the Standard Specification to which any particular item to be supplied shall comply, and there is no relevant local standard or ISO standard for the item, then the SR may at his sole discretion and without extra cost to the Employer instruct the Contractor on the national standard to be adopted in the manufacture supply and erection etc. of the item and the works associated with the item.

5.1.36 Inspection by SR During Defects Liability Period

The SR will give the Contractor due notice of his intention to carry out any inspection during the Defects Liability Period and the Contractor shall upon receipt of such notice arrange for a responsible representative to be present at the times and dates named by the SR. This representative shall render all necessary assistance and take notice of all matters and things to which the SR directs his attention.

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However, this shall be on the condition that no notice shall be required in the event that at the time of the inspection there shall be any part of the Works that have yet to be Taken Over.

5.1.37 Survey Instruments and Other Equipment for the use of the SR

The Contractor shall provide for the exclusive use of the SR and his staff survey equipment as provided in the Particular Specification.

5.1.38 Cleaning up of Site

The Sites of all permanent and temporary works, including borrow areas and tips in connection with this Contract, are to be carefully cleaned up, and trimmed, and the Site is to be handed over to the Employer in a neat and clean condition to the satisfaction of the SR. Compliance with this Clause shall be a prerequisite condition for the issue of a Taking-Over Certificate.

5.1.39 Sign Boards

The Contractor shall provide, sign-write, erect and maintain until the expiry of the Defects Liability Period sign boards of sound timber construction and hollow section steel uprights to the dimensions, sign-written and painted in durable colours, as directed by the SR. Such signboards shall be removed upon expiry of the Defects Liability Period, such removal being a pre-requisite for release of final retention money.

The signboards shall each contain not more than 10 m² of inscribed painted timber surfaces and have a total height above ground level of not more than 3.8 m. The steel uprights shall be imbedded in Class 20 concrete of sufficient volume to give the whole assembly adequate stability.

5.1.40 Compensation for Land and Entry Upon Land

All land permanently used or occupied by the Works, as shown on the Drawings will be provided by the Employer, save that working width for pipe laying may be restricted to such areas as the SR may direct to minimise disruption of existing services and facilities.

The Contractor shall, subject to the approval of the SR, make his own arrangements for the acquisition of the land required for provision of his own offices, and for camp houses, workshops, stores, borrow pits, etc.

The Contractor shall not enter onto any land or commence any operations until such time that all necessary rights of access have been completed and permission has been obtained from the landowner to enter the land and commence operations. Should the Contractor enter into any land or commence any operations without first obtaining this confirmation, he shall be liable in whole or in part at the sole discretion of the SR, for all additional costs and/or legal charges which might arise there from.

5.1.41 Alteration and Preservation of Existing Services

The Contractor shall acquaint himself with the position of all existing works, such as sewers, water drains, cables for electricity and telephone line, telephone and lighting poles, water mains, etc. before any excavation or other work likely to affect the existing services is commenced.

Where work is being carried in the vicinity of overhead power lines, the Contractor is responsible for ensuring that all persons working in such areas are aware of the relatively large distance that high voltage can "short" to earth when cranes or other large masses of steel are in the vicinity of the power line. The Contractor's shall give due attention to specified safe clearance to the various voltages.

The Contractor shall be held responsible for damage to existing works or services, and shall indemnify the Employer against any claims in this respect (including consequential damages).

In all cases where such existing works are exposed, they shall be properly shored or hung up. Special care must be exercised in re-filling to consolidate the ground under any main cables, etc. exposed and not to cover up water meters and surface boxes, etc. Poles supporting cables, adjacent to the Works, shall be

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kept securely in place until the work is completed, and shall then be made as safe and as permanent as before.

Notwithstanding the foregoing requirements, and without lessening the Contractor's responsibility, the Contractor shall inform the SR immediately of any existing works that are exposed.

The Contractor shall be responsible for arranging for the moving of services, subject to the agreement of the SR, where necessitated by the Works, and shall pay for the moving of services or alteration to services such as power lines, telephone lines, water pipes, etc. A Provisional Sum for this work has been allowed for in the Bills of Quantities. The utilisation of that item shall be at the discretion of the SR who may direct that the work be done by others, or that the Contractor shall execute the work and be compensated on a Dayworks basis. Where the Contractor encounters conditions where the alteration and preservation of existing services is necessary, he shall at once inform the SR staff who shall then direct the Contractor on the means and methods of so doing.

5.1.42 Closure of Roads

Where a road used by the Contractor for delivery of any material to be used in the Works is closed by order of the Traffic Authorities, the Contractor shall obey such closure order and shall suspend operations or use an alternative route. The fact that the Contractor is performing work for the Government of Nigeria will not give him any special privileges in this respect.

5.1.43 Liaison with Government and Police Officials

The Contractor shall keep in close contact with the Police and other Government officials of the area regarding their requirements in the control of traffic and other matters and shall provide all assistance or facilities which may be required by such officials in the execution of their duties, and shall provide in the unit rates or elsewhere in the Bills of Quantities for any expenses arising out of compliance with this Clause.

5.1.44 Regulations of Local Authorities

The Contractor shall at all times conform to the lawful provisions of any ordinance and of any order, proclamation, rule or notice made under any ordinance relating to the Works, employment of labour, etc., and to any regulation and/or by-law of any local authority and of the water or electricity undertaker within whose area and jurisdiction the Works are to be executed.

5.1.45 Building Regulations

All buildings erected by the Contractor upon the Site and campsite or sites, and the layout of the buildings and Sites shall comply with Laws of Nigeria, and with all local by-laws in so far as they are applicable.

5.1.46 Operation and Maintenance Manual

The Contractor shall compile in three copies, an Operation and Maintenance Manual for all mechanical and electrical installations as well as pipeline appurtenances provided under the Contract, for use of the Employer's staff in running the completed water supply system. The manual shall contain a general description of each installation and its operation, drawings, spare parts lists and details in English language of all the different manufactured new Plant, materials and components incorporated in the Works including but not limited to all pertinent manufacturers brochures. Reference is to be made to the relevant clauses in the Conditions of Contract and the M&E Specifications.

Taking-Over will not be considered and a Taking-Over Certificate shall not be issued until such detailed information as is required has been submitted to and accepted by the SR.

5.1.47 Training for the Employer's Personnel

The Contractor shall, if required, provide training to a number of the Employer's personnel, nominated by the SR during the construction of the Works. This shall include but not necessarily be limited to: -

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provision of a work gang or gangs with gangers or foreman to work alongside the Contractors staff in the fields of pipeline repair and the installation of valves, and replacement consumer connections.

The Contractor shall also train the Employer's nominated personnel, as well as supervise the operation of the Works until the operators are fully conversant with the Plant. This training phase shall be conducted by a competent instructor(s) and shall include instructions in the operations and maintenance of the Works in accordance with a programme previously submitted to and approved by the SR. Refer also to the relevant M&E Specification.

5.1.48 Access to Existing Facilities

Where necessary for the execution of the Works, the Contractor and his employees shall be granted access to enclosed and fenced off areas, which belong to the Employer and are in use for the abstraction, treatment, storage and conveyance of water.

Such access shall be limited to the strict requirements for carrying out of the Works without delay but shall not constitute free and unhindered access to all parts of such premises, nor shall it constitute authority for access at any and all times.

Access to such premises shall be limited to: -

- (i) the Contractor's senior and responsible staff not normally engaged upon the Works on site but who are employed by the Contractor in a capacity related to the Works.
- (ii) a reasonable number of site supervisory staff who shall oversee erection and construction work.
- (iii) Organized gangs of technicians, artisans, workmen and labour, who shall enter the premises, work therein and leave as a group or groups, each group being under the supervision of a previously nominated person; and
- (iv) Crews operating Contractor's Equipment who shall remain with their piece of equipment whilst upon such premises.

Unless otherwise specified, any authorities provided for access to such premises shall be deemed to be restricted to the Contractor's normal working hours, with the addition of reasonable times for entering the premises to prepare to start work, leaving the premises on close of work for the day, and for work which may continue during normal meal or recess breaks. Access at other times shall not however be unreasonably denied.

The Contractor shall apply for access during normal working hours (and such extensions thereto as shall not require specific approval as specified above) at least seven days before work commences on such premises, and provide in his application: -

- (i) the estimated duration of the need for such access, in weeks.
- (ii) the normal working hours which shall be in effect.
- (iii) the names of the supervisory staff who shall be responsible for and who shall enter and leave with the working gangs.
- (iv) the areas in which work shall be carried out; and
- (v) the approximate numbers of workmen in such working gangs.

Applications for access outside the above times shall be by at least three days' notice, which notice shall be deemed to be approved if it is not rejected within two days of submission.

5.1.49 Removal of Goods from Employer's Premises

The Employer's staff at any of the Employer's premises shall be entitled to demand and to be provided with written descriptions of any goods removed from within the Employer's premises, whether the goods belong to the Employer or not.

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The Employer's staff shall be permitted and assisted by the Contractor and his employees to determine that the description of such goods is true and accurate including the inspection of vehicles and the opening up of any containers, parcels or wrappings.

5.1.50 Interruption of Water Supply

Where it is necessary for the supply of water by the Employer using existing facilities in and about the site to be reduced or interrupted in order for the Contractor to replace or repair existing facilities, or install new Plant or material, hereinafter called "Disruption", then the Contractor shall only be permitted to use methods of work, types and numbers of Equipment and levels of staff and labour which will result in minimum Disruption.

The Contractor's proposals for the execution of such works shall be subject to the SR's approval, and the SR shall not be required to consider the costs to the Contractor, (including payments for overtime to the Contractor's personnel) or the convenience to the Contractor of particular sequencing of work, where such considerations conflict with the Employer's need to limit the extent of Disruption.

The Contractor shall indicate in the Programme submitted pursuant to Conditions of Contract Clause 14 the approximate dates and durations of Disruption, and shall, during the execution of the Works, notify the SR forthwith of any circumstances which arise which may affect the expected dates of such Disruptions.

At least 14 days before any Disruption proposed by the Contractor, the Contractor shall submit to the SR for his approval his plan for works associated with the Disruption and details of the dates and times intended for such Disruption. The SR shall within 7 days of such submissions:

- (i) inform the Contractor of the dates and times when such Disruption will be permitted, which shall be not more than 3 days before or 7 days after the dates proposed by the Contractor;
- (ii) instruct the Contractor on the methods of work and types and numbers of Equipment and labour to be employed on such works, or otherwise grant approval for the Contractor's plan; and
- (iii) provide the Contractor with the text of a notice by the Employer to the public of the intended Disruption.

The SR may otherwise instruct the Contractor that the Disruption shall be on dates more than 7 days after the dates proposed by the Contractor in which case the period in excess of 7 days shall be deemed to be a Suspension under Conditions of Contract Clause 40.

Approval for Disruption may be withheld at the Contractors responsibility, if in the opinion of the SR the Contractor cannot execute the works associated with the Disruption in accordance with the SR's requirements. Notification of such withholding of approval shall be accompanied with a description of the reasons therefore, and instructions on the action to be taken by the Contractor before approval is given.

The Contractor shall publish the Employers notice to the public on the dates one and two days before the commencement of the Disruption in three national newspapers at a minimum of quarter page size.

The costs and effects of compliance with this Clause (save for any Suspensions) shall be deemed to have been allowed for in the Contractor's rates and prices, and in the time for completion.

5.1.51 Copies of Standards

Within 60 days of the acceptance of the Bid, the Contractor shall provide to the SR copies of all National and International Standards which are to apply to the Plant, materials and workmanship under the Contract, together with an Index cross-referencing these standards with the applicable aspects of the Works.

Three sets of such standards securely bound are to be provided. Cost of provision of the Standards shall be included in the relevant section of the Bills of Quantities

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5.1.52 Site Safety

The Contractor shall observe and cause his employees to observe safety standards commensurate with the nature of the Works. To this end the Contractor shall provide and ensure his employees wear:

- (i) overalls,
- (ii) boots or shoes with reinforced toe caps,
- (iii) hard hats suitable for a construction site, and
- (iv) other protective equipment such as gloves, earmuffs, goggles, etc., as are necessary for particular work.

The Contractor shall further provide hard hats and Wellington boots for the SR and his staff (up to 4 number), and for the use of site visitors up to ten in number.

The Contractor shall ensure that there is suitable and sufficient fire fighting equipment provided and maintained on site. All possible precautions shall be taken in the storage and handling of petroleum and other inflammable substances.

No work shall be permitted to be executed unless the SR is satisfied that appropriate safety measures are in place and that the Contractor's employees are wearing suitable safety gear. The Contractor shall be required to ensure adequate safety during construction works to avoid harm or injury to his employees, the Supervising staff or the public. The Contractor shall ensure that all excavations are securely struted and handling of any heavy material, equipment or plant is by safe means. The Contractor shall further be responsible for ensuring that any hazard posing situation arising from the construction works to the site personnel or public is avoided. This shall include but not be limited to sufficient protection and warning for open trenches, material, and plant during and after construction works.

The costs and effects of compliance with this Clause shall be deemed to have been allowed for in the Contractors rates and prices.

5.1.53 Local Technical Agency

The Manufacturer of the Pumps and Motors and of the Electrical Switchgear supplied under this contract will be expected to have or shall prior to award undertake to appoint a local (Nigeria based) representative with proven technical competence in the electro-mechanical field. The level of competence shall be such that if the employer should decide to enter a service or service/training contract for the maintenance of the equipment indicated here, and then it would be practicable to do so. The Local Agents will be expected to have in their stores and workshop enough of the relevant spare parts, the necessary equipment and tools to service/ maintain the proposed Mechanical and Electrical Plant and suitably qualified and trained personnel to perform the required service/ maintenance works.

The above notwithstanding, the Contractor shall comply with all requirements of the Environmental Protection and Control Act of the Laws of Lagos State and Nigeria.

5.1.54 Contractor Base Camp

The Contractor shall be required to establish a Base Camp in the project area for the duration of the contract.

5.1.55 Standby or Stand-time Charges

There will be no reimbursement for standby or stand-time should the Contractor or his sub-contractors be delayed for any reason

5.2 BUILDING WORKS

Buildings shall include the Generator house, Pump / Chemical room / Store, and other structures in the design, as shown in the Drawings and scheduled in the Bills of Quantities.

The power generator, electrical panels, HTH and lime dosing system shall be located in the powerhouse. The building shall be in reinforced concrete framed construction with external walls in a combination of 225mm hollow block walls and perforated block walls as shown in the drawings.

Roofing shall be in approved seasoned treated hardwood including trusses, purlins and wall plates. Roofing shall be of long span corrugated Aluminum sheets from an approved manufacturer, secured to wood purlins with corrosion resistant drive screws.

Drainage channels, generator, tank and pump plinths and cable ducts / trays shall be provided generally as shown in the drawings but shall take into consideration the approved equipment specification.

Metal ancillaries such as chequer floor plates and duct covers shall be finished in suitable approved primer and topcoats as provided in the General Specification.

The chemical dosing shall be boarded off in appropriate partitioning, as shown in the drawings, finished in suitable approved primer and gloss paint.

The generator house floor shall be finished in 30mm screed, in 1:3 cement mortar and troweled surface. Internal and external walls shall be painted in 1 undercoat and 2 finishing coats of approved emulsion paint. Plinths for the generator, transfer pump and dosing tanks shall be constructed to the equipment specifications and provision shall be made for bolting of pump base onto the plinth by means of appropriate cast-in bolts or openings to be grouted at a later stage.

Metal ancillaries such as chequer floor plates and duct covers shall be finished in suitable approved primer and topcoats as provided in the General Specification.

Windows shall be mild steel casing type, with steel frame embedded in the sand Crete block work construction, and with 5mm thick tinted glass panes. Steel doors and main entrances shall be heavy duty, including frame, lock, hinges and drop-bolts. Timber doors shall be high quality, with frame and locks and all ironmongery. All windows and doors shall be fitted with burglar proofing.

The pump house floor shall be finished in 30mm screed, in 1:3 cement mortar and troweled surface. The floor concrete shall be Grade 25/20, reinforced with A142 fabric mesh (6mm @ 200c/c), cast on well compacted subgrade overlaid by compacted hardcore. The floor concrete shall be directly underlain by 20mm thick polythene damp-proof membrane. All concrete shall be placed using appropriately sized vibrators.

Structural members – bases, columns, roof beams – shall be reinforced appropriately in hot-rolled high yield steel bars to BS 4449 or equivalent and shall have adequate cover. Drainage shall be provided for possible pump leakage as well as cable ducts for electrical works as shown in the drawings. Internal and external walls shall be painted in 1 undercoat and 2 finishing coats of approved emulsion paint. However, the lower external wall section (from ground level to +600mm) shall be painted in gloss for ease of maintenance against rainfall splash.

The specification for the electro-mechanical installations are provided in the relevant sections of the Tender Documents.

Design of the generator plinth shall assure sufficient weight of plinth to dampen out the equipment vibration during operation. The plinths for the generator and pumps shall be constructed to the equipment specifications and provision shall be made for bolting onto the plinth by means of appropriate cast-in bolts or openings to be grouted at a later stage.

Renovation / modification works shall be carried out on all other existing buildings as detailed in the BoQ and shown in the layout drawings.

The main distribution board, switchgears, changeover, and other ancillary equipment shall be accommodated adjacent to the chemical mixing room, as shown in the drawings.

Where existing soak away pits and septic tanks are no longer usable, they shall be filled up in suitable granular material and compacted to the relevant AASHTO standards.

5.3 DISTRIBUTION NETWORK

5.2.1 Pipe Materials

The pipes shall be laid in unplasticized polyvinyl chloride (uPVC) materials, but road crossings, stream crossings and pipes above ground shall be laid in Ductile Iron (DI) pipes and fittings.

DI pipes and fittings to be laid shall be DI, PN 10 bars, to ISO 2531 / BS EN 545/598.

uPVC pipes, mainly of diameter 160mm and less shall be PN 10 bars, to ISO 4422. The pipe layout is shown in the drawings. uPVC joints and fittings shall also be PN 10 bars, to BS4346.

Furthermore, they shall comply with the general requirements of the General specification Chapter 5 – Pipework.

5.2.2 Appartenances

Where isolating gate valve chambers on the transmission mains serve the dual purpose of enclosing the valves as well as acting as anchor blocks against movement due to shock loadings, the chambers shall be constructed in reinforced concrete as shown in the drawings and to the relevant specifications for the purpose.

Hydrants shall be the “Below Ground Type”, NP 10, to DIN 3221, with bayonet coupling outlet.

Extension spindles shall be provided and installed with gate valves for the diameters 50mm – 250mm. Length shall be 1.4 – 1.8 meters. The spindle heads shall be provided with street caps for access and operation.

Design of reinforced concrete chambers and precast reinforced section shall be approved by the SR prior to construction and the design shall take into due consideration of possible traffic loads.

The Contractor shall provide suitable approved cutting equipment for cutting of short pipe lengths or spigot ends to suit as may be required for the installations.

Suitable air valves shall be installed as indicated in the drawings and instructed by the SR. Air valves shall be provided with isolating gate valves.

Cutting of pavement surfaces (asphalt, concrete) shall be carried out with suitable approved cutting equipment to proper alignment and to assure quality of the subsequent repair works.

All the works shall be executed in accordance with the applicable specifications, standards drawings, Bills of Quantities and Conditions of Contract.

5.2.3 Construction Method

Prior to commencement of the works, the Contractor shall carry out all necessary site investigations and surveys, including spot excavations to confirm alignment of the proposed pipelines as well as existing pipe material, size, alignment, and connection details at tie-in points. Subsequently, he shall finalize junction details, which shall be approved by the SR.

The works shall include for all excavation, dewatering, shuttering, backfilling, bedding, construction of valve chambers, thrust and anchor blocks, supports, pressure testing, flushing, sterilization and all other ancillary works as detailed in the drawings, BOQ and specifications.

The pipelines shall generally follow the existing road alignment unless otherwise instructed by the SR and the Contractor shall check and confirm all alignments and levels prior to commencement of work. Pipelines shall also generally follow the alignment of existing damaged or abandoned pipes, which shall be excavated and removed, prior to laying of new replacement pipes. However, where old pipes have been overlaid by new road construction, and the site conditions permit, extensions and replacement lines shall be laid parallel to the existing alignment but off the paved surfaces.

At crossings of roads, watercourse, and drainage, as approved by the SR, pipelines shall be bedded and protected as detailed in the drawings. The rates in the relevant BOQ items shall include for all earthworks, concrete works, and all ancillary works for the completed pipe crossing. All crossings shall be in DI pipework alone.

Where isolating gate valve chambers on the transmission mains serve the dual purpose of enclosing the valves as well as acting as anchor blocks against movement due to shock loadings, the chambers shall be constructed in reinforced concrete as shown in the drawings and to the relevant specifications for the purpose.

Hydrants shall be the “Below Ground Type”, NP 10, to DIN 3221, with bayonet coupling outlet. Extension spindles shall be provided and installed with buried Gate valves for the diameter range 50mm – 200mm. The spindle shall be in stainless steel and the base flange drilled to DN 2501 – NP 10. The spindles shall be

telescopic type, with the spindle shaft and hollow top spindle of steel, the spindle coupling and spindle head of ductile iron to DIN 1693, carriage protected with inner and outer cover of PE, sealed at the top against ingress of surface water and dirt. Length shall be 1.0 – 1.5 meters. The spindle heads shall be provided with street caps for access and operation.

Design of reinforced concrete chambers and precast reinforced section shall be approved by the SR prior to construction and the design shall take into due consideration of possible traffic loads.

The Contractor shall provide suitable approved cutting equipment for cutting of short pipe lengths or spigot ends to suit as may be required for the installations.

Suitable air valves shall be installed as indicated in the drawings and instructed by the SR. Air valves shall be provided with isolating gate valves.

Cutting of pavement surfaces (asphalt, concrete) shall be carried out with suitable approved cutting equipment to proper alignment and to assure quality of the subsequent repair works.

All the works shall be executed in accordance with the applicable specifications, standards, drawings, Bills of Quantities and Conditions of Contract.

5.2.4 Hydrostatique Testing of Pipelines

After laying, new pipelines shall be tested under pressure and where in trench, such tests shall be made before it is completely back-filled. During the test, all joints shall be clear of earth, timber, etc to allow visual inspection. Testing shall commence when not more than 20% of all pipework has been laid and at no time may there be more than 20% untested.

Old pipelines that are yet to be taken into service shall not be tested but shall be visually inspected for leakage after commissioning of the works.

The pipeline shall be tested in lengths between valve locations or in such shorter lengths as the SR may approve on the understanding that no extra cost will be incurred to the Employer but the maximum length of main to be tested, shall not normally exceed 500m.

The Contractor shall supply all necessary materials to carry out the test in accordance with the requirements including force pumps, water pressure gauges, including tools for the use of the SR, interconnecting pipework, feeding tank, blank flanges, temporary stop-ends, struts, and water for the test. The test section shall be capped or flanged off at each end and all branches. Testing shall not take place against closed valves.

For a pipeline incorporating flexible joints, testing shall not commence until after all the permanent anchor blocks along the pipeline have been constructed and soil around them backfilled and compacted. Capped or flanged ends along the pipeline shall also be anchored adequately to withstand the force due to test pressure. The Contractor shall submit his proposals for temporary anchoring to the SR for approval.

After the main has been clear of debris, and all necessary stop-ends and gauges fitted to the SR's approval, the Contractor shall fill up the pipe with water free from silt, and sand and grit and bring up the pressure steadily to the nominal pressure of the pipe or incorporated fittings, whichever is the lesser, (except for old pipelines where a lower value may be specified by the SR), and maintain it with a force pump for 12 hours.

The pressure shall then be increased steadily in increments of 1.0 kg/cm² with a pause of one minute between each increment to the specified test pressure for the section. Unless otherwise specifically mentioned, the applied test pressure shall be measured at the lowest point along the section being tested.

Where the test pressure has not been specified, it shall be assumed to be 50% more than the nominal pressure at the lowest point of the section being tested.

The testing shall be accepted if there is no noticeable leakage on visual inspection and pressure drop over a 6hour period does not exceed 10% of the test pressure.

In the case of long buried pipelines. This shall be in accordance with the relevant provision of the General Specification.

Leaks exceeding permissible amounts shall be made good and faulty pipes, fittings, and specials, shall be replaced by the Contractor at his own expense and the section tested again before approval is given for backfilling. Payment for the section will not be certified, until the test has been passed and backfilling completed.

5.2.5 Measurement for Pipe-laying

Pipe laying and jointing where in trench is included in the Bill of Quantities with excavation, backfilling, and temporary reinstatement, all as described in the Bills of Quantities. Measurement of the work done will be along the centre-line of junctions in the pipe network, and branches, unless otherwise indicated in the Bills of Quantities.

5.2.6 Flushing and Sterilisation

All pipework shall be flushed and cleaned, and all treated water pipework shall additionally be sterilised. The rates inserted are to be for the flushing and sterilising, and where appropriate for cleaning shall be inclusive for, sampling, testing and inclusive of the reports on the bacteriological quality of water.

5.2.7 Concrete Protection

All concrete for beds and surrounds shall be class 15 concrete. Under carriageways and where indicated on the drawings, the pipeline shall be laid in a stepped trench with the immediate surround backfilled with approved granular material and then across the step shall be laid pre-cast reinforced concrete slabs of class 25 concrete.

The unit of measurement shall be cubic metre or linear metre as indicated in the Bills of Quantities. The rate shall include for the provision, transporting and placing of concrete, all strutting and formwork, protection and curing and all labour, tools, plant, supervision overheads and profit.

5.2.8 Anchor Blocks

Pipelines with mechanical (or flexible) joints shall be adequately anchored at bends, tees, sluice or butterfly valves, tapers, blank ends, etc. Anchor blocks shall be constructed from Class 20 concrete to the dimensions indicated on Drawings unless otherwise directed by the SR. Support blocks shall be constructed from Class 20 concrete. Soil around anchor blocks shall be compacted thoroughly before the hydraulic testing of the pipeline. A lump sum provision is made for concrete ancillaries including anchor blocks in the Bills of quantities.

Anchor and Thrust blocks at proposed tie-in points will be cast at least 7 days prior to the proposed tie-in works and post tie-in pipeline testing for the affected section. The required anchor/thrust block casting will therefore precede the proposed tie-in works described in the Particular Specification.

5.2.9 Indicator and Marker Posts

Precast concrete indicator posts to the dimensions indicated on the Drawing shall be installed at all sluice valves, single-air valves, double air valves, fire hydrants and washouts, with letters SV, SAV, DAV, FH, WO, respectively, cast in wrought iron, fixed in the concrete. The posts shall be painted with at least two coats of all-weather plastic emulsion paint of approved colour.

Marker posts to the dimensions indicated on Drawings shall be installed at 250 m spacing along the pipelines installed in open country or as directed by the SR. Marker posts shall be painted with at least two coats of plastic emulsion paint of approved colour.

5.2.10 Pipe Supports

Pipe supports shall meet the requirements of BS 3974 or its update. The proposed support concrete piers shall include the metal steel strap 4- 6mm thick and 50 mm wide with hold down bolts as shown.

The cost indicated in the Bill of Quantities shall include excavation works, concrete works and the metal strap together with bolts.

5.2.11 Service Connections

Service connections shall be in PE pipes to ISO-4427 and 4437. The pipe fittings are made available for quick-fit jointing.

The work shall include for all excavation and backfilling; and materials procurement and installation – tapping ferrules and saddles; PE pipework with fittings, isolating gate valve and all other ancillaries required for a complete functional installation.

Ferrules shall be in bronze material, tapping saddles shall be PVC and gate valves shall be cast iron, with threaded socket ends and with spindle, sleeving and sandfill, and surface cast iron surface cover.

The Contractor shall submit specifications and manufacturers' brochures for all materials for the SR's approval prior to any procurement.

5.4 BOREHOLE WORKS

5.3.1 General

Borehole works shall include boreholes drilling, development and testing, pump installation, cable laying and all electrical connection to existing and / or new panel, laying of all connection pipework and commissioning of the completed works and other ancillary works. The details of work are itemized in the Bill of Quantities.

The works shall include drilling of new boreholes and redevelopment of existing ones. The borehole locations are shown in the Scheme Layout Drawings.

It is anticipated that the drilling depth of the boreholes will be determined after due geophysical investigation required for each respective town and the holes will be lined with 250mm diameter API steel casing and 150mm dia uPVC screens. The anticipated yield from each borehole is expected to guarantee a minimum output of 1.5 m³/hour.

The works shall require a rig in good working order and a compressor suitable for jetting and airlifting at the expected drilling depths.

5.3.2 Redevelopment of boreholes, replacement of appurtenances

Where required, existing boreholes shall be re-developed.

Rehabilitation works will include:

- Down the hole camera inspection of existing Borehole
- Cleaning and redevelopment of existing Borehole.
- Replacement of existing vandalised or destroyed pipes with new approved riser pipes.

The existing boreholes pump and pipework shall be dismantled, and the pump removed. The Contractor shall subsequently develop the borehole by a combination of jetting with water and surging with air as specified in the relevant section of this document and detailed in the BOQ. If required, fishing out of the reportedly dropped pump shall be done.

5.3.3 Inspection of Materials

The Contractor shall present to the SR the list of equipment to be used on the project. The Contractor is not allowed to start the work until the Consultant has checked and approved the list of materials, and equipment to be used during the contract.

5.3.4 Personnel, Drilling Equipment and Safety Equipment

Prior to commencing operations, the Contractor shall establish and submit a schedule or programmer for the works. The programme shall take into consideration the various work components. This schedule shall be subject to the approval of the SR.

The Contractor shall appoint a project manager who shall be a registered hydrogeologist or drilling engineer with at least 10years postgraduate experience who shall be responsible for site operations. He shall also provide capable and suitable personnel and drilling equipment to perform the work. Adequate safety equipment such as safety helmets, hard toed boots and gloves shall be available for the use of the drilling crew while on site.

The Contractor shall be fully operational with the drilling unit, and installation crew working within two weeks of commencing borehole construction.

5.3.5 Borehole Riser Pipes

The new borehole riser pipes shall be *in stainless steel or uPVC, with the appropriate pressure rating*. They shall be connected using a special flanged connection. The dimensions of the flanges shall be suitable to fit in the corresponding borehole casing.

The flanges shall be grooved to allow the drop cable to pass the connection without damage to the cable. The pipes shall be connected using stainless steel bolts of appropriate length and diameter. The drop cable shall be clipped to the riser pipes using non-corrosive clips not exceeding intervals of 2.0m. The riser pipes shall be provided in 6.0m length complete with jointing materials.

5.3.6 Geophysical Investigation

Immediately on commencement of work, the contractor shall carry out an electrical resistivity test comprising vertical electrical soundings, which shall be used to assess necessary information regarding the subsurface structure and the aquiferous potential. The Contractor shall have competent staff, equipment, and software for carrying out the surveys. The investigations shall indicate the following:

- Geophysical delineation of the various lithologies within the formation
- The depths to bedrock where applicable
- The structural disposition of the formation in the area
- An approximate depth of the proposed borehole

5.3.7 Drilling

The Contractor shall be responsible for selecting the appropriate drilling procedure for the geology of the project area. The diameter of the drill hole must be adequate to accommodate nominal 350 mm casing.

The Contractor may choose to either drill a hole of adequate diameter on the first pass or to drill a small diameter test hole, then ream to the desired size. Regardless of the procedure adopted by the Contractor, payment shall only be for the drill hole at the appropriate size, i.e., payment for reaming shall not be allowed.

The Contractor's drilling units shall have the capacity to construct boreholes for the casing diameter specified to a depth of up to 300 m and meet the following minimum specifications or approved equal.

- Hoisting Capacity - 10 800 kg
- Pull down Capacity - 11 300 kg
- Mud pump - 127 mm by 150 mm (5 inch x 6 inch) duplex
- Air compressor rated at 17 cubic metres per minute at 17.6 kg/cm

The Contractor shall equip each rig with a time depth recorder, which gives a continuous record of the penetration rate. The Contractor shall always maintain the time depth recorders in operating condition and consequently shall have spare time depth recorders on hand in case of failure. The Contractor shall note on the record, the type and size of bit used in each interval, the weight on the bit and the depth at which drill stem is added.

The Contractor shall be responsible for improving access where necessary to enable his equipment to reach each drill site. The Contractor shall not be compensated for time lost while access improvements are being made or for any access improvements required while his equipment is bogged down.

The Contractor shall collect representative samples of the formation penetrated at 2.0 m intervals. Samples shall be caught in a bucket placed in the drilling fluid return at the top of the surface casing and the sample allowed to settle out.

Drill cuttings shall be placed in containers provided by the Contractor as approved by the SR. Sample containers shall be steel boxes, divided into compartments approximately 100 mm by 100 mm square and 100 mm deep. The Contractor shall have at each drill site sufficient sample containers to accommodate all the samples collected in a hole to 50 metres depth.

The Contractor shall be paid unit prices per meter in accordance with the depth drilled as set out in the Bill of Quantities. The unit prices per meter shall include all costs associated with the drilling, drilling water, drilling additives, surface casing, collection of drill cuttings, and preparation of daily drilling reports, gravel packing and development.

5.3.8 Driller's Daily Report

During the drilling, completion, and development of each borehole the Contractor shall maintain a detailed driller's report. The report shall describe the drilling method; give a complete description of all formations encountered, number of meters drilled, number of hours on job, shutdown due to breakdown, length and type of casing and screen set, and such other pertinent data as requested by the SR. The format and procedures for submission of the driller's reports will be established through discussion between the SR and Contractor within 7 days of the date of the Employer's Letter of Acceptance. The Contractor shall provide to the SR a copy of the driller's report for each borehole and each unsuccessful drill hole.

5.3.9 Casing and Screen

The borehole shall be lined with iron casings and screen. The casings shall conform to the American Society for Testing and Materials Standards (ASTM) and shall be made of factory threaded high pressure with collapse resistance not less than 16 bars. The casings shall be of 225mm diameter and approximate total length for each borehole shall be 45 m. Jointing of the casings shall be by means of stainless steel treaded couplers.

The screens shall be of dia. 160mm factory slotted and the slot size shall be determined after a sieve analysis. Connection between lining and screens shall be by means of a suitable API steel threaded reducer.

All permanent borehole casings, screens and fittings shall be new. No used casings, screens or fittings shall be accepted unless specifically authorized by the SR for the particular borehole under consideration. The Contractor shall submit samples of the casing and the screen that he proposes to use, to the SR for approval. The Contractor shall specify the manufacturer, applicable standards, material, wall thickness, pressure class, type of joints, maximum joint load and collapse resistance of casings and screens. Slots size of screens and gravel size

Payment shall be on a per meter basis for the supply and installation of casing and screen in accordance with the Bill of Quantities.

5.3.10 Natural Gravel Packing

Natural gravel packing where the formation collapses against the screen shall be used. While a well-rounded, well sorted river gravel shall be used in case of artificial gravel packing. Gravel packing shall generally be in accordance with the provisions of DIN 4924

5.3.11 Development

The Contractor shall develop the borehole by a combination of jetting with water and surging with air simultaneously rotating the jetting tool and slowly raising and lowering it through the length of all screens. The development shall continue for as long as it takes until the borehole is judged by the Contractor to be free of sand and with the maximum formation yield obtained, subject to the approval of the SR. The compressor for borehole development shall be suitable for effectively jetting and airlifting at depths of up to 300m.

The Contractor shall include the cost of borehole development in his unit price for borehole construction. If the development process is prolonged because of faulty installation, the SR may require the Contractor to reconstruct the borehole at the Contractor's own expense

5.3.12 Backfilling and Surface Grouting

The annular space between the borehole casing and the borehole wall shall be backfilled with drill cuttings to within 6 m of the surface. Surface soil shall not be used for backfilling. The backfill may be placed by pouring the material down from the surface taking due caution to prevent bridging.

The upper 6 m of the annular space between the casing and the borehole wall shall be filled with neat cement grout consisting of Portland cement mixed with not more than 25 liters of water per 50 kg of cement. The Contractor shall ensure that the annular space to be grouted is clear of any deleterious materials. The Contractor shall install a surface casing to ensure that the annular space can be maintained in satisfactory condition for placement of the grout. Normally the surface casing shall be removed immediately before or after the grout seal is in place.

Concrete Well Slab

The completed borehole drilling and casing shall be overlaid with a concrete well head slab 250mm thick x 1.2m x 1.2m, in Class 20 concrete.

5.3.13 Abandonment of Unsuccessful Borehole

After the development process, the borehole may be abandoned for reasons not resulting from any action or omission of the Contractor. This may occur because of inadequate yield, unsuitable water quality or excessive distance to water level. Under these circumstances the Contractor may attempt to retrieve the casing and screen from the abandoned borehole, but shall do so at his own expense and shall reap the benefit of any savings that result

5.3.14 Borehole Disinfection

The Contractor shall use a chlorine solution prepared with calcium hypochlorite in powdered or tablet form for borehole disinfection.

Normally, interim disinfection of the borehole shall be undertaken immediately after the borehole development process has been completed. However, if the borehole testing is to be conducted within 72 hours of the borehole completion, the disinfection shall be undertaken after the borehole testing. For interim disinfection, sufficient chlorine compound shall be placed in the borehole to achieve 10 ppm of free chlorine in the water standing in the borehole. At any time, the Contractor may be requested to substantiate that he is adding the correct amount of chlorine compound to achieve the specified chlorine concentration in the borehole.

Immediately after the borehole test has been completed, the Contractor shall undertake final disinfection of the borehole. For the final disinfection sufficient chlorine compound shall be placed in the borehole to achieve 50 ppm of free chlorine in the water standing in the borehole.

5.3.15 Criteria for Successful Borehole

The suitability of a borehole for pump installation to provide a ground water supply depends on:

- Depth to static water level;
- Borehole yield;
- Sand content;
- Turbidity;
- Alignment and plumbness; and
- Chemical and bacteriological water quality.

5.3.16 Borehole Yield

An acceptable borehole yield depends on a combination of the available drawdown and the recovery characteristics. Depth of the borehole and the static water level are additional factors to be considered. Unless otherwise indicated by the SR, the minimum required yield from a borehole is 1.5m³/hour sustained over the 24 hour pumping test period. Normally the yield of the borehole is determined by the characteristics of the water bearing formation and is beyond the control of the Contractor. Provided the Contractor has followed the appropriate procedures for the completion of the borehole, he will not be held responsible for the abandonment of a borehole because of inadequate yield. However, if failure to obtain an adequate yield is caused by actions or inactions on the part of the Contractor, he will be responsible for reconstructing the borehole in the proper manner at his own cost.

The lower limit of 1.2m³/hour is considered the minimum requirement. Where possible the Contractor shall endeavour to maximize the yield from the borehole. Failure to properly exploit the aquifer potential through for example insufficient development or inadequate aquifer penetration and screening, even when the yield of the completed borehole exceeds the minimum, may be cause for rejecting the borehole and requiring the Contractor to reconstruct the borehole at his own cost.

5.3.17 Alignment and Plumbness

The Contractor shall be responsible for ensuring that every borehole meets the criteria for alignment and plumbness, to ensure the below ground components can be accommodated and operate properly. During drilling operations, the SR may direct the Contractor to reduce drilling force and/or to use drill collars to ensure an adequate alignment and plumbness.

Upon the request of the SR, the Contractor will provide at his own expense, an inclinometer to measure the alignment and plumbness of the completed borehole.

5.3.18 Chemical and Bacteriological Water Quality

The SR shall determine whether or not the chemical and bacteriological quality of the water is adequate to serve as a potable water supply.

The Contractor shall also take due caution to prevent contamination of the borehole. If the borehole has become contaminated because of an action or inaction on the part of the Contractor, the Contractor shall bear the responsibility for disinfection of the borehole and, if necessary, the construction of a new borehole at his own cost.

5.3.19 Pump Testing

The Contractor shall conduct a pumping test on every successful borehole for a minimum period of 24 hours. On occasion the SR may request a longer pumping test. The pumping shall be at a constant rate consistent with the capacity of the borehole. The Contractor must have available a submersible pump with a minimum capacity of at least 3m³/hour.

5.3.20 Water Level Recovery

Immediately after the constant rate test has been completed, the Contractor shall measure the water level recovery in the borehole over a minimum period of 24 hours, unless the water level has recovered to the original level by that time.

During the pumping and recovery periods, the Contractor shall measure the water level in the borehole using an electronic sensing device with an accuracy of 0.003 m. The water level measurements are to be taken in accordance with the following schedule:

- Every one minute for the first 10 minutes;
- Every two minutes for the period 10 minutes to 20 minutes;
- Every 5 minutes in the interval 20 minutes to 60 minutes; and
- Every 10 minutes in the interval 60 minutes to 120 minutes.
- Thereafter every 100th minute

The Contractor shall report the results of the borehole testing on forms supplied by the SR.

5.3.21 Water Samples

During the pumping test the Contractor shall also collect water samples from the borehole in a clean bottle of adequate volume, rinse the bottle several times with water being sampled, fill, securely cork and suitably label. He shall carryout an analysis of the raw water, testing for parameters specified or instructed by the SR, but not limited to the parameters listed below.

Physico-chemical Parameters	
1	Appearance
2	Colour (TCU)
3	Odour (TN)
4	Taste
5	Temperature (°C)
6	pH
7	Turbidity (NTU)
8	Electrical Conductivity (U ³ /cm)
9	Total Dissolved Solids (mg/l)
10	Total Solids (mg/l)
11	Residual Chlorine (mg/l)
12	Salinity (%)
13	Total Alkalinity (mg/l)
14	Total Hardness - CaCO ₃ (mg/l)
15	Calcium Hardness (mg/l)
16	Magnessium Hardness (mg/l)
17	Iron Fe ³⁺ (mg/l)
18	Manganese (mg/l)
19	Chlorides (mg/l)
20	Acidity (mg/l)
21	Nitrate NO ₃ . (mg/l)
22	Nitrite (mg/l)
23	Dissolved Oxygen (mg/l)
24	Free Carbon dioxide CO ₂ (mg/l)
25	Ammonia NH ₄ (mg/l)
26	Sulphate SO ₄ ²⁻ (mg/l)
27	Lead (mg/l)
28	Arsenic (mg/l)
29	Benzene (mg/l)
30	Hexavalent Chromium
31	Iodine
Micro-biological parameters	
30	Coliform counts
31	E. Coli.
32	Faecal Coli.
33	Aerobic Mesophilic organisms

5.3.22 Borehole Rehabilitation

The existing borehole shall be rehabilitated. Existing data on the borehole shall be provided by the Client and recorded in a form to be directed by the SR. All additional data as may be available from the rehabilitation exercise shall also be included.

Dismantling of above ground pipe work includes the disconnection of the elbow connection to the vertical riser pipe work and any flow or pressure meter.

Checking of pump shall include:

- visual inspection for iron encrustation and corrosion on pump and pipe work
- mechanical check to ascertain the adequacy of the pump bearings and seals.
- insulation and continuity check on pump motor.
- insulation and continuity check on cables.

- adequacy check on switches and starters.
- adequacy check on flow and pressure meters.

Borehole Redevelopment

Borehole redevelopment shall be by a combination of jetting with water and dispersant and surging and pumping with air. The development shall continue until the borehole is judged by the Contractor to be free of sand subject to the approval of the SR.

In some cases, the borehole redevelopment process may be prolonged due to the characteristics of the water bearing formation. As approved by the SR and provided the Contractor has made concerted effort in undertaking the borehole redevelopment the process may be continued beyond a period of four hours.

Payment shall be a lump sum for borehole redevelopment.

The development and pump test may indicate that the borehole cannot be brought back into commission and has to be abandoned. The Contractor shall take this decision in consultation with the SR and the client shall be duly notified.

Yield Test

The Contractor shall conduct a pumping test on every rehabilitated borehole for a minimum period of 72 hour, as described in 1.1.16 above. The SR may occasionally request longer pumping test period.

Immediately after the constant rate test has been completed the Contractor shall measure the water level recovery in the borehole over a minimum period of 24 hours unless the water level has recovered to its original level earlier than that.

During the pumping and recovery period the Contractor shall measure the water level in the borehole using electronic sensing device with an accuracy of 0.003m. The schedule for the water level measurement is as given above.

Payment shall be lump sum for each pumping and recovery test.

5.3.23 Payment for Moving Between Drill Sites

As outlined in the Bill of Quantities, the Contractor shall be paid for preparing all equipment, vehicles, supplies, and plant associated with a drilling unit, for a move to the next drill site and for setting up at the next drill site. There will be no payment for moves of less than 1 km. For moves longer than 1 km, the distance moved will be the straight-line distance scaled from a map of the Contract area between successive drill sites. The unit price quoted per kilometre shall cover the cost of moving all equipment, plant, supplies, vehicles, and personnel associated with the drilling unit in excess of 1 km and is not cumulative for each vehicle involved in the move.

5.3.24 Pumps and Installation

Installation

Before installation, pumps are to be tested at site using mobile testing pit. The pump after passing the test is then lowered in the borehole to the correct position and run for 6 hours.

All pumps are to be installed with dry run control electrodes, anti-drop galvanized wire rope (minimum gauge 4mm), in addition to flow meter, pressure gauge and gate valve.

5.3.25 Failure During Period Of Maintenance

Preamble

The obligations of the Contractor during the Defects Liability Period are provided in Section 11 of the General Conditions of Contract. The following two clauses indicate the procedures that the Contractor shall follow when failure of the pump or borehole occurs during the Period of Maintenance.

Pump Failure Due to Contractor

If a pump fails during the Period of Maintenance, the Contractor shall initiate the repair of the pump within seven calendar days of being informed by the SR of the failure of the pump. If the pump fails due to any action or inaction of the Contractor, the contractor shall rectify the defect at his own expense.

Where the pump fails for reasons not resulting from an action or inaction of the Contractor, the Contractor has the option of repairing the defect in the field or removing and replacing the defective pump.

In these circumstances, the Contractor shall be reimbursed on a unit price basis for the repair or replacement.

Unit prices shall be for a pump removal and installation for both above and below grade components in accordance with rate quoted in the Bill of Quantities as well as travel to and from the site.

Repairs to the pump that do not warrant removal and replacement shall be reimbursed in accordance with the rate quoted in the Bills of Quantities.

5.5 ELECTRICAL AND MECHANICAL WORKS

5.4.1 General

These Particular Specifications are to be read in conjunction with the General Specifications. Specific technical data is provided under the Particular Specifications, which shall be supplemented by the particulars contained under General Specifications.

Plant Outages

The works on the existing water supply system shall be planned in such a way so as to avoid a complete shutdown of the supply. The normal supply of water shall not be interrupted.

Where a complete shutdown may be required, the maximum outage allowed during the entire Works at a given time shall be limited to 24 hours.

For an outage, the Contractor shall apply in writing and give a notice of clear 10 days to the SR together with a method statement indicating how he will limit the outage.

Contractor's Responsibility for Design

Subject to the requirements of the Specification, the Contractor shall be responsible for the general and detailed design of electro-mechanical works to be carried out under the Contract and for all plant and equipment provided.

The Contractor shall be responsible for checking all technical information provided in the Drawings, Specification and Bill of Quantities and for confirming the suitability and output of his proposed plant and equipment for the duty required.

The drawings provided with the bidding documents are only for use by the Contractor in computing his bid and are not to be taken as record drawings.

The electrical schematics provided are guidelines to enable the Contractor to design practical circuits with reference to commercially available relays and other components. In this respect, the Contractor shall provide the manufacturer's name and technical details of all the components.

Scales shown on title blocks do not apply to the reduced scale drawings provided.

The Contractor shall be responsible for making all necessary site measurements and establishing all relevant data regarding conditions on site, required for the design, manufacture, and installation and commissioning of the equipment.

The Contractor's design shall include any necessary modifications to existing installations to suit the characteristics of replacement plant proposed.

The SR's approval of the Contractor's designs shall not relieve the Contractor of his responsibilities under the Contract.

Drawings, Operation and Maintenance Manual

The tender drawings for this Contract are in the Book of Drawings.

At the time of the tender, the Tenderer shall submit details of Plant and materials and drawings of the completed installation such as will demonstrate that the tender is based upon anticipated works, which it is expected would fulfill the intended purposes. These Tender Drawings shall also serve to illustrate the Tenderer's intentions if the Tender is accepted. The acceptance of the Tender shall not be deemed to be acceptance of the Tender Drawings.

Within the period specified in the contract, the Contractor shall inspect the Site and shall submit for the SR's approval four paper copies of full and detailed designs of the Works (Principle Contractor's Drawings) including but not limited to:

- (a.) Calculations, design criteria, design assumptions and the like to support the sizes, ratings, and essential components of the Works;
- (b.) Detailed drawings showing the location arrangement, dimensions, layout etc. of all of the Works, including circuit diagrams, dimensioned drawings of Plant, and fixing details to associated civil works;
- (c.) The quantities of materials which the Contractor intends to procure such as to enable completion of the Works;
- (d.) The requirements, specifications, sizes and other information required for the completion of foundations, supports, access works and other civil works associated with the Works;
- (e.) Specifications and manufacturer's information regarding the Plant and materials to be provided; and
- (f.) Procedure for switching on the starters

- Fault finding
- Logic diagram for mechanical checks before starting pumps
- Logic diagrams for electrical checks before starting pumps
- Normal starting and shutdown procedures
- Over current and earth fault settings
- Dosing procedures: solution strengths and adjustments;
- Such samples and models as shall be necessary to amplify upon the information provided as above.

The SR shall provide his approval or otherwise within 28 days of submission of the Principle Contractor's Drawings. Any Contractor's drawings, which the SR disapproves, shall be modified and resubmitted within 14 days of the SR's notice of disapproval or other period stated in the Contract. Upon approval, the Contractor shall resubmit the approved drawings in one transparency copy to the SR within 14 days of approval and he may utilize these Drawings as the basis of ordering Plant and materials for the Works.

Subsequently and from time to time for the duration of the Contract, the Contractor shall submit further drawings to amplify or modify the Drawings as shall be required by the SR or shall be considered by the Contractor as necessary or desirable.

The Contractor shall provide three draft copies of the Operation and Maintenance manuals and the drawings of the Works as built at the time of submitting the notice of readiness to make the Tests on Completion.

The Contractor shall give to the SR 21 days' notice of the date after which he will be ready to make the Tests on Completion for the Plant. The Tests shall then take place within 14 days after the said date. Upon approval of the manuals, three copies shall be submitted. Of the approved drawings, three transparency and three paper copies shall be provided.

The satisfactory completion and submission of the Operation and Maintenance manuals and as-built drawings shall be one of the conditions, which the Contractor shall fulfill before the Hand-Over certificate is released.

3.4.1 Tests of Plant and Works

5.5.2.1 Tests During Manufacture

During manufacture, the Contractor or his supplier shall carry out all tests on the Plant and materials which are specified in the relevant Standard Specification and shall forward to the SR duly certified copies of the test results and a certificate stating that the Plant and materials comply with the relevant Standards Specification.

Each pump shall be tested individually at the manufacturer's works in accordance with SSRN 016 and 017. All pumps shall be tested complete with all the shaft bearings, thrust bearings and directly driven auxiliaries. Pump casings pipework and all other parts of the installations subjected to high pressures shall be hydraulically tested at the Contractor's works to at least 1.5 times the maximum permissible working pressure.

5.5.2.2 Commissioning and Site Performance Trials and Tests

After complete erection of the Plant at the site, the Contractor shall commission the Plant and operate each pump for a period of not less than 150 hours, (of which at least 36 hours shall be continuous) during which time he shall carry out any adjustments or modifications he may deem necessary to achieve the best possible efficiencies. The pumps may be run singly or in any combination to achieve these running hours, subject to availability of and demand for water and at the discretion of the SR.

The Operation and Maintenance manuals shall be completed before the commencement of Performance Trials. During the trials, the Employer's staff shall be trained on all the operation, maintenance and safety aspects of the pumping and treatment plant.

After all the pumps have been so operated, Site performance Trials shall be carried out on the Plant under the joint supervision of the Supervisor, the SR, the WCA and the Contractor in accordance with Tests on Completion clause in the Contract to ascertain whether the Plant is capable of properly performing the specified duties and to determine the efficiencies of the pumping sets.

For the purpose of these trials, the head against which the pump sets are expected to work shall be checked by the pressure gauges installed by the Contractor. The head value shall be adjusted if necessary, by throttling using line valves at the discretion of the SR, to be within 3% of the 'Assessment Heads' specified in the relevant Penalty Clause.

Reading of the pressure and cumulative discharge meter readings shall be taken simultaneously at such intervals as the SR may determine during the period of each trial.

The power credited to each pump shall be equal to $(Q \times H \times 3.12 \times 10^{-3}) \div \rho$ in kilowatts, where Q is the rate of flow in litres per second determined volumetrically as determined above and H is the pumping head in metres credited to each pump as the difference in gauge readings across the pump. ρ is the combined efficiency of the pump set.

The input power to each motor shall be computed in kilowatts as the sum of the readings of two portable Standard Class 1 Wattmeter connected for the measurement of balanced three-phase power. The wattmeter's, which shall be made available for the tests by the Contractor, shall be initially calibrated together with their instrument transformers and connecting leads by PHCN or any other accredited agency, at the Contractor's responsibility.

The Contractor shall provide an accredited representative and except as otherwise indicated all measuring instruments and all other apparatus, oils and consumables necessary for the Performance Trials, as well as portable radio transceivers for use in communicating during the trials.

The Final Acceptance Certificate will not be issued until all the completion tests have been performed and satisfactory results given to the SR or until any resultant modifications; repairs and re-testing are, in the SR's opinion, satisfactorily completed.

5.5.2.3 Running-in Period after Commissioning

After the site performance trials, the Works shall be operated under the supervision of the Contractor's representative. The Contractor's representative shall further instruct the Employer's operators in all the operations of the Plant. All final adjustments shall be completed during this period. A period of at least five days of running-in will be expected at the plant.

5.5.2.4 Operation of Plant After Running in Period

After the running-in period, the Contractor's representative shall operate the plant for a further period until the Employer's staff are fully conversant with all aspects of the plant and the plant operation is fully functional and the required production throughput is attained.

Hand-over certificates for completion of the plant shall only be provided to the Contractor after a satisfactory operation of the plant at this stage.

The Contractor shall perform On-the-job training in the following areas wherever applicable.

- Installation of mechanical and electrical plant
- Operation and maintenance of pumping plant
- Operation and maintenance of water treatment plant
- Leakage repairs
- Operation and maintenance of plant utility (works) equipment such as electric generators, water collection, treatment, distribution, and supply systems.
- Operation and maintenance of process equipment such as piping, pumps, filters, compressors, motors, stills and instruments
- Operation and maintenance of safety equipment such as pressure-relief valves, breathing and emergency relief equipment and fire extinguishers
- Operation and maintenance of auxiliary equipment such as pipelines, drains, gauges and measuring instruments.

5.5.3 Operation After Running-in Time and Training of WCAs

At the end of the running-in time at the water treatment plants, the Contractor shall maintain his plant operators for a sufficient period to train the WCAs or their appointed operators on all the aspects of operations.

During this period, the Contractor shall organize a formal session of instruction at each plant. Each session shall last for at least one week.

The estimated number of staff to be trained will be approximately twelve (12) numbers. The Tenderer shall ensure that his price includes the cost of transport, lodging and daily allowances for all the trainees.

5.5.4 *Applicable Standards*

All equipment and materials shall comply with IEC, VDE and/or BS recommendations (latest issue). Equipment and material also shall comply with applicable national/local regulations are these regulations less stringent than this specification, the latter shall prevail.

1. Regulation under the Electricity Acts of Nigeria.
2. Regulations PHCN, (National Electric Power Authority) or Successor.
3. International Standards
 - IEC standard voltage IEC 38
 - recommendations for indicating electrical measuring instruments and their accessories IEC 51
 - standard current rating
 - material and apparatus in relation to their thermal stability in service IEC 85
 - standard current rating (2 to 63 A) of phase links for LV fuses IEC 113
 - recommended graphical symbols IEC 117
 - degree of protection of enclosures for low voltage switchgear and control gear IEC 144
 - LV distribution switchgear IEC 157
 - LC control gear for industrial use IEC 158
 - LV fuses with high breaking capacity IEC 269
 - definitions for switchgear and control gear IEC 277
 - LV motor starters IEC 292
 - control switches IEC 337
 - push button switches IEC 341
 - low-voltage air-break switches, air-break, switch-disconnector and fuse combination units IEC 204,408
 - factory-built assemblies of low-voltage switchgear and control gear IEC 439

5.5.5 *Service Conditions*

Unless otherwise specified the following service conditions shall apply:

1. Environmental Conditions
 - Ambient temperature: max. 42 degrees Celsius
 - Humidity: 100%
2. Altitude
 - The altitude shall not exceed 1000 meters above sea level.
3. Electric system variations
 - Voltage: 415 Volt rated operational voltage plus or minus 5%
 - Frequency range: 50 Hz rated operational frequency plus or minus 3%

The total of the absolute voltage and frequency variations shall not exceed the value of 5 %.

Low voltage signifies any voltage exceeding extra low voltage but not exceeding 1000 Volts AC. or 1500 Volts DC Above this value high voltage is signified.

5.5.6 *Booster, Low Lift-and High Lift Pumping Stations*

5.5.6.1 *Inspection and Rehabilitation*

Inspection and shop Testing

All pumps shall be tested in accordance with ISO 3555, class B or BS 5316 Part 2 Class B inclusive the following conditions:

- a. The pumps shall be driven by their own electric motor.
- b. During testing also the power absorbed by the motor shall be measured.
- c. Each required set of observations shall at least have observations of four duty-points of each pump.

These 4 points are:

- * nominal capacity;
- * maximum allowable capacity;
- * minimum allowable capacity;
- * zero capacity/closed pressure.

The SR may decide to test for more duty-points.

2) Rehabilitation of Booster pumps and High lift pumps

The overhaul of a booster pump or high lift pump shall involve at least the following activities:

- To check the condition and the wear of the body, the impeller, the wearing ring, bearings etc. To repair the coating.
- To lubricate all parts indicated by the supplier of the pump and electric motor
- To measure the insulation resistance of the wiring of the electric motor (for a power rating of 415 V: < 1000 x 415 Ohm).
- To check the coupling between the pump and the electric motor
- To check adjustment alignment of pump and electric motor.
- To install the pump units again in good operation condition according to the drawing
- To supply spare parts for 2 years of operation.
- Repair according to the Bill of Quantities

5.5.6.2 Pipework and accessories

1) Check Valves (non-return valves)

Check valves shall comply with BS 5153/1452/1400 and shall be of the swing type suitable for either vertical or horizontal use. Valves shall be flanged to BS 4504.

Type: with outside counterweight and electrical switch for no flow indication. The valves shall not contain any brasses which have more than 5% zinc. They shall have ductile iron bodies and flaps fitted with gunmetal (BS 1400-LG2), aluminium bronze or nickel copper alloy components.

2) Automatic Air Relief Valves

Automatic air relief valves shall be designed to meet the following conditions:

- a) Discharge air during charging of the pipeline
- b) Admit air during emptying of the pipeline
- c) Discharge air accumulated at local peaks along the pipeline under normal operating conditions.

Condition (a) and (b) shall be met by the employment of a large orifice capable of handling large volumes of air at a high flow rate, and condition (c) by a small orifice capable of discharging small quantities of air as they accumulate.

Types of Air Valves:

a) Double Acting Air Valves:

These shall combine both large and small orifices within one valve. The large orifice shall be sealed by a buoyant rigid base and the chamber housing shall be designed to avoid premature closing of the valve by the air whilst being discharged. The small orifice shall be sealed by a buoyant ball at all pressures above atmospheric except when air accumulates in the valve chamber.

b) Single Air Valves:

These include a small orifice only, operating in a manner identical with the small orifice in a double acting valve.

c) The nominal pressure range shall be at least PN 10 depending on the max. pressure in the pipeline.

3) Rehabilitation of valves

To overhaul the valves shall involve at least:

- to repair leakages
- to make in good operational condition
- to check coating and to repair it
- to supply seals, packing gaskets, joint rings, 2 sets per type of valve.

5.5.6.3 Distribution Boards

Arrangements

Switchboards and panels shall comprise busbars to which incoming and outgoing units are connected.

The arrangement of components shall be standardized as much as possible throughout all the switchboards and panels.

The distribution boards shall be factory assembled.

Interchangeability

All components shall be standardized one, electrically identical components shall be mechanically interchangeable.

Enclosure and accessibility

Switchboards and panels shall have a complete enclosure of metal or of an insulating material with sufficient mechanical strength and shall be of floor mounting or wall mounting construction; their maximum height shall not exceed 2.00m.

The panels shall have front access only. All components requiring access, such as terminals, or maintenance shall be easily accessible.

The panels shall not be provided with removable rear panels. Clear access at the rear or on both sides of the panel is therefore not required.

Each panel shall be provided with a map holder fixed on the inside of the front door. This map holder shall contain a complete set of drawings of the respective panel including clearly indicating which cables are connected to the which terminals.

The panels shall be provided with:

- plinth, floor standing panels only.
- wall brackets, wall mounted panels only.
- surface treatment, semi-textured powder spray finish on epoxy-polyester base, colour RAL 7032, pebble grey.
- front door fastener with T -handle and lock, all panels.
- cable entry on top (unless otherwise indicated on drawing) with nonmagnetic gland plate and proper cable glands.
- terminal blocks for all incoming and outgoing cabling obviating the use of cable lugs.
- cable anchoring rails, all panels.
- manual operated circuit breakers and switches. They shall be easily accessible and operable at the front.
- 20 % spare space for future extension of the distribution boards and consumer switch boards

Safety

The following features for personal and electrical safety shall be incorporated:

- cubicles, sections, sub-sections, and compartments which shall be accessible during normal operation, shall contain in opened position no exposed live parts under normal operational conditions.
- the insulation shall be capable of providing adequate and lasting protection under specified normal conditions and recognized over-currents and over-voltages.
- Electrical lay-out and wiring of switchgear shall comply with IEC 118, unless otherwise specified.

Bus-bar system

Bus-bar system shall be either air insulated, or epoxy resin moulded (or equivalent) insulated; compound or oil insulated bus-bar systems are not acceptable. All current-carrying parts shall be of hard or medium hard-drawn high conductivity copper unless approval for the use of other high conductivity material is specifically given.

The terminals for external protective conductors shall be marked with the earthing symbol.

Short-circuit ratings

Switchboards and panels and all their components shall be capable of withstanding the thermal and dynamic stresses resulting from the prospective short-circuit currents without injury to personnel - or damage to material.

"Type test" certificates shall be available.

The maximum expected short-circuit conditions at incoming unit (s) and/or bus-bar system shall be 5 KA/Is. The time value of the rated short time withstand current shall be one second. The value of the rated peak withstand current shall be equal to 2 - 3 times the rated short time withstand current. For components of the switchboards and panels protected by fuses which are not an integral part thereof, short-time and peak withstand current values may be selected, taking into account the limiting effects on the current and on duration of the associated fuses.

Current ratings

Busbars, cables and other conductors shall be suitably sized to carry the maximum expectable current in the rated service. For standard current ratings, reference is made to the table of Standard Ratings.

Outgoing circuits

Outgoing circuits shall be manual operated and shall be provided with Moulded Case Circuit Breakers (MCCB's) in combination with adjustable overload- and short-circuit protection. Fault breaking protection devices as required for the type of cable and equipment to be connected.

Fuses or fused switches are not allowed. The Consumer Switch boards shall be provided with Miniature Circuit Breakers (MCB's).

For requirements of isolating characteristics for the MCCB's reference is made to IEC 408, and for main switch characteristics reference is made to IEC 204.

All switching devices shall have the number of poles as indicated on the drawings, if not indicated the switching devices shall be of the 3-pole type with removable neutral link.

All protective devices shall be executed with an easily visible manual reset facility operated from the front of the switchgear. The protective device shall be mounted in such a way that settings can be read conveniently and that adjustments can be made without the need for special tools.

Protective devices may be connected in the primary circuit or, for the larger sizes, via current transformers.

The Tenderer shall check the dimensions of the switch gears indicated on the electrical drawings and the conformity with the offered electric motors and other components.

Change-over switches

Each borehole or booster station shall be provided with a 3 position change-over switch TP + N, for choosing the incoming power from PHCN or the diesel generator set, or, choosing the incoming power from diesel generator set 1 or diesel generator set 2 if there is no PHCN power supply. Change-over load switches shall be mechanically interlocked. f

Switch positions are:

- 1, GENERATOR 1
- 2, OFF (centre position)
- 3, PHCN (or GENERATOR 2)

The 3 positions shall be clearly indicated on the panel.

Interlocking by means of keys only is not allowed unless specified.

Incoming circuits

Incoming circuits shall be load switches as indicated on the drawings.

Cable terminations

Cable entries, cable glands and terminals shall be suitable to accept the type and size of cables specified.

Cable glands for cables with armouring shall be constructed with armour clamping facilities: rubber bushes with bushes with cable clamping devices are allowed.

In and outgoing cables shall be pull-relieved on a cable anchoring rail.

For all wires and conductors' individual terminals shall be provided unless terminals are specially made for more than one conductor. Terminals shall be of non-loosening construction and of the wedge type, obviating the use of cable lugs.

Grounding

In the switchboards or panels, a main grounding bar shall be fitted along the whole length. This bar shall consist of a hard or medium hard-drawn high conductivity copper strength to allow convenient connection of cable grounding conductors.

To this grounding bar shall be bonded all switchboard or panel enclosure parts made of metal, all individual cubicles and boxes, all equipment and all metal cable sheaths. Joints in the main ground bar shall be tinned and bolted with galvanized or cadmiumized bolts and non-loosening washers.

Grounding shall be provided where necessary to ensure the electrical continuity of grounding circuits and where necessary to provide a path for the dissipation of station charges.

Minimum sizes for single underground conductors shall be 35 mm². Minimum sizes for single above ground conductors shall be trenches as far as routing permits. Where grounding cables crossroads, they shall be run in metal conduit. All welded connections shall be made by cad weld. Grounds resistance shall be 1 ohm maximum.

Secondary cables and wiring

Secondary wiring shall preferably have black-coloured PVC-insulation and shall have a cross-sectional area of at least 1.5 mm².

Wires shall be stranded. Wiring between terminals shall be continuous and without joints. Wire shall not be mounted directly to metal but shall be kept in position by means of insulated tubes, channels, cleats or plastic strips. Individual wires or cables shall be identified at both ends by means ferrules of insulating material, marked in accordance with the related wiring diagrams.

Marking

Nameplates shall be made of corrosion-resistant material with indelible inscriptions in the language specified on the data sheet; enamelled plates are not acceptable. The purchase order number, the year of manufacture, the type and serial number of the equipment etc., shall be marked clearly on a nameplate on the outside of the enclosure.

Components, such as switching devices, protection relays, instruments, instrument transformers, fuses, and fuse holders, shall be marked with their ratings and all other essential data as required, following IEC recommendations and including but not limited to the following information:

- manufacturer's name and trademark
- system characteristics, e.g. rated main and auxiliary operational voltages, frequency and number of phases
- rated currents of the bus-bar system utilization category and rated duty class, dynamic short-circuit rating (crest value)
- thermal short-circuit rating making/breaking capacity of switches (symmetrical peak in kA)
- rated currents or rated powers of all individual switching devices
- accuracy and accuracy limit factor for instruments and instrument transformers respectively.

Assemblage and tools

Equipment supplied in transport units shall have these units clearly marked to facilities assembly at site. Erection instructions and any special tools required shall be packed with each order.

Pump Panels

For the enclosures, safety, arrangements, protective devices, terminals etc. of the Pump Panels reference is made to the specifications of the Distribution Boards.

Specification as described under art 16.1.12 of Part I.

The pumps shall be switched on/off by a push button switch on front door of the pump panel. A dry running protection system shall be installed on the non-return valve in the discharge line of the pump.

5.5.6.4 Public Metering Panels

For the enclosures, safety, arrangements, protective devices, terminals etc. of the public Metering Panels reference is made to the specifications of the Distribution Boards.

The Metering Panels to be provided with:

- Three ammeters, one for each phase;
- Voltmeter with metering selection switch with positions: off-RY -RB- YB-RN- YN-BN
- Public approved kWh meter.
- Front door shall have facilities to be able to seal the door by PHCN.

5.5.6.5 Consumer Switch Boards

Specification as described elsewhere in this specification.

5.5.6.6 Inspection and Testing

General

The switchgear and its components shall be examined at the supplier's factory in the country of origin in detail and in conformity with the requirements laid down in these specifications. The manufacturer shall carry out final tests on the switchgear and its components as specified. He shall prepare a full report on the results.

The Contractor shall notify the SR in adequate time prior to the equipment testing to make it possible for the SR to inspect the switchboards and panels and its components and to witness these tests.

Insulation Resistance Test

The electrical insulation of the entire switchgear shall be DC Megger tested. The insulation resistance shall be at least 100 ohms per volt of rated voltage.

Performance Test

Components shall be tested for mechanical and electrical operation, including the operation by their control and protective devices as far as applicable. Protection and measuring devices, auxiliary relays and current transformers shall be tested by primary current injection.

Interchangeability Test

Spot checks shall be taken to verify interchangeability of identical components.

5.5.6.7 Documents

All documents and manuals must be submitted and shall show the relevant order and item identification. And shall where not written in the English language be translated to the English Language.

5.5.7 Cabling

5.5.7.1 General

- all incoming and outgoing cables shall enter and leave on the top of the switchboard or panel.
- in the field, cables shall run underground; in buildings, cables shall run in cable trays, or in insulated tubes.
- cable types and sizes shall be determined corresponding the required duties, loads, voltage drop (5 %), short-circuit level, heat dissipation and the environmental conditions.

- the Tenderer shall check the dimensions of the cables indicated on the electrical drawings and the conformity with the offered electric motors and other components.

Aboveground Cabling

The cable shall be constructed as follows:

conductors: copper
 insulation : XPLE (Cross linked polyethylene)
 outer sheath : PVC

- * Above ground cables shall be supported by cable trays or cable ladder.
- * Cable trays shall be closed by removable top covers allowing adequate ventilation.
- * Cables in trays may be bunched in more layers as long as the thermal derating factor is not further affected.
- * Instrument cables shall not be laid near LV cables.

Calculations to determine the size, currents and losses of the electrical cable network are done in compliance with IEC standards. The computations make use of the following assumptions:

- * Armoured/unarmoured cables
- * Rated voltage not exceeding 0.6KV to earth and IKV between the phases.
- * Maximum permissible temperature: 70oC for conductors insulated with PVC and 0oC for conductors insulated with XLPE or EPR.
- * No solar radiation
- * Ground thermal resistivity 2.5 kilo Ohm/w
- * Ambient temperature: 4oC for overhead and 40oC for underground cables.

SUMMARY OF COMPUTATIONS

No	From	To	Length (m)	Current (amps)	Type	Mat. Insulation / conductor	Size per conductor
1	Gen-set/ Solar Unit	Change-over switch	-	-	NC2XFY	PVC/SWA/PVC	-
2	PHCN Overhead Line	Change-over switch	-	-	NC2XFY	PVC/SWA/PVC	-
3	Change-over switch	Main DB	-	-	NC2XFY	PVC/SWA/PVC	-
4	Main DB	Small power & lighting	-	-	NCY	PVC/PVC	-
5	Main D.B	Equipment starter	-	-	NC2XFY	PVC/SWA/PVC	-
6	Equipment starter	Equipment	-	-	NCY	PVC/SWA/PVC	-

5.5.8 Lighting and Small Power

General

A complete plant lighting system shall be installed in accordance to the electrical drawings. The installation shall comply with the specifications as described in item 16.1.29 of part 1. The fluorescent luminaries shall be 1x40W and shall include tubes and starters.

External Luminaries

Luminaries shall be of the fluorescent type weatherproof IP65.

Internal Luminaries

All indoor luminaries shall be the fluorescent type weatherproof IP65.

Wall Socket Outlets and Switches

The wall sockets shall be weatherproof, surface mounted metal clad 13 AMP.
The light switches shall be weatherproof, surface mounted metal clad 10 AMP.
All switches and socket outlets shall be mounted 1.3~ meter above finished floor level.

5.5.9 High Tension Equipment

5.5.9.1 Scope of Works

The scope of works includes the supply, installation, and connection to the existing High Tension (11KV or 33KV) Public overhead line with connection to the new dedicated transformers. The installation shall be in accordance to the Public regulations.

5.5.9.2 Transformers

The temperature rise limits shall be reduced to suit the ambient conditions on Site.
The transformer shall have the standard fittings and accessories appropriate to its rating as listed in Appendix H of BS 171.

Test certificates shall be provided for type tests listed in Clause 8.1.2 of BS 171: Part 1. Routine tests listed in Clause 8.1.1 of BS 171: Part 1 shall be performed on all transformers.
Limits of temperature rise above 400C ambient temperature shall not exceed 65°C of winding and top oil respectively.

The transformers shall be furnished and equipped with the following accessories:

- a) H.T. and L.T. bushings, with terminal connectors.
- b) arcing horns, corrosion proved, according to DIN 42531.
- c) tap changer (above 250 kV A)
- d) thermometer pocket
- e) nameplate with connection diagram
- t) oil drain valve with plug or cap, installed at the lower part of the tank.
- g) sludge drain plug, installed at the bottom of the tank.
- h) earthing terminal, with solderless clamp type connector suitable for steel stranded conductor diameter of 9.0 mm (size 50 mm2).
- i) lifting lugs.

The transformer shall be placed outside on a concrete plinth measuring 1.5m x 1.5m. With galvanised wire mesh fence with gate and lock (2 meter high)

5.5.9.3 Earthing

The HV Earthing system shall comply with the requirements of British Standard Code of Practice 1013.

All metal work associated with the high voltage system including the disconnecter - fuse frame, surge diverters and transformer tanks shall be solidly earthed. The earthing shall be achieved by means of an earth electrode or system of electrodes, the value of which should be such that the high voltage protection shall operate in the event of a breakdown between either the HV windings of the transformer or the HV line and supporting metal work at the transformer position.

5.5.9.4 High Voltage Fused Isolator

The fused isolators shall comply the regulations of PHCN.

5.5.10 Testing, Inspection and Commissioning of Mechanical Equipment

The requirements of this section applicable to works (factory) and site tests shall apply unless other requirements relative to specialized plant are detailed elsewhere in this Specification.

The Contractor shall be responsible for all arrangements in connection with the testing and inspection of all equipment and shall give the SR at least three weeks' notice of the date when it is proposed to carry out any works or site tests. Full details of equipment to be tested and the proposed test procedures shall be given to the SR not later than the notification of the test date. Unless otherwise specified the Contractor shall be responsible for the supply of all water, power and materials required for carrying out the tests.

In the event of any part of the equipment failing to meet the Specification the Contractor shall immediately take steps to substitute other equipment capable of complying with the Specification or adopt such other steps as the SR may direct.

Any item of equipment failing to pass the prescribed tests shall be retested within a reasonable time under the same conditions and any reasonable expenses which the SR may incur by the repetition shall be deducted from the Contract Price.

If the SR does not witness a particular test the Contractor shall nevertheless carry out the test under the conditions that would prevail had the SR been present.

The result of each works and site test shall be noted on appropriate test certificate which shall be signed by the senior representative of the Contractor responsible for conducting the test. A report on the tests together with subsequent calculation, curves etc. shall be sent to the SR within 14 days of the tests.

All tests made by the SR or by the Contractor as specified herein shall be at the risk and expense of the Contractor.

No equipment or materials shall be dispatched from the manufacturer's works without the permission of the SR.

The following sections indicate the tests and the standards to which certain items of plant are to be tested. They shall not be considered exhaustive in scope or limiting the equipment to be tested.

5.5.10.1 Works Tests

General

Works tests shall be carried out on all equipment. Where the SR decides to witness the tests, these shall be carried out on a mutually convenient date within 7 days of the original date proposed by the Contractor.

The various items of equipment shall be erected and run to conform as nearly as possible to the conditions that will prevail at Site. Tests shall be carried out using the actual motors to be supplied with the equipment.

The Contractor shall demonstrate the guaranteed figures of output, kilowatt input, overall efficiency, etc., given in the Specification and the Schedules. He shall also satisfy the SR as to the mechanical reliability of the plant and its ability to fulfill the whole of requirements.

The Contractor shall satisfy the SR as to the accuracy of all test instruments and shall produce recent calibration tests or have them calibrated at his own expense by an independent authority.

If, when testing, any doubt arises as to the accuracy of instruments used they shall be calibrated by the Contractor or otherwise the instrument maker's tolerance shall be allowed.

Hydraulic Pressure Tests

All castings, valves, pipework and any other part of the equipment liable to be subjected to pressure shall be hydraulically works tested to the requirements of the relevant standard. Valves shall be tested to ensure they are drop tight.

Tests of Materials and Apparatus

All materials used in the manufacture and all apparatus incorporated in the equipment shall be tested at the manufacturer's works. If required, the Contractor shall send the SR test certificates giving full particulars of such tests and certifying that they have been satisfactorily carried out.

The tests include:

- visual inspection.
- measurements.
- capacities.
- welding's.
- coating.
- numbers of delivery.
- seaworthy packing.

Pumping Plant

Centrifugal, mixed flow and axial pumps shall be tested as follows:

Each pump shall be tested complete with all shaft bearings, thrust bearings, and directly driven auxiliaries or, where this is impracticable, the Contractor shall state what allowances shall be made for losses incurred by these items, and shall demonstrate the accuracy of these allowances to the satisfaction of the SR.

The pumps shall be tested in the factory of origin; test certificates have to be handed over to the SR. The pumps shall be tested according to BS 5316, Part 1-1979 or ISO 3555, Class B.

The pumps shall be tested under the following conditions:

- (a) The pumps shall be driven by their own proper electric driven motor.
- (b) During testing also the power absorbed by the motor shall be measured.
- (c) Each required set of observations shall at least have observations of four duty points of each pump. These 4 points are:
 - nominal capacity;
 - maximum allowable lasting capacity;
 - minimum allowable lasting capacity;
 - zero capacity.
- (d) The SR may decide to test more duty-points.
- (e) In the event that pumps have to operate in duty-points where the available NPSH is less than 3 mwc more than the required NPSH, the required NPSH curve shall be tested in several extra duty-points.

Screw pumps will not normally be hydraulically tested in the works but individual items of plant may be tested and inspected, as determined by the SR.

5.5.10.2 Commissioning

After satisfactory completion of tests on and inspection of individual items of equipment as specified herein the Contractor shall commission the complete plant such that it is in a fully operational condition prior to hand over to the Employer.

The Contractor shall demonstrate to the Employer's satisfaction that the whole plant process and the various integrated systems are capable of functioning reliably as designed and meeting the performance criteria specified. It is emphasized that this objective will not be considered as having been met if the plant requires an excessive degree of operator skill or intervention to achieve the specified plant performance.

5.5.11 *Testing, Inspection and Commissioning of Electrical Equipment*

5.5.11.1 General

The requirements of this section applicable to works (factory) and site tests shall apply unless other requirements relative to specialized plant are detailed elsewhere in this Specification.

The Contractor shall be responsible for all arrangements in connection with the testing and inspection of all equipment and shall give the SR at least three weeks' notice of the date when it is proposed to carry out any works or site tests. Full details of equipment to be tested and the proposed test procedures shall be given to the SR not later than the notification of the test date. Unless otherwise specified the Contractor shall be responsible for the supply of all water, power and materials required for carrying out the tests.

In the event of any part of the equipment failing to meet the Specification the Contractor shall immediately take steps to substitute other equipment capable of complying with the Specification or adopt such other steps as the SR may direct.

Any item of equipment failing to pass the prescribed tests shall be retested within a reasonable time under the same conditions and any reasonable expenses which the SR may incur by the repetition shall be deducted from the Contract Price.

If the SR does not witness a particular test the Contractor shall nevertheless carry out the test under the conditions that would prevail had the SR been present.

The result of each works and site test shall be noted on appropriate test certificate which shall be signed by the senior representative of the Contractor responsible for conducting the test. A report on the tests together with subsequent calculation, curves etc. shall be sent to the SR within 14 days of the tests.

All tests made by the SR or by the Contractor as specified herein shall be at the risk and expense of the Contractor.

No equipment or materials shall be dispatched from the manufacturer's works without the permission of the SR.

The following sections indicate the tests and the standards to which certain items of plant are to be tested. They shall not be considered exhaustive in scope or limiting the equipment to be tested.

5.5.11.2 Works tests

Works tests shall be carried out on all equipment. Where the SR decides to witness the tests, these shall be carried out on a mutually convenient date within 7 days of the original date proposed by the Contractor.

The various items of equipment shall be erected and run to conform as nearly as possible to the conditions that will prevail at Site. Tests shall be carried out using the actual motors to be supplied with the equipment.

The Contractor shall demonstrate the guaranteed figures of output, kilowatt input, overall efficiency, etc., given in the Specification and the Schedules. He shall also satisfy the SR as to the mechanical reliability of the plant and its ability to fulfill the whole of requirements.

The Contractor shall satisfy the SR as to the accuracy of all test instruments and shall produce recent calibration tests or have them calibrated at his own expense by an independent authority.

If, when testing, any doubt arises as to the accuracy of instruments used they shall be calibrated by the Contractor or otherwise the instrument maker's tolerance shall be allowed.

Test includes mainly:

- visual inspection;
- measurements;
- capacities;
- weldings;
- coating;
- numbers of delivery;
- seaworthy packing.

Tests of Materials and Apparatus

All materials used in the manufacture and all apparatus incorporated in the equipment shall be tested at the manufacturer's works. If required, the Contractor shall send the SR test certificates giving full particulars of such tests and certifying that they have been satisfactorily carried out.

For scope of works and number of deliveries see the Bill of Quantities.

Switchboards and Control Panels

Tests shall be based upon the requirements of the IEC Standard to which the equipment was constructed. Tests shall include, but not exhaustively:

- Visual inspection of compliance with their specification.
- Over-voltage withstand tests.
- Test of interlocks, sequences, etc.

Cables

All cables shall be subject to routine tests in accordance with the relevant British or approved alternative Standard. A certificate shall be provided with each drum.

The tests to be carried out on every drum at manufacturer's premises shall include:

- High voltage A.C. insulation pressure test between cores, each core to earth metallic
- Sheath or armour as applicable.
- Insulation resistance test.
- Core continuity and identification.
- Conductor resistance test.

5.5.11.3 Site testing and pre-commissioning

General

Testing and pre-commissioning shall be carried out by the Contractor to the requirements of the technical specification and as approved. The Contractor shall ensure all test staff, services (electricity, etc.) measuring and test instruments necessary to demonstrate the equipment is available at Site. All labour, materials, and equipment required shall be supplied by the Contractor.

As soon as practicable after the plant has been completely erected and is running satisfactorily each main item of equipment shall be tested in the presence of the SR to ascertain that the performance and correct operation of the individual items of equipment attained at the works tests are possible on site. Where tolerances are not stated the Contractor shall submit his proposals for approval.

If, in the opinion of the SR, the tests on site are being unduly delayed he may give the Contractor written notice to prepare such tests. If within 10 days from the receipt of the said notice the tests have not been carried out, the SR may himself proceed to carry out the said tests.

All costs incurred shall be charged to the Contractor.

The contractor shall be responsible for co-ordinating the programme of site testing of all items and for ensuring that all responsible parties concerned are present during any tests.

The tests include mainly:

- visual inspection;
- i- measurements, rotation, speed, capacities;
- coating;
- acoustic properties;
- number of delivery;
- delivery of:
- spare parts and tools
- operation and maintenance manuals
- drawings.

Testing and Inspection of electrical Installation

On completion of each section of the installation prior to it being made 'live' and put into service and subsequently on completion of the whole installation, the cables and equipment shall be tested to comply with all appropriate regulations and particularly with the tests laid down in the I.E.E. Wiring Regulations.

Inspections and operation of the electrical equipment and installation shall be made by the Contractor to ensure that it will perform as designed, conforms to the extent of the drawings and Specifications, has proper insulation and safety features and is not hazardous to personnel. All system, equipment and appurtenances shall present a good appearance, be of good workmanship and be free of dust, debris, moisture, oil chemicals or other harmful matter.

Electrical wiring systems shall be inspected to determine that they conform to the relevant regulations, codes and standards.

Site tests shall include but not be limited to the followings:

(1) Dielectric Test

All electrical components inclusive electric motors and generator shall be subjected to a one minute AC test voltage. Test voltages shall be in accordance with the appropriate table of IEC 439.

Tests shall be carried out between all poles connected together and the frame, as well as between each pole and all other poles connected to the frame.

(2) Insulation Resistance Test

The electrical insulation of the entire switchgear including all components inclusive electric motors and generator shall be DC Megger tested.

The insulation resistance shall be at least 1,000 ohm per volt of rated voltage.

(3) Performance Test

Components shall be tested for mechanical and electrical operation, including the operation by their control and protective devices as far as applicable. Variations in the control supply shall be taken into account. Protection and measuring devices, auxiliary relays and current transformers shall be tested by primary current injection.

(4) Interchangeability Test

Spot checks shall be taken to verify interchangeability of identical components.

(5) Earth Loop Impedance

Shall be tested using a 50 volt AC Voltmeter/ammeter unit. All circuits shall be checked to ensure that sufficient fault current will flow to operate the protective device.

(6) Verification of Polarity

Shall be carried out to ensure that all fuses and single pole control devices are connected in the live conductor and that live conductors are correctly marked.

(7) MV Switch Gear and motor control centres

Prior to being made live the following tests and inspections shall be carried out:

Voltage withstand test in accordance with IEC on all equipment including Voltage transformers.

Protection and indication circuits shall be tested by primary injection while outgoing cables are not connected.

Operation of all mechanisms and circuits, correct sequencing of operations and correct functioning of interlocks.

Test of all control circuits.

Physical check on:

- a) general performance.
- b) correct circuit breakers.
- c) correct fuses fitted and correct setting for protection relays.
- d) phase continuity.

5.5.11.4 Commissioning

After satisfactory completion of tests on and inspection of individual items of equipment as specified herein the Contractor shall commission the complete plant such that it is in a fully operational condition prior to hand over the Employer.

The Contractor shall demonstrate to the Employer's satisfaction that the whole plant process and the various integrated systems are capable of functioning reliably as designed and meeting the performance criteria specified. It is emphasized that this objective will not be considered as having been met if the plant requires an excessive degree of operator skill or intervention to achieve the specified plant performance.

5.6 PARTICULAR SPECIFICATION

5.6.1 Project Location

The map below shows area of the project location in the BAY State within the context of Nigeria Map. According to the project’s Terms of Reference, the project cut across Borno, Adamawa and Yobe State within the north east geopolitical zone of Nigeria. The three states are part of the Nigeria boundary states to Chad in the East and Niger in the North. The states are called BAY states bounded and share boundary with the transit states like Jigawa, Bauchi, Gombe and Taraba states coming from FCT Abuja. The three states lie approximately on longitude 120 00’E to 130 00’E and latitudes 070 45’N to 130 00’N.

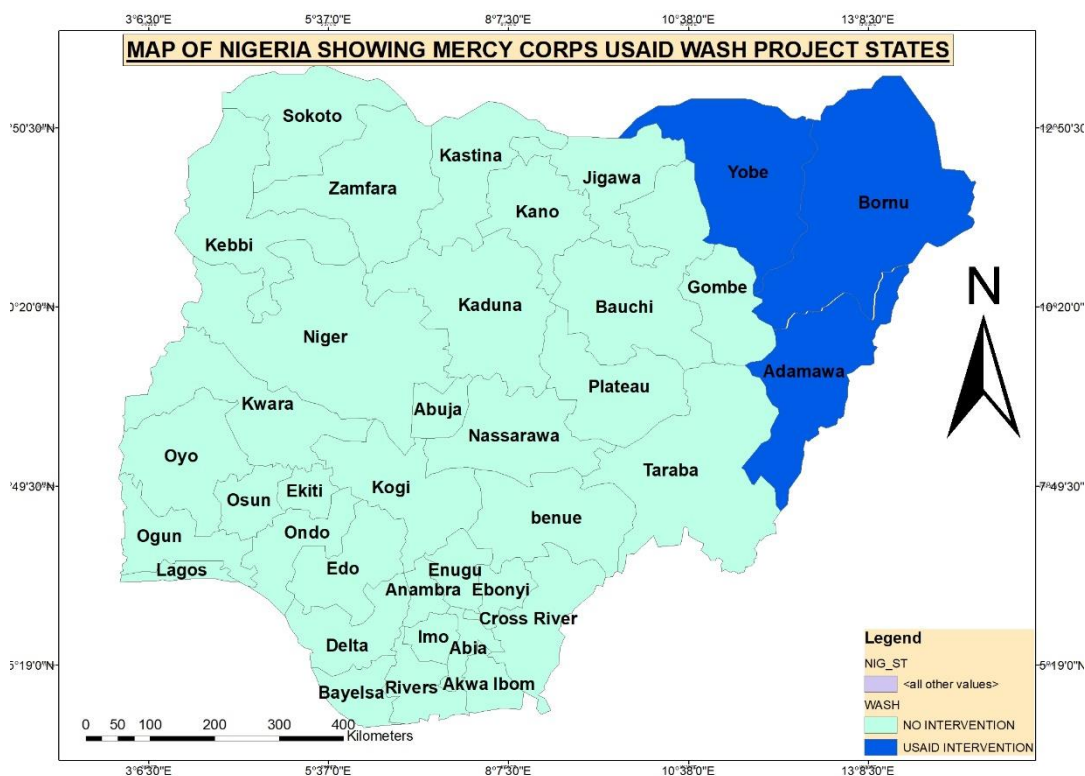


Figure 1.1: BAY States Project Area Location

5.6.2 Borno State

The projects in Borno State are located in three selected LGAs of the State. The area is bounded by latitudes 10° 05’ N and 14° 30’ N, with longitude 11° 33’ E and 14° 34’ E. The three small towns which are in three respective Local Government Area are; Biu town in Biu Local Government Area, Kwayakusar town in Kwayakusar Local Government Area and Shani town in Shani Local Government Area. See the Map below to show relative locations of the LGAs within Borno.

In the three towns, there are existing boreholes and hand dug wells which were owned by private individuals and governments.

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For Sanitation, toilet facilities will be proposed public institutions in those communities like schools; both primary and secondary schools, Markets, motor parks.

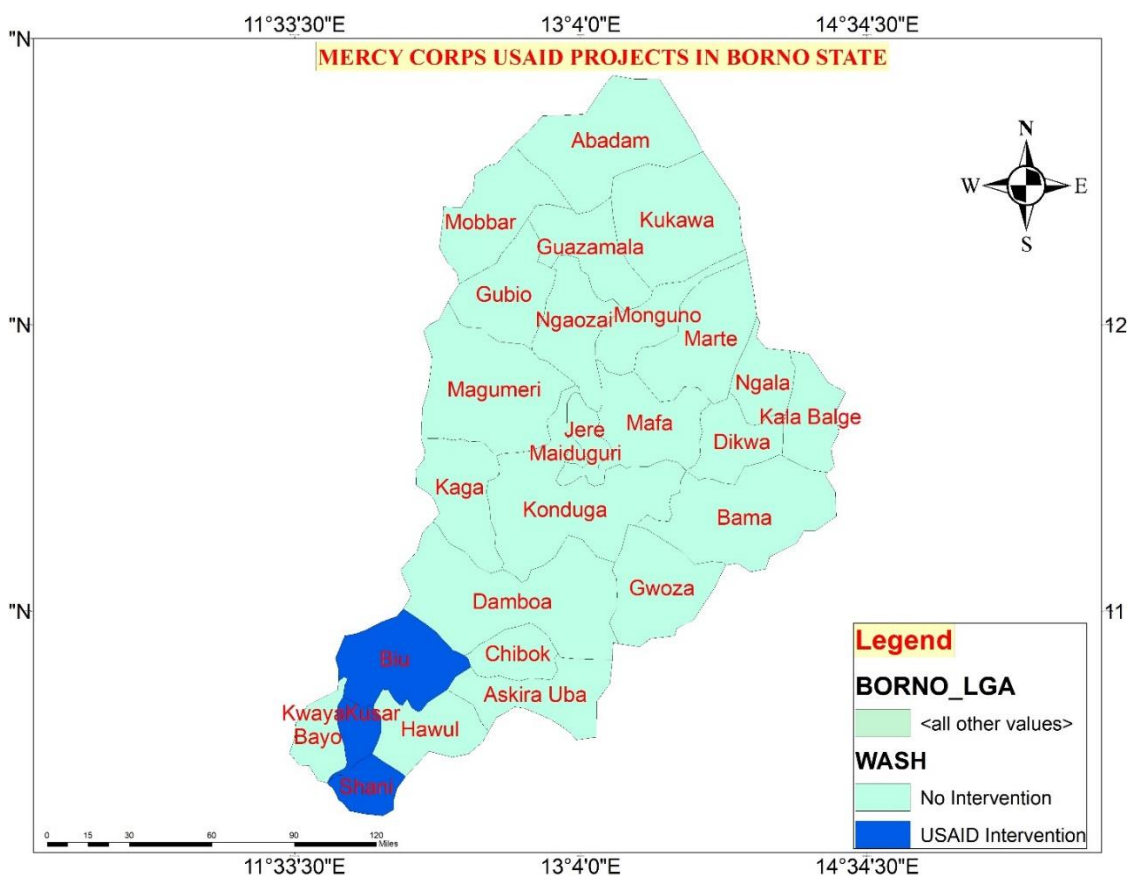


Figure 1.2: Map of Borno State Showing LGAs of USAID-Mercy Corps Project

Table 1.1 Project LGA and Town Locations in Adamawa State

State	LGA	Town
BORNO	Kwaya Kusar	Kwaya Kusar Town
	Shani	Shani Town
	Biu	Biu Town

5.6.2.1 Kwayakusar Local Government Area - Kwayakusar Town

Kwayakusar is a small town in the LGA called in the same name. Its estimated population is 18,000. Water supply has been proposed to cover the town sufficiently, and some existing water facilities including the ones located within identified schools were selected as targeted sources to achieve required water demand for adequate delivery of water to the town.

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The project also proposed provision / improvement of sanitary facilities in few identified public areas (schools, market, and motor park) as indicated in the following table.

5.6.2.2 Shani Local Government Area (Shani Small town)

Shani is a small town in the LGA called in the same name. Its estimated population is about 17,000. Water supply has been proposed to cover the town sufficiently, and some existing water facilities including the ones located within identified schools were selected as targeted sources to achieve required water demand for adequate delivery of water to the town.

The project also proposed provision / improvement of sanitary facilities in few identified public areas (schools, market, and motor park).

The location of the proposed facilities in Shani small town, where the technical survey for sanitation facilities and investigation/exploration of the existing/non-existing water sources were carried out, are listed in the table below:

5.6.2.3 Biu Local Government Area (Mandara Abdu town)

Mandara Abdu is a small town in Biu LGA. Its estimated population is 19,000. Water supply has been proposed to cover the town sufficiently, and some existing water facilities including the ones located within identified schools were selected as targeted sources to achieve required water demand for adequate delivery of water to the town.

The project also proposed provision / improvement of sanitary facilities in few identified public areas (schools, market, and motor park).

Table 1.4 Project towns and Intervention within Biu LGA

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STATE		BORNO												
LGA		BIU												
SMALL TOWN		DUGIA												
S/NO	FACILITY LOCATIONS SELECTED/VISITED	COORDINATES	TOTAL NO OF STAND POINTS	TOTAL RETICULATION KM	POP	PER CAPITA DEMAND (l/d)	TOTAL WATER DEMAND (L/d)	BOREHOLE NO.	AVG YIELD L/Min	TOTAL WATER SOURCE AVAILABLE	WATER DEMAND GAP (l/d)	ADDITIONAL BOREHOLES REQUIRED	Total Storage Required*	REMARK
1	Angwanmallam Bukar Emam Water Scheme	8.43185N, 12.05826E	4	0**	1800	30	54,000	1		30240	23760	1	0+50	Rehabilitate Gen house and M& E items and additional bore hole drilled. Repair leaks in reticulation. No new reticulation
2	Jugolgaldimari Water Scheme	8.43408N, 12.04472E	4	0.00	1800	30	54,000	1		30240	23,760	1	0+50	Rehabilitate borehole and equip, connection to power grid., new storage tank, connect to existing reticulation, repair leaks in reticulation
3	Tsamiya Galdimari	8.44582N, 12.04611E	5	0.00	1800	30	54,000	1		30240	23,760	1	0+50	Rehabilitate Gen house and M& E items and additional bore hole drilled. Repair leaks in reticulation. No new reticulation
4	Mandara Abdul	10.60484N, 12.19539E	6	0	1800	30	54,000	1	25.2	30240	23,760	1	0+50	Rehabilitate Gen house and M& E items and additional bore hole drilled. Repair leaks in reticulation. No new reticulation
5	Universal Basic Education Primary School, Filin Jirgi, Biu	10.58200N, 12.21042E	24	1	3800	30	114,000	1		30240	83,760	3	2+50	Rehabilitate existing borehole, 3 new bore holes, new 50 cu.m storage, 8 new toilets TBC, reticulation beyond school
6	Government Senior Science Secondary	10.62152N 12.19065E	35	1	4200	30	126,000			0	126,000	4	0+50	4 new boreholes New 50cu.m storage, reticulation beyond school. 8 new toilets to be constructed
7	Gamji Primary School	10.6126139N 12.18906E	21	1	3800	30	114,000			0	114,000	4	0+50	4 new boreholes New 50cu.m storage, reticulation beyond school. 8 new toilets to be constructed
			99	3	19000		570,000	5		151200		14		
* Total storage includes existing storage + Additional proposed Storage														
** All rehabilitated and additional borehole will be pumped into existing reticulation system														

5.6.3 Tender Specification

The Particular Specification as contained herein aims to highlight the works required to be implemented under the Contract, provide standards, characteristics and construction data of materials and equipment to be used, and describe the way in which the works are to be carried out.

The Particular Specification is to be read in conjunction with the General Specification, Bill of Quantities and Drawings and Conditions of Contract.

5.6.4 Work Sequence and Records

The Contractor shall submit a programme of activities for execution of the works. No physical work shall commence before submission of the work programme and acceptance/approval by the supervisor.

The Contractor shall adhere to the approved Work Programme and shall inform the SR of any intended change.

The contractor shall submit a detailed proposal for each component of the work, including working/workshop drawing, sequence and method of execution and testing, which shall be approved by the SR prior to commencement of the work component. Works for which such proposal are not received and approved by the supervisor will be rejected in the event of subsequent defects found by the supervisor.

Where an existing scheme in operation is to be rehabilitated or expanded, the works shall be carried in such manner as to reduce plant shut down time during rehabilitation/expansion works to the minimum. Where completely new electro-mechanical equipment is proposed, full shut-down may not be avoidable during the M & E installation, but this shall be kept to a minimum.

The Contractor shall provide a day-to-day diary sheet recording plant, staff, materials delivery, work done, tests, rainfall and any other event which might influence the works and any other records as agreed upon.

The Contractor shall provide the SR with documentary evidence of material orders for the project and shall inform the SR of progress if assembly or manufacture is not on site.

It is noted that the Client wishes to complete the works within the shortest possible time.

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The Contractor shall avail his Agent at all site and progress meetings called by the SR.

5.6.5 Notice of Operations

The Contractor shall give full and complete written notice of all important operations to the SR sufficiently in advance to enable the SR to make such arrangements as the Engineer may consider necessary for inspection or for any other purpose. The Contractor shall not start any important operation without the written approval of the SR.

5.6.6 Liaison with Stakeholders

In order to facilitate the entire work, the Contractor shall duly liaise with all Stakeholders. He shall especially keep the WCA and LGA (through the WASH Coordinator) informed of all his activities well in advance to permit them arrange for all access and community sensitization necessary for the Contractor to operate without hindrance.

5.6.7 Existing Services

Immediately after mobilization and prior to commencement of works on site, the Contractor shall investigate and confirm all existing underground and surface service facilities, such as power supply and communication cables, drainage, service ducts and other facilities within the working area. All existing pipelines and alignments shall also be confirmed. The Contractor shall liaise with the TAT as well as with other concerned authorities in charge of these facilities and shall carry out the works in such manner as to preserve these facilities. Where it is required to relocate such facilities, the Contractor shall be responsible for all arrangements for such relocation, in liaison with the concerned authorities. Expenses arising from the investigation, confirmation, measures for preservation and relocation shall be included in the applicable items in the Bill of Quantities.

5.6.8 Setting Out

The Contractor shall be responsible for setting out the works in accordance with the designs and for all construction levels being correctly related to the benchmark level given by the SR for reference at the particular site. The Contractor shall seek approval from the SR of the setting out prior to any commencement of work.

5.6.9 Contractor's Responsibility for Design

Design details are provided in the specifications, bills of quantities and drawings, which are sufficient to enable the Contractor to fully understand the scope of work and price accordingly. The Contractor shall provide detailed proposals and working drawings for all civil works and electro-mechanical works.

For the distribution system, the Contractor shall be responsible to check and verify pipeline levels and alignments and connection details on site.

All the works shall be designed to adequately perform the functions required with a minimum of maintenance and shall be to the standards provided in the Specification. The Contractor's detailed proposals shall include as a minimum the provisions given in the Bills of Quantities, Drawings and Specification, but shall also include any additional requirement for the complete operational systems meeting the specified performance criteria.

The Contractor shall be responsible for checking all technical information provided in the Bills of Quantities, Drawings and Specification and for confirming the suitability of his designs and the output of his proposed plant and equipment for the duty required.

The Contractor shall be responsible for making all necessary site measurement investigations and establishment of relevant site data required for design and construction of the works. In this respect, the Contractor shall provide the manufacturer's name and technical details of all the components.

The Contractor shall include in his prices for design and all works and all risks involved, except where specific provision is made in the Bill of Quantities.

The Contractor's design shall include any necessary modifications to existing installations to suit the characteristics of plant proposed

The Contractor shall submit his proposals for the SR approval or comments, which shall be given within 14 days of the submission.

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The SR's approval of the Contractor's proposals shall not relieve the Contractor of his responsibilities under the Contract. Documents to be submitted for the Contractor's proposal shall include, but not be limited to the following:

- (i) Calculations, design criteria, design assumptions and the like to support the sizes, ratings, and essential components of the Works;
- (ii) Detailed drawings showing the location arrangement, dimensions, layout etc. of all of the Works, including circuit diagrams, dimensioned drawings of Plant, and fixing details to associated civil works. The drawings shall be sized to designations A1, A2, A3, and A4, as required by the SR;
- (iii) The quantities of materials which the Contractor intends to procure in order to enable completion of the Works;
- (iv) The requirements, specifications, sizes and other information required for the completion of foundations, supports, access works and other civil works associated with the Works;

Subsequently and from time to time for the duration of the Contract, the Contractor shall submit further drawings to amplify or modify the Drawings as shall be required by the SR or as shall be considered by the Contractor as necessary or desirable.

5.6.10 'As-Built' Drawings

The Contractor shall prepare all necessary drawings and diagrams of the "as-constructed" and "as-fitted" works together with any other material or information as may be required for record, maintenance, and repair etc. purposes.

The Contractor shall present to the SR the drawings in the same format i.e. in AutoCAD. The drawings to be submitted shall be 3no A1 sets and 2 no soft copies of the same in Compact Discs or DVDs.

The foregoing drawings shall be submitted not later than 4 (four) weeks after completion of the successful testing of completed works. The SR shall not issue the Completion Certificate until the "As-Built" drawings have been submitted and meet his approval.

5.6.11 Operation and Maintenance Manuals

The Contractor shall prepare and submit Operation and Maintenance (O & M) Manuals for all components of the scheme - electro-mechanical equipment, chemical dosing and pipe appurtenances for operation and maintenance of the individual plant items.

The Manuals shall include:

- I. Schedule of approved Record Drawings and documents;
- II. Detailed description of the Plant and its method of operation, control and protection;
- III. Recommended operation and routine check procedures. These should include safety precautions to be observed while plant is in operation, pre-start checklist, bearings and moving parts needing special attention, lubricant types and lubrication intervals, routine tests to confirm a good working order of plant and fault finding guide;
- IV. Recommended care and maintenance routines together with the procedures for repair and recommissioning of major items of plant;
- V. Recommended emergency control measures;
- VI. Maker's descriptive literature and technical data sheets in respect of each item of the Plant including the recommended installation, care, maintenance and overhaul instructions, part lists, etc., whereby the Plant may be maintained correctly and whereby spare parts may be ordered without difficulty
- VII. Exploded views of all items of plant with each component and reference number cross referenced to the appropriate data sheet and spares schedule
- VIII. Schedule of the principal items of plant and components, showing the title, maker's type reference, serial number, ratings, etc., whereby reference to each item is simplified

- IX. Test results and curves, including all electrical test data and reports
- X. Schedule of all makers' addresses, with telephone, fax and email contact.

The Manuals shall be completed and submitted for the SR's approval prior to Testing of the Completed Works, since they will be used for the testing. Wherever possible the O&M Manuals shall be submitted in electronic form readable with standard software.

5.6.12 Tests of Plant and Works

5.6.12.1 Tests During Manufacture

During manufacture, the Contractor or his supplier shall carry out all tests on the Plant and materials which are specified in the relevant Standard Specification and shall forward to the SR duly certified copies of the test results and a certificate stating that the Plant and materials comply with the relevant Standards Specification.

Each pump shall be tested individually at the manufacturer's works in accordance with the relevant specification.

All pumps shall be tested complete with all the shaft bearings, thrust bearings and directly driven auxiliaries.

Pumps, casings, pipe-work and all other parts of the installations subjected to high pressures shall be hydraulically tested at the Contractor's works to at least 1.5 times the maximum permissible working pressure.

5.6.12.2 Commissioning and Site Performance Trials and Tests

After complete installation of the electro-mechanical equipment, the Contractor shall commission the scheme and operate each plant for a period of not less than 12 hours, (of which at least 6 hours shall be continuous) during which time he shall carry out any adjustments or modifications he may deem necessary to achieve the best possible efficiencies. The pumps may be run singly or in any combination to achieve these running hours, subject to availability of and demand for water and at the discretion of the SR.

The Operation and Maintenance manuals shall be completed before the commencement of Performance Trials. During the trials, the Community level O & M technicians and artisans, who shall have been pre-selected, shall be trained on all the operation, maintenance and safety aspects of all equipment and plant.

After all the pumps have been so operated, Site Performance Trials shall be carried out on the Plant under the joint supervision of the SR or other Supervising Authority and the Contractor in accordance with Tests on Completion clause in the Contract to ascertain whether the Plant is capable of properly performing the specified duties and to determine the efficiencies of the pumping sets.

For the purpose of these trials, the head against which the pump sets are expected to work shall be checked by the pressure gauges installed by the Contractor. The head value shall be adjusted if necessary by throttling using line valves at the discretion of the SR, to be within 3% of the 'Assessment Heads' specified.

Reading of the pressure and cumulative discharge meter readings shall be taken simultaneously at such intervals as the SR may determine during the period of each trial.

The power credited to each pump shall be equal to $(Q \times H \times 9.80 \times 10^{-3}) \div \rho$ in kilowatts, where Q is the rate of flow in litres per second determined volumetrically as determined above and H is the pumping head in metres credited to each pump as the difference in gauge readings across the pump. ρ is the combined efficiency of the pump set.

The input power to each motor shall be computed in kilowatts as the sum of the readings of two portable, calibrated Standard Class 1 Wattmeter connected for the measurement of balanced three-phase power.

The Contractor shall provide an accredited representative and all measuring instruments and all other apparatus, oils and consumables necessary for the Performance Trials, as well as portable radio transceivers for use in communicating during the trials.

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The testing shall also cover the water quality control, including operation of chemical dosing equipment, water quality analysis and adjustments/modifications as may be necessary.

The Take Over Certificate will not be issued until all the completion tests have been performed and satisfactory results given to the SR or until any resultant modifications; repairs and re-testing are, in the SR's opinion, satisfactorily completed.

5.6.12.3 Running-in Period after Commissioning

After the site performance trials, the Works shall be operated under the supervision of the Contractor's representative. The Contractor's representative shall further instruct the Employer's operators in all the operations of the Plant. All final adjustments shall be completed during this period. A period of at least two weeks of running-in will be expected.

5.6.12.4 Training of Local Operatives

From the installation period and especially during testing and commissioning and running-in, the Contractor shall train pre-selected local technicians in the operation and maintenance of the plant.

Hand-over certificates for completion of the plant shall only be provided to the Contractor upon confirmation of satisfactory operation of the plant by the local operatives.

The Contractor shall train the operators in the following areas wherever applicable;

- Installation of mechanical and electrical plant
- Operation and maintenance of pumping plant
- Operation and maintenance of water treatment plant
- Leakage repairs
- Operation and maintenance of plant utility (works) equipment such as electric generators, water collection, treatment, distribution and supply systems.
- Operation and maintenance of safety equipment such as pressure-relief valves, breathing and emergency relief equipment and fire extinguishers
- Operation and maintenance of auxiliary equipment such as pipelines, drains, gauges and measuring instruments.

The training shall also include formal sessions of instruction at each plant. The training shall be carried out over a total period of one (1) month, starting from and including the period of testing and commissioning and running-in of the system.

5.6.12.5 Fuel and Electricity Supplies

The Contractor shall be responsible for the provision of fuel and electricity supplies required for testing. The existing facilities of the works may be used where available.

5.6.12.6 Contractor's Detailed Proposal for Testing and Training

The Contractor shall, prior to commencement of the works testing and training of operatives, submit a detailed work programme in line with the guidelines given in 1.13.1 to 1.13.4 above for the SR's approval and Client's agreement.

5.6.12.7 Supply of Chemicals for Operation

The Contractor shall, supply to store, the chemicals listed below and in the quantities so indicated for the initial three (3) months of operation. The chemical shall be high quality grade and shall be approved prior to ordering.

Minimum provision shall be estimated based on scheme daily output and the estimated dosing rates below.

- Lime (CaO) – 90mg/l (for pH correction and Iron removal);

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- Calcium Hypochlorite - High Test (HTH) – 10mg/l (to achieve Cl₂ residual of minimum 0.2mg/l at the service point).

5.6.13 Transport and Storage

The Contractor shall be responsible for the storage and security of all material delivered to site and installed until the Issue of the Certificate of Completion.

Each item shall be securely packed and adequately protected and marked to avoid loss or damage in transit.

All equipment shall be handled and stored in accordance with the manufacturers recommendations.

Deliveries shall be kept to the minimum number possible and any items which are required to be built in or laid under structures shall be delivered to site in ample time to avoid delays

5.6.14 Site Office for the Supervisor

The Contractor shall provide a Porta-Cabin type office at an agreed location in each LGA of operation to be specified by the SR. The layout of the building shall be to the approval of the Supervisor the office shall be waterproof, have opening windows and be provided with electric lighting and the Contractor shall bear all costs associated with this provision. The offices shall be so situated and the approaches and foundations so constructed as to be easily accessible in all weather conditions both by foot and two wheels drive vehicles.

The Contractor shall be actively responsible for the maintenance of the structure and shall provide electric power, potable water, sanitation, daily cleaning and stationery at no additional charge to the Employer. Hard standing for three vehicles shall be provided adjacent to the office.

The structure shall comprise a single general office with conveniences, well shaded against direct sunlight and shall be to the following specification:

- Floor area of not less than 18 sq.m and contain:-
 - No. Desks
 - No. Chairs
 - 1 No. Drafting table with stool
 - 1 No. Plan chest with 4 drawers
 - 1 No. 2m by 1m steel lockable file rack
 - 1 No. Steel lockable filing cabinet with 4 drawers
 - 1 No. Bookcase
 - 1 No. Pin board 1m by 2m
 - 1 No. Multiple letter trays
 - 1 No. Air Conditioner
 - 1 No. Paper stapler and punch
 - 2 No. Waste paper baskets
 - Detail and tracing paper
 - 1 No. A3 colour printer
 - 1 No. A4 colour printer
- Toilet (1 No.) Toilet
- 1 No. Water closet
- 1 No. Wash hand basin
- 1 No. Towel rail with towels
- 1 No. Mirror

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- Other Requirements
- 1 No. Refrigerator 0.25 cu.m³ capacity
- 1 No. Electric kettle
- 1 No. Teapot, sugar basin and milk jug
- 1 No. Set of cups, saucers, plates and cutlery for six people
- 1 No. Table top
- 1 No. Water filter

- **Safety Equipment**
- 1 No. Fire extinguisher
- 1 No. First Aid Kit
- 6 No. Safety helmets
- 6 No. Pair Wellington Boots
- Hand gloves – sum

5.6.15 Survey and Other Equipment for Use of the Supervision Representative

The Contractor shall provide and maintain for the exclusive use of the SR and his staff, for the duration of the Contract, the following equipment: -

Survey Equipment

Item	No
(a) Suitable modern and accurate total station	1
The total station should be compatible for electronic data transfer to a GPS Total Station Leica Geosystem 500 series type or similar approved	
(b) SR's Level and staff	1
(c) Steel tapes, 100 m. long	2
(d) Steel tapes, 50 m. long	2
(e) Spirit Levels	1
(f) Plumb bobs	1
(g) Pocket tapes	2
(h) Survey staff and ranging rods	2 each
(i) Survey umbrellas	2

5.7.0 SCOPE OF WORKS

The works are a part of the overall intervention of the United State Agency for International Development (USAID) for improved water supply and sanitation in 3 small towns in 3 LGAs in Borno State.

The works under the Contract are required to provide water supply to the towns through construction of new or rehabilitation of existing borehole-based schemes and limited reticulation in the towns. Construction of toilets in public institutions such as schools, market places and motor parks are part of the required works.

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5.7.1 Project Overview

The project overview is presented below.

The Contract shall include the following works:

Borehole Works

- Drilling, testing and commissioning of boreholes and/or rehabilitation of existing borehole
- Installation of riser pipes and submersible pumps
- Laying of connection pipework to elevated reservoir.
- Supply and Installation of starter panels and cabling
- Provision of solar powered borehole system

Civil Works

- Construction of elevated steel storage tank
- Construction of power house and other facilities buildings
- General Landscaping, construction of gate house and fencing

Distribution

- Laying of uPVC pipe mains, 75mm, 90mm dia to 160mm dia
- Installation of air valves, washouts gate valves and water meters
- Construction of blockwork valve chambers
- Construction of water kiosks and public standpipes

Other Works

- Training of Artisans and Technicians at Community level in Operation and Maintenance of the Schemes.
- Compilation of “As-Built Drawings” and Operation and Maintenance Manuals adequate for Community level Management of the Schemes.

This particular specification for civil works shall be read in conjunction with the electro-mechanical works specification.

The scope of work is itemized in subsequent sections of this specification and itemized details of work are provided in the accompanying Bills of Quantities (BOQ).

The detailed work is itemized in subsequent sections of this specification and itemized details of work are provided in the accompanying Bills of Quantities (BOQ).

5.7.0 DESCRIPTION OF SCHEME COMPONENTS

5.7.1 Small Towns

The proposed water supply scheme shall comprise of number of indicated boreholes, from which raw water shall be pumped through a mini treatment system into an elevated storage tank. The water shall be delivered into distribution

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pipelines by gravity from the elevated tank and shall be dispensed at various public waters stand posts located at specific points in towns.

If confirmed necessary by results of water quality tests, a simple spray aeration and chemical exchange system shall be installed for Iron removal from the raw water pumped from the boreholes.

The systems for each town shall deliver respective quantities of water over a 10-hour pumping period.

The boreholes shall be run by alternative power supply of renewable solar energy. The details are provided in the Power Supply section of this Particular Specification.

The Drawings and Bills of Quantities for civil works, including reinforced concrete and steel structures, access roads, drainage and treatment plant components provide sufficient layout details, but are not detailed working drawings. The detailed proposal and working drawings shall be prepared and submitted by the Contractor after detailed surveys, which shall be approved by the SR, within the first month of construction. The Contractor shall carry out all necessary surveys for all components of the scheme rehabilitation and submit a methodology, including priced schedule of works for the approval of the SR before commencement of the work.

All the works shall be executed in accordance with the applicable specifications, standards, drawings, Bills of Quantities and Conditions of Contract.

5.8.1.1 Existing Tanks

Existing Ground Level Steel Tanks

The tank dimensions are *shown in the drawings*. Physical inspection shall be carried out, followed by leakage testing. Leakage repair of welded tanks shall include the following works:

- Spot welding of isolated leakage points or replacement of sectional panels, for welded steel tanks;
- Replacement of leaking panels or reconstruction of leaking joints, for pressed steel panel tanks;
- Clean internal surfaces, de-rust localized surface corrosion and re-paint all internal surfaces in non-toxic epoxy or chlorinated rubber paint;
- Clean external surfaces, de-rust localized surface corrosion and re-paint external walls and roof, manhole covers and vents in suitable approved bituminous aluminium paint;
- Provide angle sections of appropriate size for additional bracing of buckled sections;
- Supply and install suitable level gauge;
- Final cleaning and disinfection of tank.
- Replace or service Inlet and outlet valves.

Existing Reinforced Concrete Ground Tanks

Isolated walls leakage points shall be repaired using suitable proprietary resin based admixtures either in isolation or with cement mortar applicable by pressure injection or other appropriate means. If found necessary from the leakage test, the internal walls and floor surfaces shall be treated by application of proprietary waterproof membrane or waterproof cement mortar. Existing corroded access ladders, vents, access manhole cover and level gauge shall all be replaced. The *access manhole cover* shall be replaced. All metal ancillaries shall be painted in approved proprietary ton-toxic paint for corrosion protection.

Damaged de-watering pumps shall be repaired or replaced.

Wall applications for repair shall be in proprietary non-toxic material.

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Inlet and outlet valves shall be serviced / replaced.

Existing Elevated Steel Tank

The existing reinforced concrete elevated tank and tower shall be treated in the same way as the ground tanks. However, in addition, the support tower shall be cleaned; de-localized surface corrosion de-rusted and the entire support tower painted in suitable approved bituminous paint;

New Elevated Steel Tanks

New elevated tank shall be constructed in the head works compound. The tank shall be complete with cover and access manhole, inlet and outlet connection pipework, level gauge and float valve, support tower with access ladder and *an intermediate rest platforms at a height of 7.5m*, perimeter walkway, earthing system and all other ancillaries.

The outlet pipework shall also include for connection *with water meters*.

The steel tank shall comply with BS 1564: Specification for galvanised steel sectional tanks and the support tower structure with BS 449: The use of structural steel in building. The Contractor shall carry out necessary geotechnical investigation to determine the soil bearing capacity at the site and the foundation design shall be based on the results of the investigation. Geotechnical investigations shall include a minimum of 2 nos cone penetrometer tests and 1 nos borings to a depth of 15m minimum.

Site pipework shall be in approved steel pipe and fittings, appropriate joints. Weld jointing shall be allowed for steel pipes and fittings.

The completed tank shall be tested for water tightness as specified in the General Specification Sub-clause 622.

The works shall also include the reinforced concrete base and all associated earthworks

The Contractor shall submit for approval his proposals for the work, which as a minimum, shall include the provisions in the specification, drawings and as listed in the BOQ prior to commencement.

Painting of external surfaces shall be as provided for in Clause 616 Painting of Steel Surfaces, Class B, using zinc epoxy primer and topcoat of zinc epoxy or heavy-duty epoxy coal tar or other approved painting. Internal surfaces shall be painted as specified for Class E, F and G surfaces, using zinc epoxy primer and topcoat of zinc epoxy or chlorinated rubber or other similar approved compounds.

Painting of the support tower shall be in suitable 3-layer application of approved primer and white aluminum finish.

The works shall include all other surface preparation prior to application of the paints.

Leakage Testing

Testing for leakage shall be carried out by cleaning and filling the tank with water at a steady rate. The water shall be left for 24 hours to allow for stabilization, after which the level shall be measured by a vernier hook gauge. The test shall be acceptable if the total level drop, after allowing for evaporation and rainfall does not exceed 2 mm per 1 m of average water depth, over the test period or as otherwise considered acceptable by the SR.

5.8.1.2 Chemical Dosing

Disinfection shall be by HTH solution and the system shall include one mixing tank of 500litres capacity and 1 pumps, with pipework to the point of dosing, service water pipe work, chemical agitators and all ancillaries to make the dosing system complete. The pipework shall be in 12mm dia uPVC pipe and include isolating and non-return valves. HTH shall be dosed into the delivery pipe to the elevated reservoir. The entry point into the delivery pipe shall be designed such that reverse flow of water into the dosing line shall be avoided.

pH correction shall be achieved through the use of one 150litres capacity plastic mixing tank and 1 No pump with common pipework to the point of dosing, service water pipe work, chemical agitators and all ancillaries to make the dosing system complete. The pipework shall be in 12mm dia uPVC pipe and include isolating and non-return valves. Lime shall be dosed into the outlet pipe from the elevated reservoir as the water goes into the distribution system. The entry point into the delivery pipe shall be designed such that reverse flow of water into the elevated tank shall be avoided.

The chemical dosing equipment shall be located in the power house and partitioned as shown in the drawings.

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An injection device shall be provided for chlorine solution dosing into the raw water pipe. The injection tube shall extend across the pipe bore and be drilled at pre-determined centers to ensure uniform distribution across the flow profile.

Chlorine solution injection shall be fitted with a non-return and isolation valves.

The chemical dosing equipment shall be housed in the Pumping / Chemical Mixing room. Chemical tank plinths shall similarly be placed on concrete plinths 150mm above floor level.

The works are schedules in the Bill of Quantities.

Technical drawings and sketches

See attached Annex 1

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5. Sample Contract

This is the anticipated contract. However, if required, additional terms and conditions may be added by Mercy Corps in the final contract.

INTERMEDIATE WORKS CONTRACT

Contract No. _____

THIS WORKS CONTRACT entered into as of _____ by and between MERCY CORPS, a State of Washington, U.S.A. nonprofit corporation having its principal office in Portland, Oregon, U.S.A. (“**Mercy Corps**” or “**MC**”), and _____ (“**Contractor**”) is as follows

1. Additional Terms and Defined Terms. Additional Terms are specified in Schedule I hereto (the “Additional Terms”). The terms in Schedule I are incorporated in this Contract by this reference. The following additional defined terms are included in Schedule I: Authorized Representative, Owner, Payment Terms and Subcontractor Percentage Limit. “**Contract**” means this Works Contract as amended, modified or supplemented from time to time together with its Schedules and appendixes (if any). “**Statement of Work**” means the Statement of Work attached as Schedule II. “**Work**” or “**Works**” means all the goods and services described in the Statement of Work. Other terms may be defined throughout this Contract as specified.

2. The Work. Contractor, together with its Subcontractors (if any), will fully execute and complete the Work in accordance with the terms and conditions set forth in this Contract. The Contractor will perform and complete the Work strictly in accordance with this Contract. Contractor warrants that all Work will be completed in strict adherence to the approved design and engineering plans, any relevant government issued permits and authorizations, and any Mercy Corps approved Bills of Quantity as applicable per the Statement of Work collectively the “**Specifications**”). Each Statement of Work will list out the documents that will be used as the Specifications. No deviation, substitution or change is permitted without Mercy Corps’ prior written consent following the Change Order processes required in this Contract.

3. Subcontractors.

- a. Contractor is only allowed to subcontract components of the work if Schedule I indicates that subcontracting is allowed. “**Subcontractor**” means a person or entity that has a direct contract with Contractor (or with another Subcontractor) to perform a portion of the Work or to supply materials or equipment for the Work. “**Subcontract**” means an agreement between Contractor and a subcontractor.
- b. Even when allowed, Contractor must notify in writing MC’s Authorized Representative in advance of any subcontractor it intends to hire. MC’s authorized representative may reject any subcontractor if MC has reasonable grounds to believe that the subcontractor is not qualified to perform the work, is charging more than the market rate or would violate any of the warranties and representations in this Contract. In no event will Contractor be reimbursed or paid by Mercy Corps for any amounts paid or owed to subcontractors that exceeds the Subcontracting Percentage Limit in Schedule I.
- c. Contractor will be solely responsible, and Mercy Corps will not have responsibility, for all aspects of safety related to the Work. Contractor will take all necessary precautions for the safety of, and will provide protection to prevent damage, injury or loss to, persons or property whether it be their own, Mercy Corps’ or community.

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SCHEDULE III. Other Contract Provisions Required by Law or MC's Donor

A: DFID funded Program

Mercy Corps, in accordance with donor regulations, requires certain certifications and provisions, set forth herein, to be included in all contracts.

Liability/Indemnity

The Contractor acknowledges that DFID will not be held responsible for or in relation to the activities of the Contractor under this Contract.

Right of Access/ Audit

The Contractor shall permit Mercy Corps, its donor, DFID (UK), and/or the UK's National Audit Office and/or any of their duly authorized representatives, access to project sites and relevant records, including books, documents, papers (including in electronic format) for the purpose of monitoring, evaluation and audit. Such verification or audit may take place at any time during this Contract and up to seven years after final payment made under this Contract.

Anti-Corruption and Anti-Bribery

The parties recognize that Mercy Corps has a zero tolerance approach to bribery and corruption. The Contractor will comply with all relevant anti-bribery and anti-corruption laws (including the UK Bribery Act 2010) and comply with the principles of Mercy Corps' Anti-Corruption and Anti-Bribery Policies, or equivalent policies, including: (a) not accepting or offering a bribe or facilitation payment; and (b) reporting immediately to Mercy Corps any bribery issues which the Contractor becomes aware of during this Contract; and, at the reasonable request of Mercy Corps, confirming in writing that they have complied with this clause and provide any information reasonably requested in support of such compliance. MC recognizes that in complying with this clause, the Contractor is not expected to risk life, limb or freedom.

Cancellation of the Contract

If any illegal or corrupt practices were or are committed in the award or execution of this Contract, including if any offer, gift, payment, contribution or benefit of any kind was accepted as an inducement or reward for the award or execution of this Contract, this Contract will be cancelled with immediate effect, in which case Mercy Corps will return to the Contractor any items delivered and the Contractor will return to Mercy Corps any funds paid (at each of their own cost, unless otherwise agreed).

Confidentiality

The Contractor acknowledges that Mercy Corps has reporting obligations to DFID. Accordingly, the Contractor consents to Mercy Corps sharing information about the Vendor or the Services with DFID as required.

Conflict of Interest

- (a) The Vendor shall take all reasonable precautions to avoid any conflict of interests and shall inform MC without delay of any situation constituting or likely to entail a conflict of interests.
- (b) There is a conflict of interests where the impartial and objective exercise of the functions, tasks and activities under this Contract is compromised for reasons involving family, emotional life, political or national affinity, economic interest or any other shared interest with another person or party.

Principal of Ethical Procurement

The Contractor acknowledges that Mercy Corps must comply with DFID's principle of Ethical Procurement including adhering to the minimum ethical standards of the avoidance of child labour, and the respect of basic social rights and working conditions based on international labour standards.

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Child Protection

The Contractor acknowledges that, under the Donor Contract, the recipients of funds are required to have a robust child protection policy and mechanisms to monitor its adherence and that it is important that a focus on child protection is maintained throughout the lifecycle of the Project. The Donor reserves the right to ask for the relevant child protection policy and mechanisms and test that they are implemented during the life of the Project.

B: DOS funded Program

Mercy Corps, in accordance with donor regulations, requires certain certifications and provisions, set forth herein, to be included in all contracts.

1. The Contractor is reminded that U.S. Executive Orders and U.S. law prohibits transactions with, and the provision of resources and support to, individuals and organizations associated with terrorism. It is the legal responsibility of the Contractor to ensure compliance with these Executive Orders and laws.
2. Contractor certifies that neither it nor its principals is presently excluded or disqualified from participation in this transaction by any US Government department or agency.
3. Contractor certifies that it will not and has not used any funds received directly or indirectly from the U.S. Government has been paid or will be paid to any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of U.S. Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining this Contract or any other U.S. government funded project.
4. Mercy Corps, the US Department of State, the Inspector General of the United States, and the Comptroller General of the United States, or any of their duly authorized representatives have the right of timely and unrestricted access to any books, documents, papers and records of Contractor that are pertinent to this Contract, in order to make audits, examinations, excerpts and transcripts and copies of such documents. This right also includes timely and reasonable access to a Contractor's personnel for the purpose of interview and discussion related to such documents.
5. The U.S. Government is opposed to prostitution and related activities, which are inherently harmful and dehumanizing, and contribute to the phenomenon of trafficking in persons. None of the funds made available under this contract may be used to promote, support, or advocate for the legalization or practice of prostitution. Nothing in the preceding sentence shall be construed to preclude assistance designed to ameliorate the suffering of, or health risks to, victims while they are being trafficked or after they are out of the situation that resulted from such victims being trafficked. The Contractor does not promote, support, or advocate the legalization or practice of prostitution.
6. Mercy Corps has the right to terminate this Contract, without penalty, if Contractor or its employees, or any Subcontractor or its employees, engage in any of the following conduct:
 - (i) Trafficking in persons (as defined in the Protocol to Prevent, Suppress, and Punish Trafficking in Persons, especially Women and Children, supplementing the UN Convention against Transnational Organized Crime) during the period of this Contract;
 - (ii) Procure a commercial sex act during the period of time that this Contract is in effect; or
 - (iii) Use forced labor in the performance of the Contract.
7. The Contractor agrees to incorporate the terms of "Exhibit C" word-for-word in all of its sub-contracts funded under this Contract, if any.

C: European Funded Programs

Mercy Corps has received funding from European Union, designated herewith as the Donor. Mercy Corps, in accordance with the Donor regulations under which this contract is executed, requires certain certifications and provisions, set forth herein, to be included in all contracts.

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Liability/Indemnity

Under no circumstances nor for any reason whatsoever will the Donor be held liable for damages as a result of the work pursuant to this Contract.

Right of Access/ Audit

- (a) The Contractor will be responsible for holding all invoices, receipts and financial and accounting documents relating to this Contract for at least seven years following final payment made under this Contract.
- (b) The Contractor will allow Mercy Corps or the Donor (or any other organisation authorised by the Donor) access to the location where the Contractor is based or any location where the Services are being implemented and to all documents, information and other material related to this Contract (including in electronic format), necessary to assess, or audit the implementation of the project and compliance with this Contract. Such audit may take place at any time during this Contract and up to seven years following final payment made under this Contract.

Confidentiality

The Contractor acknowledges that Mercy Corps has reporting obligations to the Donor. Accordingly, the Contractor consents to Mercy Corps sharing information about the Contractor or the Services with the Donor as required.

Anti-corruption

The Parties recognize that Mercy Corps has a zero tolerance approach to bribery and corruption. The Contractor will comply with all relevant anti-bribery and anti-corruption laws (including the UK Bribery Act 2010) and comply with the principles of Mercy Corps' Anti-Corruption and Anti-Bribery Policies, or equivalent policies, including: (a) not accepting or offering a bribe or facilitation payment; and (b) reporting immediately to Mercy Corps any bribery issues which the Contractor becomes aware of during this Contract; and, at the reasonable request of Mercy Corps, confirming in writing that they have complied with this Clause and provide any information reasonably requested in support of such compliance.

Mercy Corps recognizes that in complying with this Clause, the Contractor is not expected to risk life, limb or freedom.

Principal of Ethical Procurement

The Contractor acknowledges that Mercy Corps must comply with the Donor's principle of Ethical Procurement including adhering to the minimum ethical standards of the avoidance of child labour, and the respect of basic social rights and working conditions based on international labour standards.

D: USAID Funded Programs

Mercy Corps, in accordance with donor regulations, requires certain certifications and provisions, set forth herein, to be included in all contracts.

1. The recipient must not engage in transactions with, or provide resources or support to, individuals and organizations associated with terrorism, including those individuals or entities that appear on the Specially Designated Nationals and Blocked Persons List maintained by the U.S. Treasury (online at: <http://www.treasury.gov/resource-center/sanctions/SDNList/Pages/default.aspx>) or the United Nations Security designation list (online at: http://www.un.org/sc/committees/1267/aq_sanctions_list.shtml).
2. Contractor certifies that neither it nor its principals is presently excluded or disqualified from participation in this transaction by any US Government department or agency.
3. Contractor certifies that it will not and has not used any funds received directly or indirectly from the U.S. Government to pay any person or organization for influencing or attempting to influence an officer or employee

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- of any agency, a member of U.S. Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining this Contract or any other U.S. government funded project.
4. Mercy Corps, USAID, and the Comptroller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers and records of Contractor which are directly pertinent to this Contract for the purpose of making audits, examinations, excerpts and transcriptions.
 5. The Contractor or its employees, or any Subcontractor or its employees, must not engage in any of the following conduct:
 - (i) Trafficking in persons (as defined in the Protocol to Prevent, Suppress, and Punish Trafficking in Persons, especially Women and Children, supplementing the UN Convention against Transnational Organized Crime) during the period of this Contract;
 - (ii) Procure a commercial sex act during the period of this Contract;
 - (iii) Use forced labor in the performance of the Contract; or
 - (iv) Commit acts that directly support or advance trafficking in persons, including the following acts:
 - a. Destroying, concealing, confiscating, or otherwise denying an employee access to that employee's identity or immigration documents;
 - b. Failing to provide return transportation or pay for return transportation costs to an employee from a country outside the United States to the country from which the employee was recruited upon the end of employment if requested by the employee, unless:
 - exempted from the requirement to provide or pay for such return transportation by Mercy Corps under this award; or
 - the employee is a victim of human trafficking seeking victim services or legal redress in the country of employment or a witness in a human trafficking enforcement action;
 - c. Soliciting a person for the purpose of employment, or offering employment, by means of materially false or fraudulent pretenses, representations, or promises regarding that employment;
 - d. Charging employees' recruitment fees; or
 - e. Providing or arranging housing that fails to meet the host country housing and safety standards.

The Contractor agrees to report in a timely manner to Mercy Corps any credible information from any source that alleges the contractor or any sub-contractor has engaged in any of the prohibited activities identified in this provision.

6. The Contractor must inform its employees working under this contract in the predominant native language of the workforce that they are afforded the employee whistleblower rights and protections provided under 41 U.S.C. § 4712; and
7. Prohibition on Requiring Certain Internal Confidentiality Agreements or Statements
 - (a) The Contractor must not require its employees or sub-contractors to sign or comply with internal confidentiality agreements or statements that prohibit or otherwise restrict employees or sub-contractors from lawfully reporting waste, fraud, or abuse related to the performance of this contract to Mercy Corps or to USAID's Office of the Inspector General.
 - (b) The Contractor must notify current employees and sub-contractors that prohibitions and restrictions of any preexisting internal confidentiality agreements or statements covered by this provision, to the extent that such prohibitions and restrictions are inconsistent with the prohibitions of this provision, are no longer in effect.

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(c) If Mercy Corps, USAID or other authorized officials of the US Government determines that the Contractor is not in compliance with the requirements of this provision, Mercy Corps may, at its sole discretion, suspend or terminate the contract. Further, Mercy Corps may, at its sole discretion, decide not pay a portion or all of amounts invoiced or expenditures incurred, as applicable, by the Contractor with funds provided under this contract, and also may require the Contractor to refund a portion or all of any amounts paid to the Contractor under this contract.

(d) Definitions:

Terms in this clause will have the meaning defined in this section or as defined in 2 CFR 200.

“Internal confidentiality agreement or statement” means a confidentiality agreement or any other written statement that the Contractor requires any of its employees or sub-contractors to sign regarding nondisclosure of recipient information, except that it does not include confidentiality agreements arising out of civil litigation or confidentiality agreements that Contractor employees or sub-contractors sign at the behest of a US government agency.

(e) The Contractor must include this provision, including this paragraph (e), in subawards and sub-contracts funded under this contract.

8. Contractor must disclose, in a timely manner, in writing to the USAID Office of Inspector General and Mercy Corps all violations of US government criminal law involving fraud, bribery or gratuity violations potentially affecting this Contract.

Disclosures to USAID must be sent to:

U.S. Agency for International Development

Office of the Inspector General

P.O. Box 657

Washington, DC 200044-0657

Phone: 1-800-230-6539 or 202-712-1023

Email: ig.hotline@usaid.gov

URL: <https://oig.usaid.gov/content/usaid-contractor-reporting-form>

9. USAID policy requires that the contractor not discriminate against any beneficiaries in implementation of this contract, such as, but not limited to, by withholding, adversely impacting, or denying equitable access to the benefits provided through this contract on the basis of any factor not expressly stated in the contract. This includes, for example, race, color, religion, sex (including gender identity, sexual orientation, and pregnancy), national origin, disability, age, genetic information, marital status, parental status, political affiliation, or veteran's status. Nothing in this provision is intended to limit the ability of the contractor to target activities toward the assistance needs of certain populations as defined in the contract.

10. The Contractor agrees to incorporate the terms of “Schedule II – subsection C” word-for-word in all of its sub-contracts funded under this Contract, if any.

E. Reporting of currency and cash-based transaction required under Nigerian laws.

1. The special control unit against money laundering (SCUML) as well as Federal Ministry of Industry, trade and investment, in line with the provision of the “Money Laundering (Prohibition) Act (TPA)” 2011 (as amended) and Federal Ministry of Industry, Trade and Investment (designation of Non-Financial institutions) 2013 and 2016 respectively, requires designated non-financial institutions to report all currency transactions of N5,000,000 and above, in case of an individual or N10,000,000 and above, in the case of a body corporate within seven (7) days from the date of transaction.

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2. The laws also require designated non-financial institutions to report all cash-based transactions in excess of \$1,000 or its equivalent within seven (7) days to SCUML through its online platform.
3. Accordingly, Mercy Corps, being a registered and designated non-financial institution, in compliance with above requirements in clause a and b of this document is obliged to report all transaction to SCUML.
4. By signing this document, the vendor/contractor/service provider unconditionally allows Mercy Corps to share necessary data and documents with SCUML and the “Economic and Financial Crimes Commission (EFCC).
5. Vendor/contractor/service provider also agrees to allow SCUML and EFCC the unconditional access to his bank account(s), account books and daily ledger with regard to the amount paid against this contract.

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6. Attachments to the Tender Package

7.1 Attachment 1 -Supplier Information Form.

This document must be submitted with your bid

The information provided will be used to evaluate the Company before contracting with the Mercy Corps.

Please complete all fields.

Supplier Information

Company Name	
Any other names company is operating under (Acronyms, Abbreviations, Aliases)	
Previous names of the company	
Address	
Website	
Phone/Fax Numbers	Phone: _____ Fax: _____
Primary Contact	Name: Phone Number: Email Address:
Government - owned (yes/no)	
Name(s) of Board of Directors	
Name(s) of Company Owner(s)	
Parent companies, if any	
Subsidiary or affiliate companies, if any	

Vendor Capacity	
Number of qualified Staff.	
Do you operate in Borno State or the Northeast Nigeria?	
Do you operate in the Deep Field Locations within Borno State e.g. Biu, Kwaya-kusar or Shani LGAs?	
Do you have experience in drilling motorized borehole, water supply overhead steel stanchion and water fetching point? If yes, attach similar contract(s) successfully completed with evidence works completion	
Do you have the equipment and the relevant personal to deliver works? If Yes, attach CVs of relevant personal and evidence of equipment ownership or least agreement	
Vendor Experience:	
What is your primary area of business?	
How many years of experience do you have in this field?	
Provide examples of similar work executed i.e. Contracts or service completion certificates from INGO, UN or government agencies	
Please mention previous similar works done. (attach contract if possible)	<ol style="list-style-type: none"> 1. 2.

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	3.
Will you subcontract other companies for the project?	
Other:	
Do you understand the security situation between these routes? Biu, Kwaya-kusar and Shani LGAs – Borno State.	
Can you get approval from Authorities to move equipment and personal to deliver works in Biu, Kwaya-kusar and Shani LGAs? Please attach acknowledgement.	

Financial Information

Bank Name and Address	
Bank Account Number	
Name under which company is registered at bank	
Payment Terms: Payment will be done in wire transfer.	
MC will do the payment after the completion of works, do you agree on these terms?	
Payment will be based on deliverable and invoice will only be paid after the completion of each deliverable	

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Delivery Time/Completion Time

<p>How many days, from the time of contract signature will it take you to mobilize to site, commence work, complete and handover works to Mercy Corps?</p>	
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References

This information is required; references should be a former client whom the company have rendered similar service(s)

Client Name:	1. <u>Contact Name, Phone, Email Address:</u>
Client Name:	2. <u>Contact Name, Phone, Email Address:</u>
Client Name:	3. <u>Contact Name, Phone, Email Address:</u>

Supplier Self-Certification of Eligibility

Company certifies that:

1. It, its affiliates and subsidiaries, owners, officers, directors and key employees (to the best of its knowledge) are not the subject of any government’s sanctions, designations, donor rules or prohibitions, or laws prohibiting transactions with it/them. It is not the subject of any donor government investigation into its misconduct with any other recipient of that donors funding.
2. It, its affiliates and subsidiaries, owners, officers, directors and key employees have not and do not engage in any form of terrorism or attacks on civilians and do not provide any form of material support or financial resources for individuals or organizations that do engage in any form of terrorism or deliberate attacks on civilians.
3. It, its affiliates and subsidiaries, owners, officers, directors and key employees have not and do not engage in weapons or drugs manufacture, transport, sale or distribution.

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4. It is not in default on any material credit agreement, bankrupt or being wound up, are having its affairs administered by the courts, have entered into arrangements with creditors, have suspended business activities, are the subject of proceedings concerning those matters, or are in any analogous situation arising from a similar procedure provided for in national legislation or regulations.
5. It has not been determined to be in breach of a material contract by any legal body anytime within the past 2 years.
6. It pays taxes as and when due and is not currently the subject of any investigation or proceeding related to back-owed taxes.
7. It provides workers compensation insurance to its workers in accordance with the laws of the countries where it operates.
8. It pays social security obligations as required in the countries where it operates.
9. It, its owners, officers and directors have not been convicted of an offense concerning its professional conduct and has not engaged in grave professional misconduct.
10. It, its affiliates and subsidiaries, owners, officers, directors and key employees have not been the subject of criminal investigation or judgement for fraud, corruption, human trafficking, spying, weapons transport or smuggling, sexual exploitation or abuse, involvement in a criminal organization or any other criminal activity.
11. It treats its employees with dignity and respect and maintains social operating standards, including: working conditions and social rights: avoidance of child labor, bondage, forced labor, human trafficking or exploitation; assurance of safe and reasonable working conditions; freedom of association; freedom from exploitation, abuse, and discrimination; protection of basic social rights of its employees and Mercy Corps beneficiaries.
12. To the best of its knowledge, no Mercy Corps employee, officer, consultant or other party related to Mercy Corps has a financial interest in the Company's business activities, nor is any Mercy Corps employee related to any owner, officer, director or employee of the company, and, if so, it will ensure that the relationship is disclosed to Mercy Corps and will not be used for improper influence. Discovery of an undisclosed Conflict of Interest will result in immediate revocation of the Company's Authorized Supplier status and disqualification of Company from participation in future Mercy Corps procurement.
13. It understands that attempting to or agreeing to provide anything of value to any Mercy Corps employee, agent or representative for the purpose of encouraging that person to award Company a contract or take or not take any action related to any contract will result in immediate termination of any agreement. Company certifies that it does not engage in such conduct.
14. It understands that Mercy Corps seeks fair and open competition and the fairest price available and that any attempt by company to subvert fair and open competition, including working with other bidders to fix prices, working to exclude competition, seeking confidential information from Mercy Corps or other bidders, using multiple related or controlled companies to give the appearance of competition, or any similar activity, will result in termination of any agreement. Company certifies that it does not engage in such conduct.
15. It understands that Mercy Corps prohibits any of its partners or suppliers from bribing public officials and certifies that it does not do so.
16. It is not conducting business under other names or aliases that have not been declared to Mercy Corps.

If the Company cannot certify to any of the above, it should explain why not. Mercy Corps may take the individual circumstances into account for some situations. However, any false certification could be grounds for immediate disqualification and termination of any future agreement.

By signing the Supplier Information Form, you certify that your Company is eligible to supply goods and services to major donor funded organizations and that all of the above statements are accurate and factual.

Company Name: _____

Name of Representative: _____

Title: _____

Signature: _____

Date: _____

Tender Package — Request for Bid (RFB)



MERCY CORPS USE ONLY

Following documents have been provided:

Documents	

I _____ an employee of Mercy Corps having completed and reviewed this form confirm the accuracy of information provided:

Name _____

Title _____

Signature _____

Date* _____

Tender Package — Request for Bid (RFB)



7.2 Attachment 2 - Price Offer Sheet

Borehole Drilling - Jugolgaldimari Biu					
Item No	Description	Unit	Unit Price (Naira)	Estimated Qty	Amount (Naira)
100	<u>General Items</u>				
	-				
101	Provide and maintain Project Sign- boards, 2 Nos as directed on site	No		1	-
105	Provision of O & M Manuals	Ls		1	-
106	Progress photographs/video, as specified	Ls		1	-
109	Provision for social & economic impact management	Ps		1	-
Total General Items to Bill Biu_Jugolgaldimari Summary					-
200	Boreholes				
	New Boreholes: 1 Nos.				
	<i>Mobilization and demobilization</i>				
201	Mobilization and Demobilization of Men, Drilling Rig, Self Loader and all Borehole Drilling Equipment and Materials - Include for site clearing and preparation.	Ls		1	-
	<i>Predrilling hydrogeological investigation</i>				
202	Carry out predrilling hydrogeological investigation as specified (with confirmation report submitted)	No		1	-
	Drilling				
203	Drilling of an appropriate diameter hole, in sedimentary formation for installation of 150 mm high pressure iron casing and screens, depth 0 - 100 m (maximum depth 60m for all locations)	m		60	-
204	Supply and install 160mm (6") iron casing	m		51	-

Tender Package — Request for Bid (RFB)



205	Supply and install 150 mm iron screen (10m maximum length for all locations)	m		9	-
206	Carry out geophysical logging of the open hole before casing installation	No		1	-
207	Supply and install 2 - 4mm gravel pack as specified in accordance to DIN 4924 Gravel of 1.0 - 2.0 mm (clay-seal top of the gravel pack)	No		1	-
208	Clay seal above gravel pack, 6m depth	No		1	-
209	Backfill drilled material in the annular space on the top of the clay sealing.	No		1	-
210	Grouting and blinding of seal above backfill area, 15m depth and construction of blinding layer 50mm thick around casing in Class 15 concrete.	No		1	-
211	Construction of wellhead slab 250mm thick x 1.2m x 1.2m, in Class 20 concrete, as specified	No		1	-
212	Supply and install protective lockable borehole cap and wellhead nameplate on the casing as specified. Include for making good the area around the casing.	No		1	-
Sub-Total Page to Borehole Works Summary					-
Borehole cleaning and test-pumping					
213	Carry out borehole cleaning and development by backwashing, jetting and airlifting	No		1	-
214	Equip the borehole with suitable pumpset and ancillary equipment for a 6 hour pumping test to establish maximum and safe yield from the borehole. Include for measurements and records of discharge water	day		1	-
215	Carry out water quality analysis, including full bacteriological and physico-chemical analysis	No		1	-

Tender Package — Request for Bid (RFB)



216	Carry out disinfection of the motorised borehole, permanent pump and riser pipes as specified	No		1	-
217	Provide and install header pipework, in 75mm dia upvc pipes, fittings, and appurtenances including 1 no 90 deg and 2 nos 45 deg bends, air valve, gate valve, non-return valve, pressure gauge and flow meter.	No		1	-
218	Prepare Technical Report (allow 5 copies) for the borehole test pumping and construction details. Include for borehole material logs, yields, recovery, water quality analysis (full chemical and bacteriological) and borehole vertical alignment.	Ls		1	-
Sub-Total Page to Borehole Works Summary					-
COLLECTION SHEET					
Summary Borehole Works					
	Sheet 1				-
	Sheet 2				-
Total Borehole Works to Biu_AngwanmallamBukar Summary					-

-

BILL	Bill 02 Biu_Jugolgaldimari Summary	AMOUNT (NGN)
1	Preliminary and General	-
2	Borehole	-
TOTAL BILL BIU_JUGOLGALDIMARI SUMMARY CARRIED FORWARD TO GRAND SUMMARY		-

Tender Package — Request for Bid (RFB)



Construction of Storage and Reticulations - Jugolgaldimari Biu					
Item No	Description	Unit	Unit Price (Naira)	Estimated Qty	Amount (Naira)
100	<u>General Items</u>				
	<u>Mobilization to site</u>	Ls		1	-
Total General Items to Bill Biu_Jugolgaldimari Summary					-
200	Boreholes				
201	Supply and installation of 32 mm dia. UPVC Pipes of 10 bar flanged with all connections to form rising main to connect supply to overhead tank	m		20	-
Sub-Total Page to Borehole Works Summary					-
COLLECTION SHEET					
Summary Borehole Works					
Sheet 1					
Total Borehole Works to Biu_AngwanmallamBukar Summary					-
300	Storage				
	<i>Storage Tanks</i>				-
301	Fabricate, Erect and Construction of Elevated Pressed Steel tank, 50cub.m on 10m Tower complete with, Steel tower Columns, Top & Bottom Bearers, Angle bracings, Walkway Platform, handrail, Safety guage, Ladder, Bolts, Nuts, washers and associated Inlet, Outlet, Overflow Drain Pipe and Gate valves	No		1	-
304	Construct reinforced concrete foundation, in accordance with results of geophysical investigation	Ps			-
Fencing - Blockwall Perimeter fence 30m x 30m x 2.7m high					

Tender Package — Request for Bid (RFB)



308	Provide and erect blockwall perimeter fence to include foundation	m2		324	-
Sub-Total Page to Treatment Plant Summary					-
	<i>Gate - Welded steel open grid structure, 3.6m wide X2.1m high, double leaf</i>				
309	Provide and fix welded steel gate 3.6m wide X 2.1m high, in 50mm dia galvanized steel pipe frame and 50mm X 50mm welded galvanized mesh (8 SWG), as in drawing and include for fixing to concrete support posts. Include locking latches and bolts	No		1	-
310	Provide and fix reinforced concrete(C25/20) gate posts 250mm X 250mm X 3.0m long, including Y12 bars, formwork and all ancillaries	No.		2	-
311	Provide and place mass concrete bases (C25/20) to gate posts, 750mm X 750mm X 900mm, including excavation, preparations and backfilling	Ls		1	-
Sub-Total Page to Treatment Plant Summary					-
BILL COLLECTION SHEET					
Summary Treatment Plant					
Sheet 1					
Sheet 2					
Total Treatment Plant to Biu_Jugolgaldimari Summary					-
400	<i>Rehabilitation of Existing Distribution and Connection Network</i>				
401	Allow for repair existing distribution and connection pipeline	m		1,000	-

Tender Package — Request for Bid (RFB)



Sub-Total Page to Distribution Network Summary					-
402	Water standpipe, including concrete base and taphead with two outlets, as shown in drawings	No		4	-
Sub-Total Page to Distribution Network Summary					-
BILL COLLECTION SHEET					
Summary Distribution Network					
	Sheet 4				-
	Sheet 5				-
Total Distribution Network to Bill Biu_Jugolgaldimari Summary					-

BILL	Bill 02 Biu_Jugolgaldimari Summary	AMOUNT (NGN)
1	Preliminary and General	-
2	Borehole	-
3	Storage	-
5	Distribution Network	-
TOTAL BILL BIU JUGOLGALDIMARI SUMMARY CARRIED FORWARD TO GRAND SUMMARY		-

Tender Package — Request for Bid (RFB)



Borehole Drilling Old Prison Kwayakusar

Item No	Description	Unit	Unit Price (Naira)	Estimated Qty	Amount (Naira)
100	<u>General Items</u>				
	-				
101	Provide and maintain Project Sign- boards, 2 Nos as directed on site	No		1	-
105	Provision of O & M Manuals	Ls		1	-
106	Progress photographs/video, as specified	Ls		1	-
Total General Items to Wagini I Summary					-
200	Boreholes				
	New Boreholes: 1 Nos.				
	<i>Mobilization and demobilization</i>				
201	Mobilization and Demobilization of Men, Drilling Rig, Self Loader and all Borehole Drilling Equipment and Materials - Include for site clearing and preparation.	Ls		1	-
	<i>Predrilling hydrogeological investigation</i>				
202	Carry out predrilling hydrogeological investigation as specified (with confirmation report submitted)	No		1	-
	Drilling				
203	Drilling of an appropriate diameter hole, in sedimentary formation for installation of 150 mm high presuure iron casing and screens, depth 0 - 100 m (maximum depth 60m for all locations)	m		60	-
204	Supply and install 160mm (6") iron casing	m		51	-
205	Supply and install 150 mm iron screen (10m maximum length for all locations)	m		9	-

Tender Package — Request for Bid (RFB)



206	Carry out geophysical logging of the open hole before casing installation	No		1	-
207	Supply and install 2 - 4mm gravel pack as specified in accordance to DIN 4924 Gravel of 1.0 - 2.0 mm (clay-seal top of the gravel pack)	No		1	-
208	Clay seal above gravel pack, 6m depth	No		1	-
209	Backfill drilled material in the annular space on the top of the clay sealing.	No		1	-
210	Grouting and blinding of seal above backfill area, 15m depth and construction of blinding layer 50mm thick around casing in Class 15 concrete.	No		1	-
211	Construction of wellhead slab 250mm thick x 1.2m x 1.2m, in Class 20 concrete, as specified	No		1	-
212	Supply and install protective lockable borehole cap and wellhead nameplate on the casing as specified. Include for making good the area around the casing.	No		1	-
Sub-Total Page to Borehole Works Summary					-
	Borehole cleaning and test-pumping				
213	Carry out borehole cleaning and development by backwashing, jetting and airlifting	No		1	-
214	Equip the borehole with suitable pumpset and ancillary equipment for a 6 hour pumping test to establish maximum and safe yield from the borehole. Include for measurements and records of discharge water	day		1	-
215	Carry out water quality analysis, including full bacteriological and physico-chemical analysis	No		1	-
216	Carry out disinfection of the motorised borehole, permanent pump and riser pipes as specified	No		1	-

Tender Package — Request for Bid (RFB)



217	Provide and install header pipework, in 75mm dia upvc pipes, fittings, and appurtenances including 1 no 90 deg and 2 nos 45 deg bends, air valve, gate valve, non-return valve, pressure gauge and flow meter.	No		1	-
218	Prepare Technical Report (allow 5 copies) for the borehole test pumping and construction details. Include for borehole material logs, yields, recovery, water quality analysis (full chemical and bacteriological) and borehole vertical alignment.	Ls		1	-
Sub-Total Page to Borehole Works Summary					-
COLLECTION SHEET					
Summary Borehole Works					
	Sheet 1				-
	Sheet 2				-
Total Borehole Works Wagini I Summary					-
	-				

BILL	Bill 02 Wagini I Summary	AMOUNT (NGN)
1	Preliminary and General	-
2	Borehole	-
TOTAL BILL WAGINI I SUMMARY CARRIED FORWARD TO GRAND SUMMARY		-

Borehole Drilling Wagini I Shani					
Item No	Description	Unit	Unit Price (Naira)	Estimated Qty	Amount (Naira)
100	<u>General Items</u>				
	-				
101	Provide and maintain Project Sign- boards, 2 Nos as directed on site	No		1	-
105	Provision of O & M Manuals	Ls		1	-
106	Progress photographs/video, as specified	Ls		1	-
Total General Items to Wagini I Summary					-
200	Boreholes				
	New Boreholes: 1 Nos.				
	<i>Mobilization and demobilization</i>				
201	Mobilization and Demobilization of Men, Drilling Rig, Self Loader and all Borehole Drilling Equipment and Materials - Include for site clearing and preparation.	Ls		1	-
	<i>Predrilling hydrogeological investigation</i>				
202	Carry out predrilling hydrogeological investigation as specified (with confrimation report submitted)	No		1	-
	Drilling				
203	Drilling of an appropriate diameter hole, in sedimentary formation for installation of 150 mm high presuure iron casing and screens, depth 0 - 100 m (maximum depth 60m for all locations)	m		60	-
204	Supply and install 160mm (6") iron casing	m		51	-
205	Supply and install 150 mm iron screen (10m maximum length for all locations)	m		9	-

Tender Package — Request for Bid (RFB)



206	Carry out geophysical logging of the open hole before casing installation	No		1	-
207	Supply and install 2 - 4mm gravel pack as specified in accordance to DIN 4924 Gravel of 1.0 - 2.0 mm (clay-seal top of the gravel pack)	No		1	-
208	Clay seal above gravel pack, 6m depth	No		1	-
209	Backfill drilled material in the annular space on the top of the clay sealing.	No		1	-
210	Grouting and blinding of seal above backfill area, 15m depth and construction of blinding layer 50mm thick around casing in Class 15 concrete.	No		1	-
211	Construction of wellhead slab 250mm thick x 1.2m x 1.2m, in Class 20 concrete, as specified	No		1	-
212	Supply and install protective lockable borehole cap and wellhead nameplate on the casing as specified. Include for making good the area around the casing.	No		1	-
Sub-Total Page to Borehole Works Summary					-
Borehole cleaning and test-pumping					
213	Carry out borehole cleaning and development by backwashing, jetting and airlifting	No		1	-
214	Equip the borehole with suitable pumpset and ancillary equipment for a 6 hour pumping test to establish maximum and safe yield from the borehole. Include for measurements and records of discharge water	day		1	-
215	Carry out water quality analysis, including full bacteriological and physico-chemical analysis	No		1	-
216	Carry out disinfection of the motorised borehole, permanent pump and riser pipes as specified	No		1	-

Tender Package — Request for Bid (RFB)



217	Provide and install header pipework, in 75mm dia upvc pipes, fittings, and appurtenances including 1 no 90 deg and 2 nos 45 deg bends, air valve, gate valve, non-return valve, pressure gauge and flow meter.	No		1	-
218	Prepare Technical Report (allow 5 copies) for the borehole test pumping and construction details. Include for borehole material logs, yields, recovery, water quality analysis (full chemical and bacteriological) and borehole vertical alignment.	Ls		1	-
Sub-Total Page to Borehole Works Summary					-
COLLECTION SHEET					
Summary Borehole Works					
	Sheet 1				-
	Sheet 2				-
Total Borehole Works Wagini I Summary					-
	-				

BILL	Bill 02 Wagini I Summary	AMOUNT (NGN)
1	Preliminary and General	-
2	Borehole	-
TOTAL BILL WAGINI I SUMMARY CARRIED FORWARD TO GRAND SUMMARY		-

Tender Package — Request for Bid (RFB)



Construction of Storage Reservoir Old Prison Kwayakusar					
Item No	Description	Unit	Unit Price (Naira)	Estimated Qty	Amount (Naira)
100	<u>General Items</u>				
	<u>Mobilization to site</u>	Ls		1	-
Total General Items to Bill Wagini I Summary					-
200	Connections				
201	Supply and installation of 32 mm dia. UPVC Pipes of 10 bar flanged with all connections to form rising main to connect supply to overhead tank	m		25	-
Sub-Total Page to Borehole Works Summary					-
	COLLECTION SHEET				
	Summary connection Works				
	Sheet 1				-
Total connection Works to Wagini I Summary					-
300	<i>Storage Tanks</i>				
301	Fabricate, Erect and Construction of Elevated Pressed Steel tank, 50cub.m on 10m Tower complete with, Steel tower Columns, Top & Bottom Bearers, Angle bracings, Walkway Platform, handrail, Safety guage, Ladder, Bolts, Nuts, washers and associated Inlet, Outlet, Overflow Drain Pipe and Gate valves	No		1	-

Tender Package — Request for Bid (RFB)



302	Rehabilitation of existing 36cub.m on the existing Tower to include; Increasing the height of the stanchion to 9m, addition of 2 footing to make it 6 when added to the existing 4 footing, Walkway Platform, handrail,Safety guage, Ladder, painting, Bolts, Nuts, washers and associated Inlet, Outlet, Overflow Drain Pipe and Gate valves among other <i>as will be directed by the WASH Engineer.</i>	No		1	-
304	Construct reinforced concrete foundation, in accordance with results of geophysical investigation	Ps			-
Sub-Total Page to Treatment Plant Summary					-
BILL COLLECTION SHEET					
Summary Treatment Plant					
Sheet 1					
Total Treatment Plant to Wagini I Summary					-
BILL	Bill 02 Wagini I Summary			AMOUNT (NGN)	
1	Preliminary and General			-	
2	Borehole			-	
3	Treatment Works			-	
TOTAL Bill 02 Wagini I Summary CARRIED FORWARD TO GRAND SUMMARY					-

Tender Package — Request for Bid (RFB)



Construction of Storage Reservoir Wagini I Shani					
Item No	Description	Unit	Unit Price (Naira)	Estimated Qty	Amount (Naira)
100	<u>General Items</u>				
	<u>Mobilization to site</u>	Ls		1	-
Total General Items to Bill Wagini I Summary					-
200	Connections				
201	Supply and installation of 32 mm dia. UPVC Pipes of 10 bar flanged with all connections to form rising main to connect supply to overhead tank	m		25	-
Sub-Total Page to Borehole Works Summary					-
COLLECTION SHEET					
Summary connection Works					
Sheet 1					
Total connection Works to Wagini I Summary					-
300	<i>Storage Tanks</i>				
301	Fabricate, Erect and Construction of Elevated Pressed Steel tank, 50cub.m on 10m Tower complete with, Steel tower Columns, Top & Bottom Bearers, Angle bracings, Walkway Platform, handrail, Safety guage, Ladder, Bolts, Nuts, washers and associated Inlet, Outlet, Overflow Drain Pipe and Gate valves	No		1	-

Tender Package — Request for Bid (RFB)



302	Rehabilitation of existing 36cub.m on the existing Tower to include; Increasing the height of the stanchion to 9m, addition of 2 footing to make it 6 when added to the existing 4 footing, Walkway Platform, handrail,Safety guage, Ladder, painting, Bolts, Nuts, washers and associated Inlet, Outlet, Overflow Drain Pipe and Gate valves among other <i>as will be directed by the WASH Engineer.</i>	No		1	-
304	Construct reinforced concrete foundation, in accordance with results of geophysical investigation	Ps			-
Sub-Total Page to Treatment Plant Summary					-
BILL COLLECTION SHEET					
Summary Treatment Plant					
Sheet 1					
Total Treatment Plant to Wagini I Summary					-
BILL	Bill 02 Wagini I Summary			AMOUNT (NGN)	
1	Preliminary and General			-	
2	Borehole			-	
3	Treatment Works			-	
TOTAL Bill 02 Wagini I Summary CARRIED FORWARD TO GRAND SUMMARY					-

Tender Package — Request for Bid (RFB)



7.3 Summary

Price Offer Sheet (Summary)				
Item Description	Quantity	Unit of Measure	Unit Price	Total Price
Borehole Drilling Jugol Galdimari Biu	1	Lump Sum		
Construction of Storage Reservoir & Reticulation Jugol Galdimari Biu	1	Lump Sum		
Borehole Drilling Old Prison Kwayakusar	1	Lump Sum		
Borehole Drilling Wagani I Shani	1	Lump Sum		
Construction of Storage Reservoir Old Prison Kwayakusar	1	Lump Sum		
Construction of Storage Reservoir Wagini I Shani	1	Lump Sum		
As Per Attached BOQ				
Total before tax:				
VAT (if applicable)				
Total:				
Company Name:				
Name of Representative:				
Title:				
Signature:				
Date:				
Tender #: NIG/BIU/TEN11				

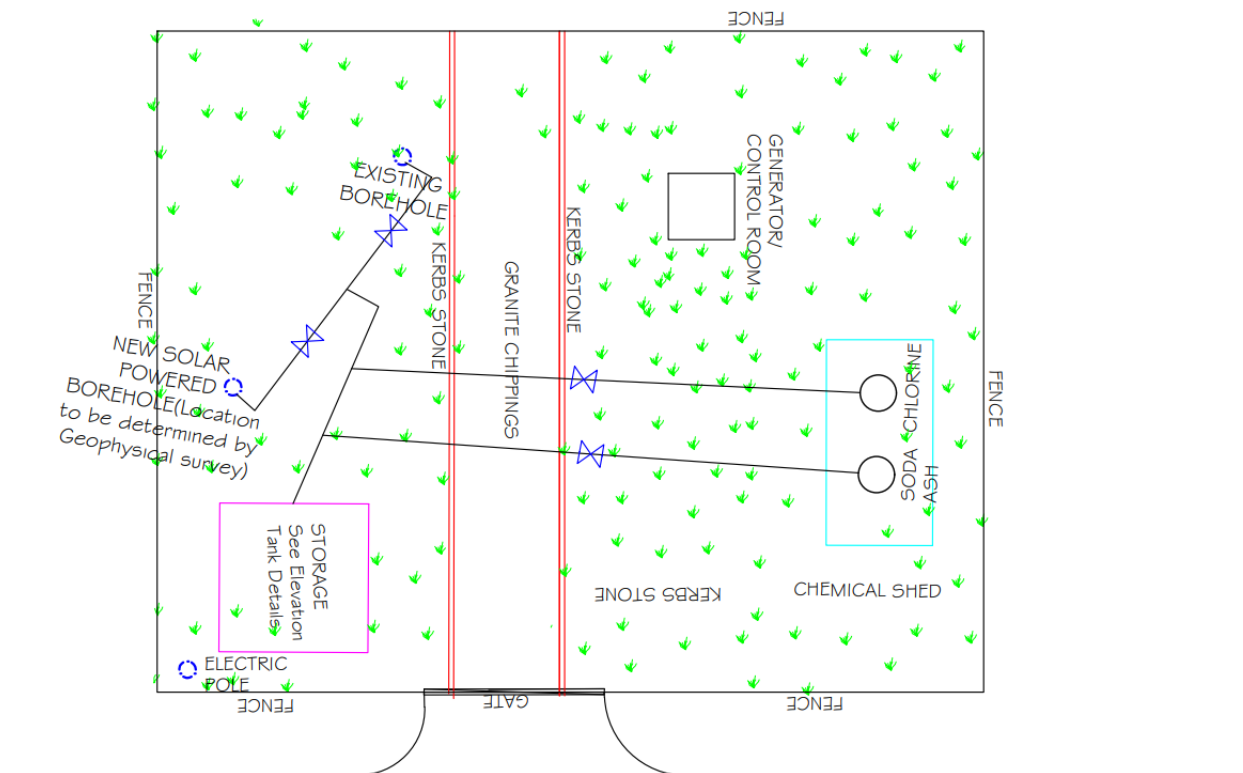


Tender Package — Request for Bid (RFB)



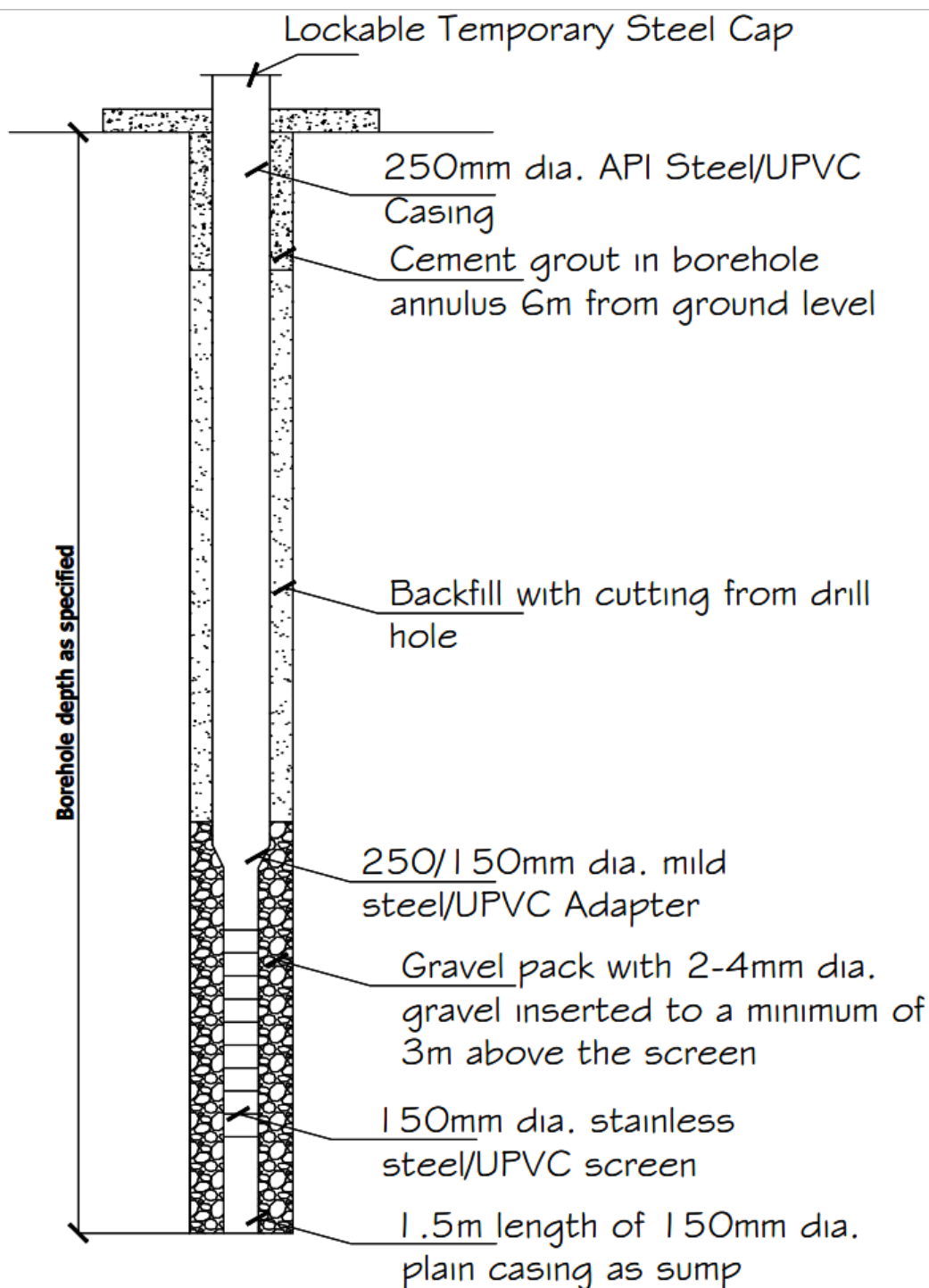
8. Design and Drawings

8.1 Biu – Jugol/Galdimari Water Scheme

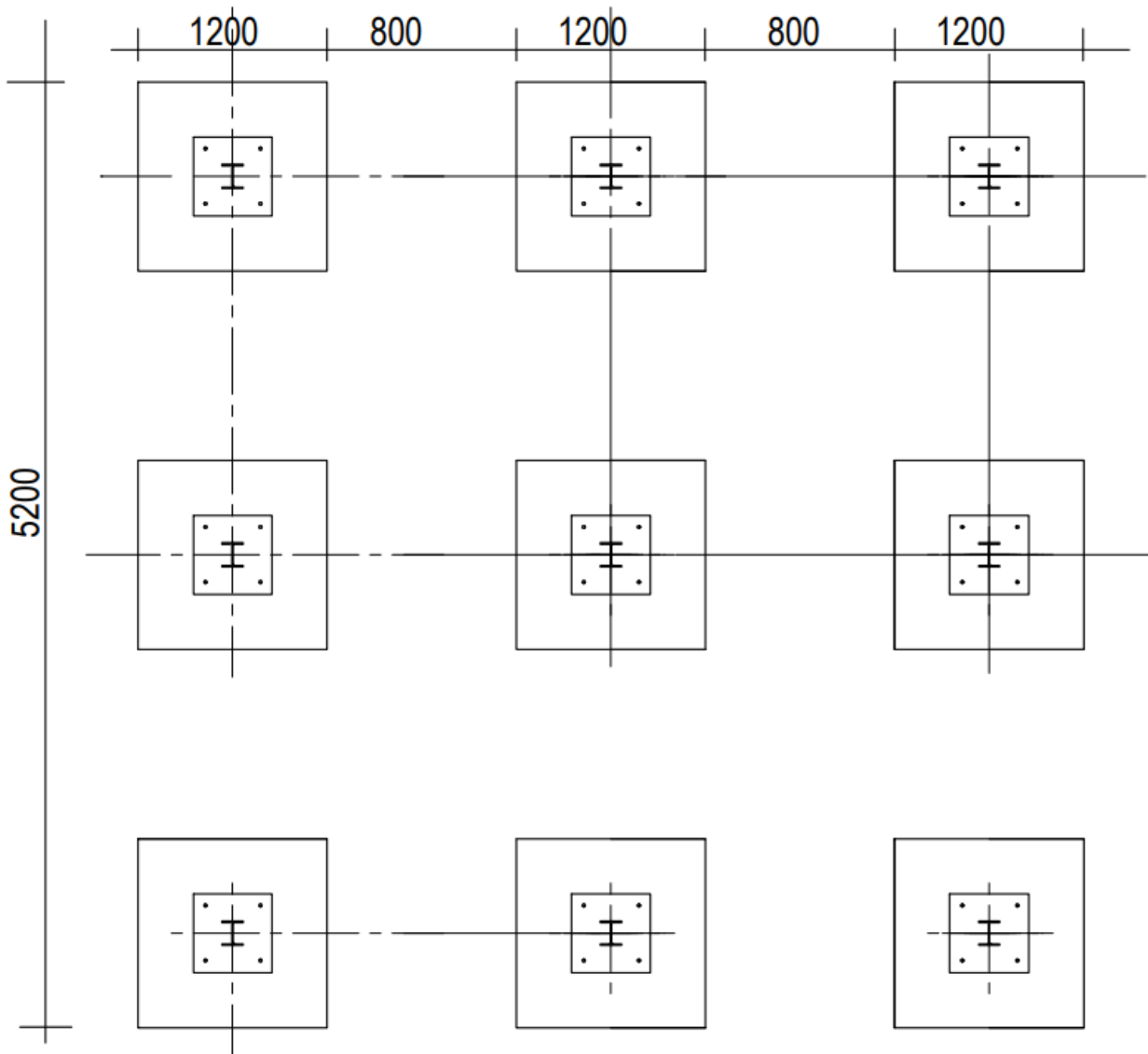


JUGOLGALDIMARI WATER SCHEME

Tender Package — Request for Bid (RFB)



Tender Package — Request for Bid (RFB)

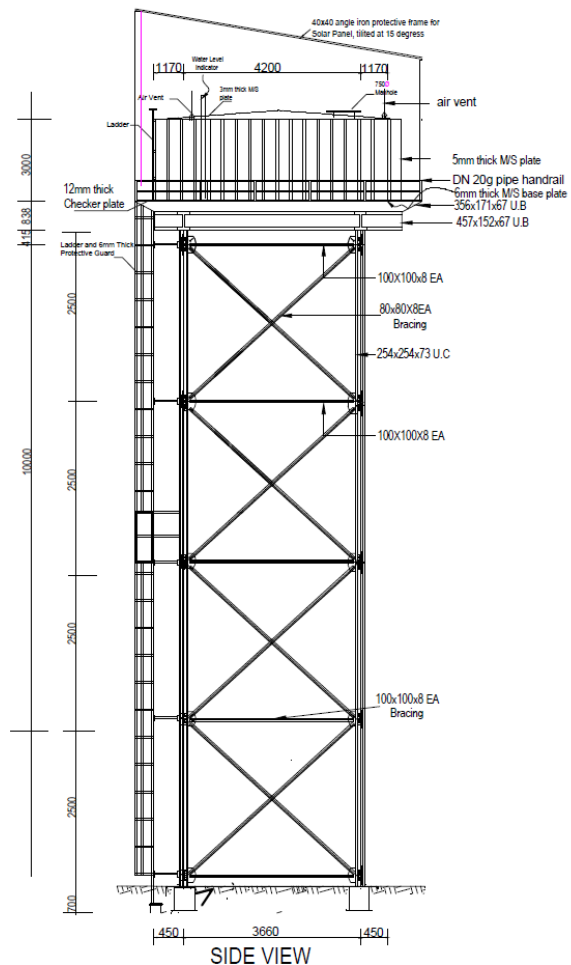
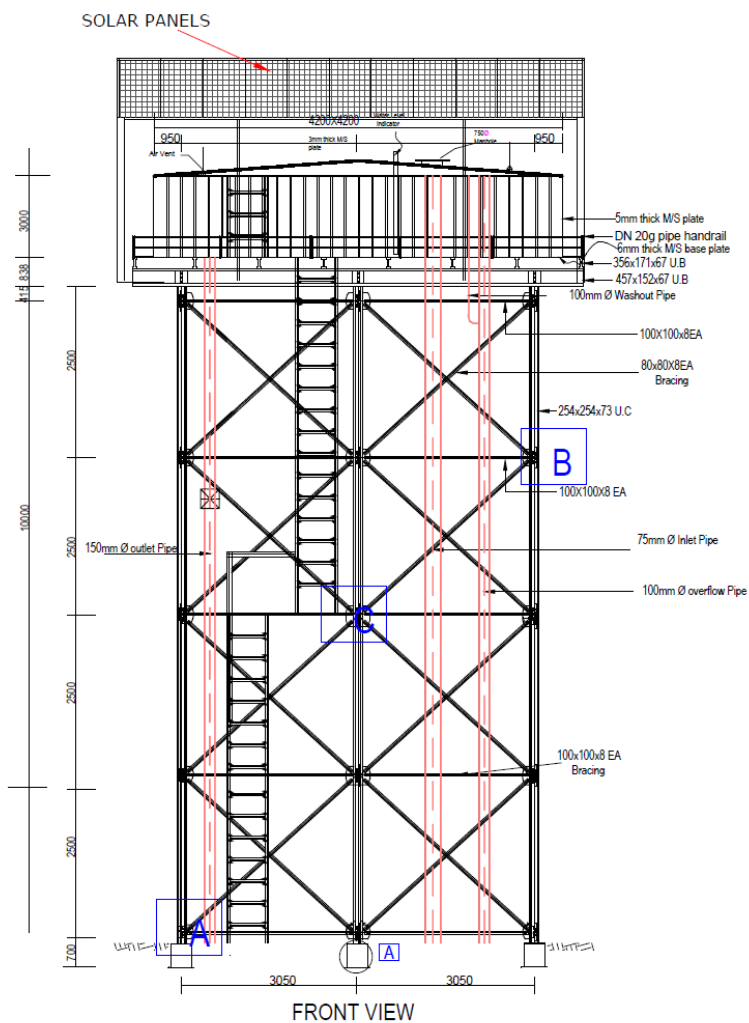


TANK FOOTING PLAN VIEW

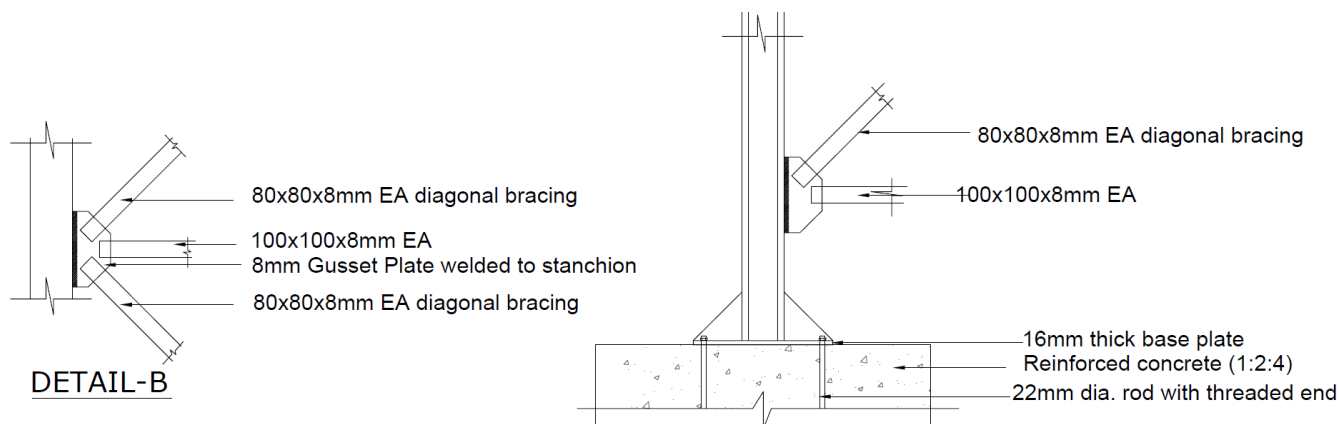
Tender Package — Request for Bid (RFB)



NOTE:
Soil bearing capacity is to be determined by contractor on site for the foundation of tower.

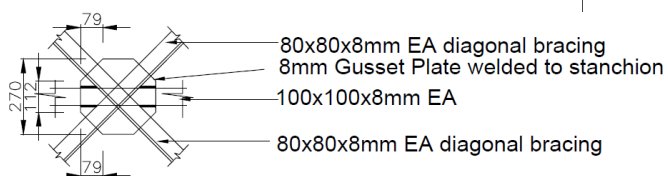


Tender Package — Request for Bid (RFB)

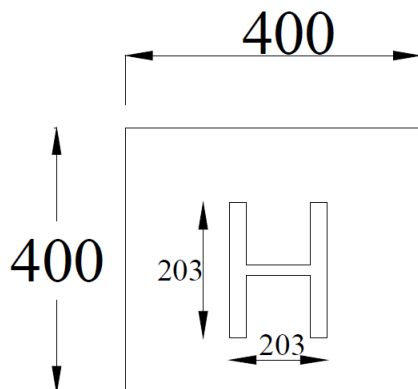
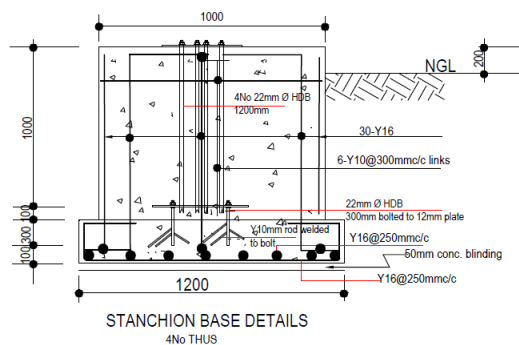
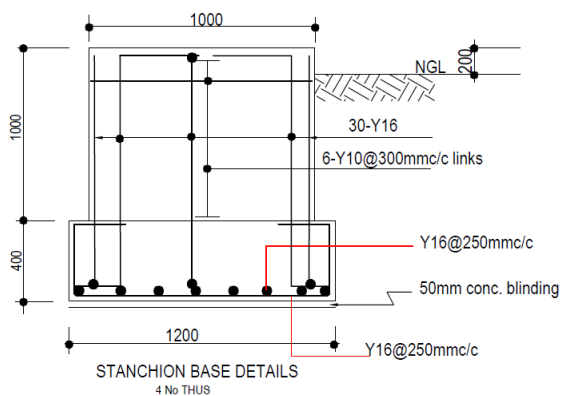


DETAIL-B

DETAIL-A

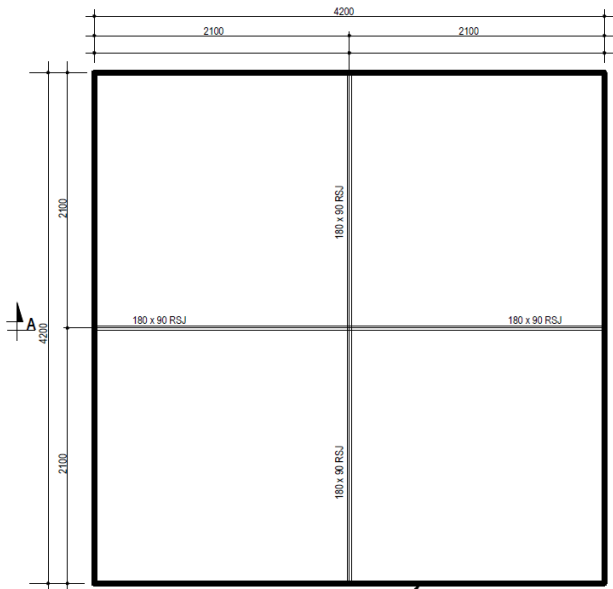


DETAIL-C

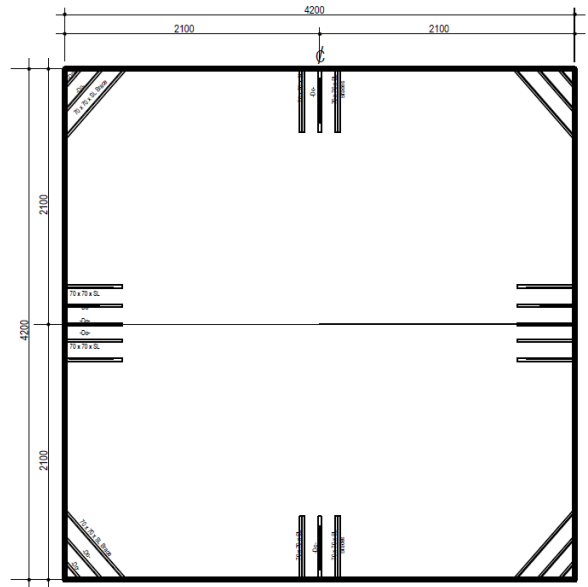


COLUMN BASE PLATE

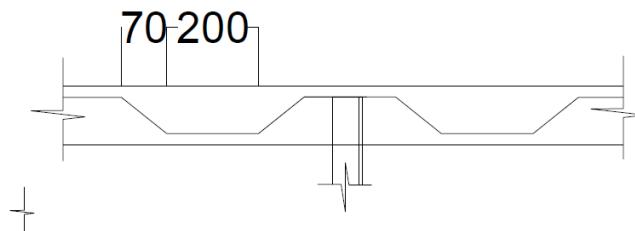
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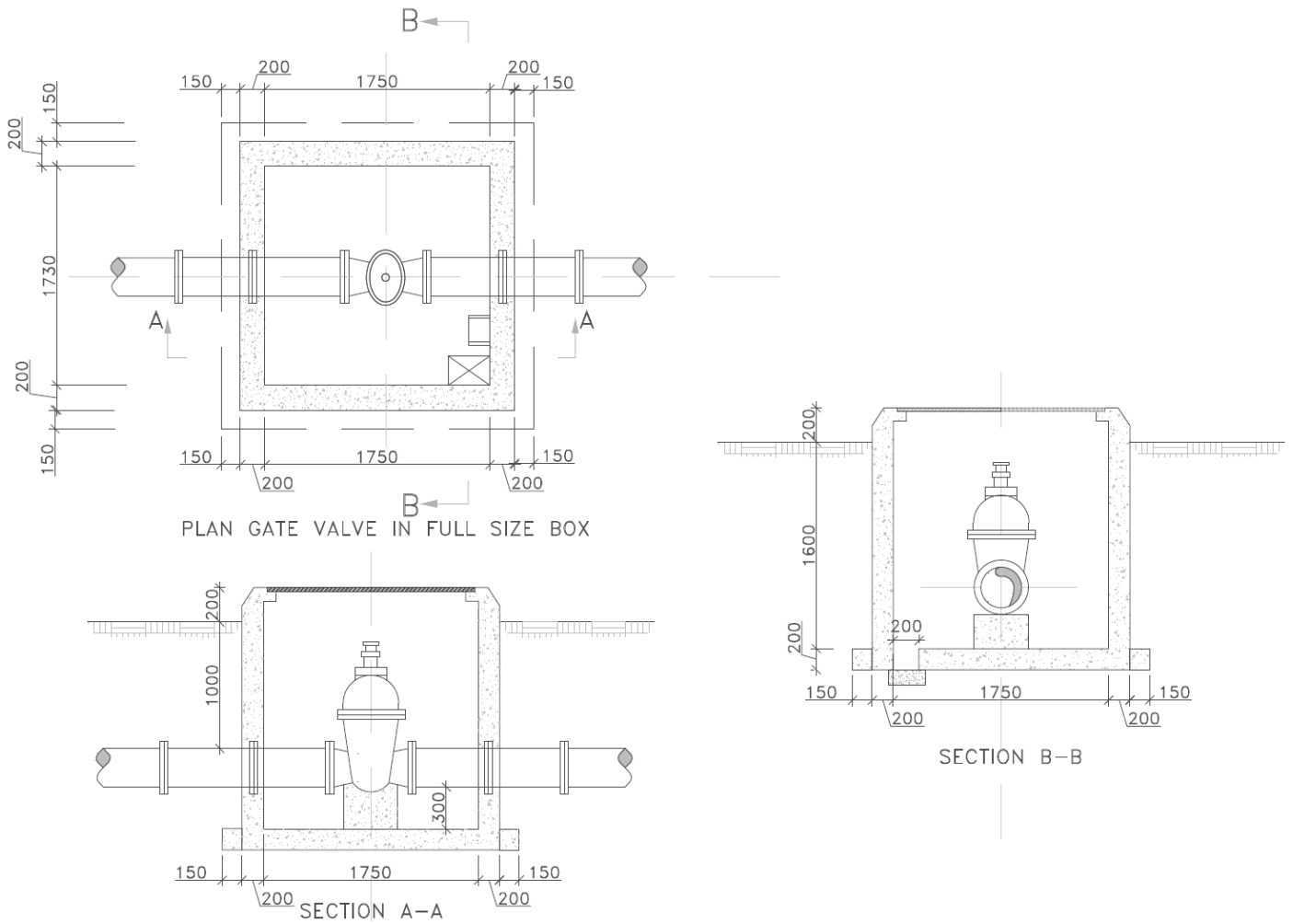
6mm Thick
Base Plate
**PLAN OF WELDED STEEL TANK
SHOWING INTERNAL PARTITIONING**



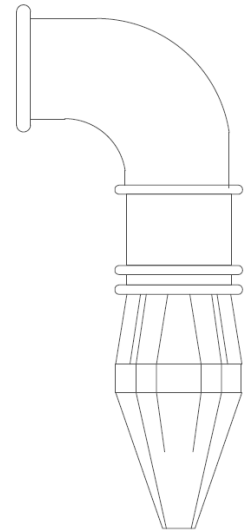
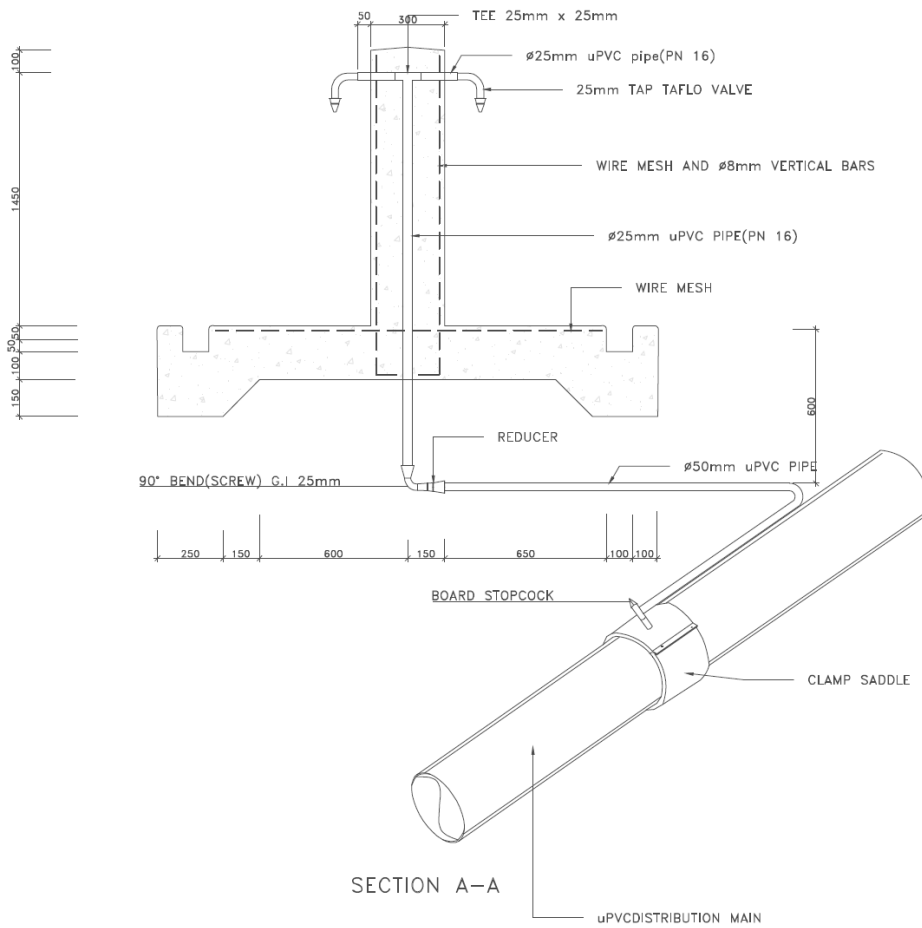
PLAN SHOWING INTERNAL BRACES



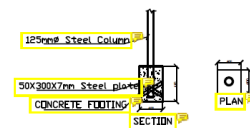
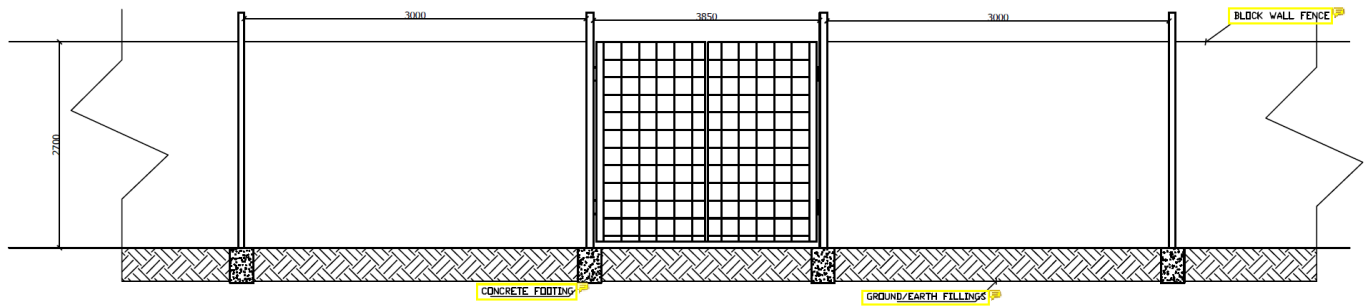
Tender Package — Request for Bid (RFB)



Tender Package — Request for Bid (RFB)

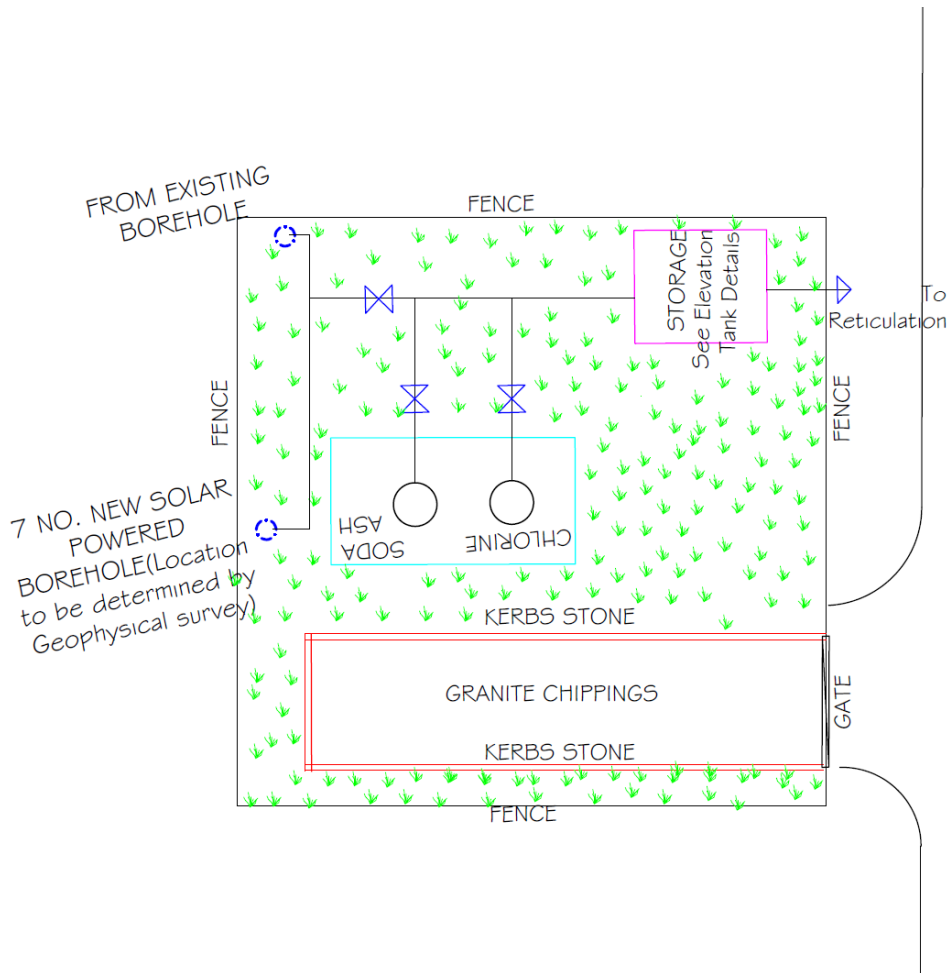


TAFLO TABLOT VALVE



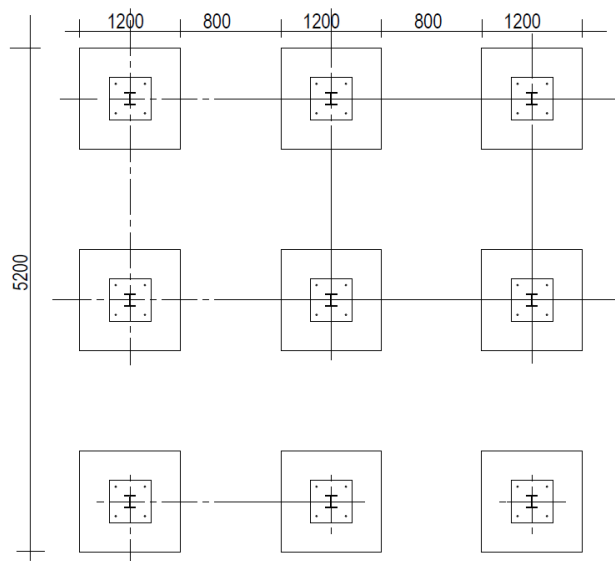
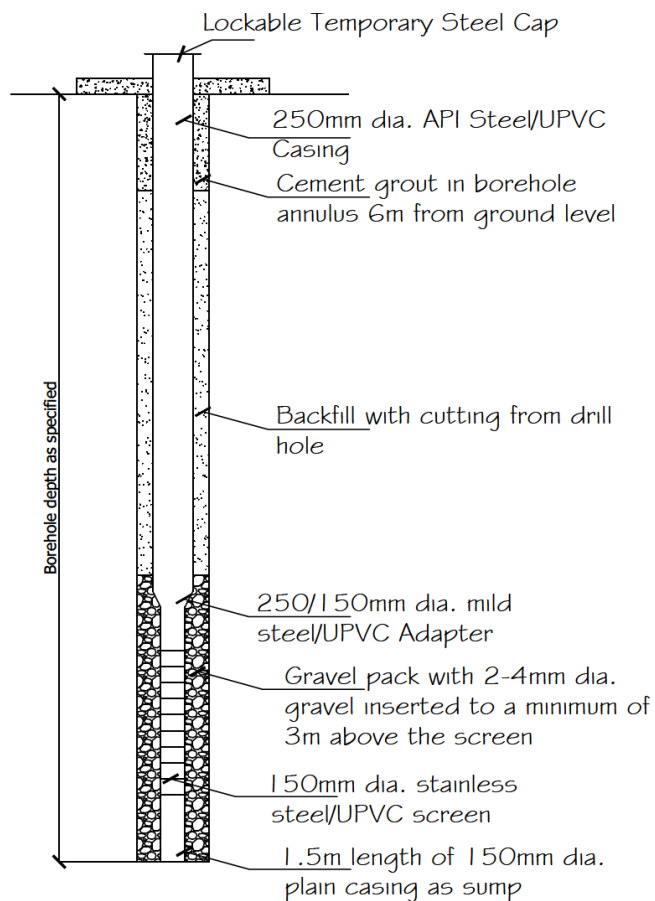
Tender Package — Request for Bid (RFB)

8.2 Kwayakusar – Old Prison



OLD PRISON WATER SCHEME

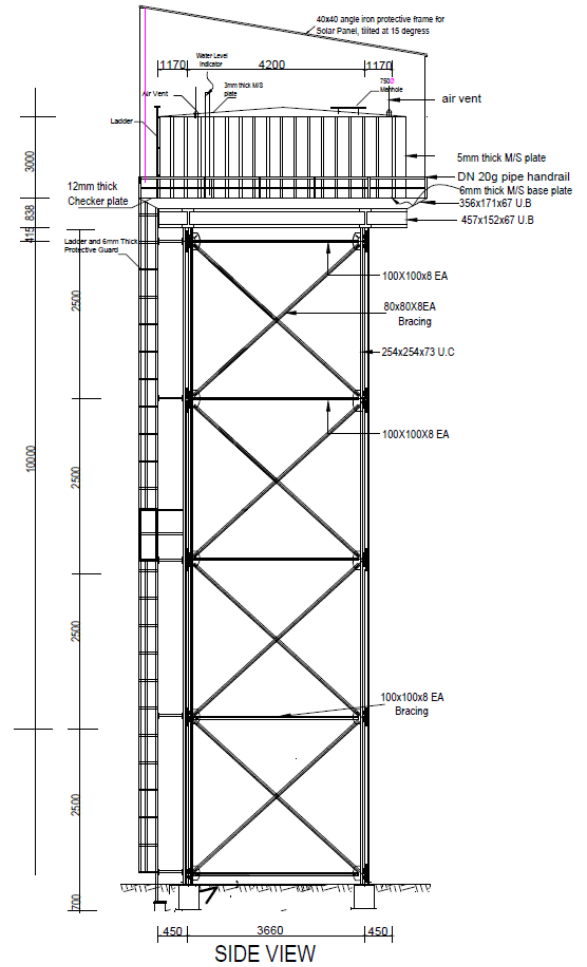
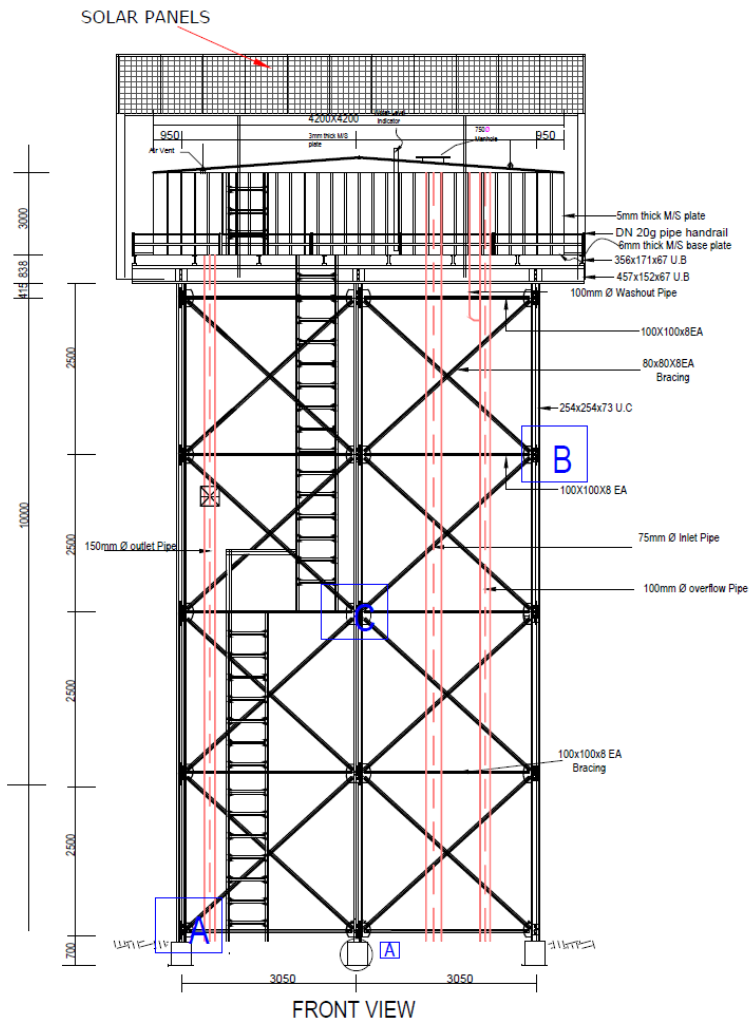
Tender Package — Request for Bid (RFB)



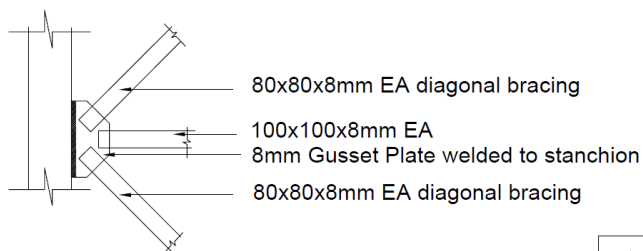
TANK FOOTING PLAN VIEW

Tender Package — Request for Bid (RFB)

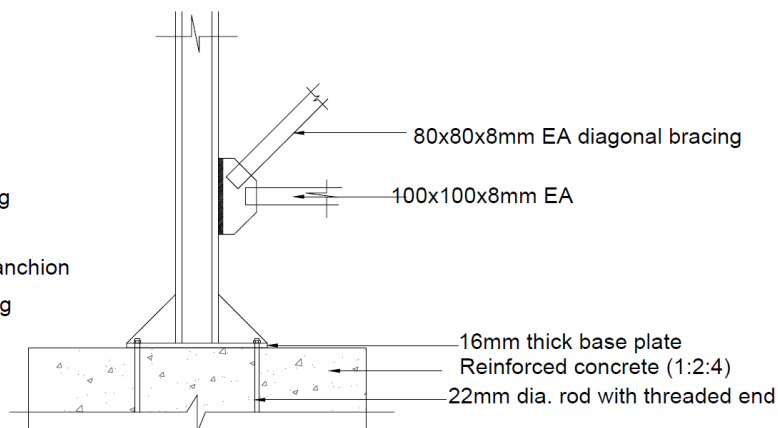
NOTE:
Soil bearing capacity is to be determined by contractor on site for the foundation of tower.



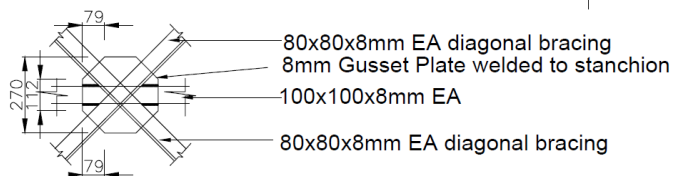
Tender Package — Request for Bid (RFB)



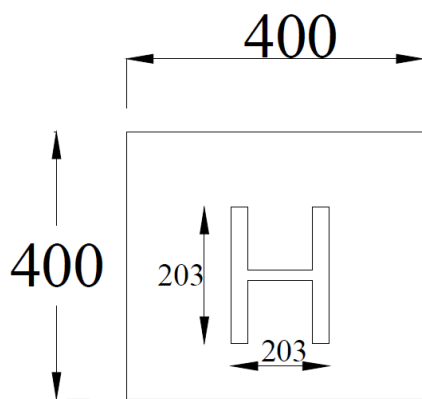
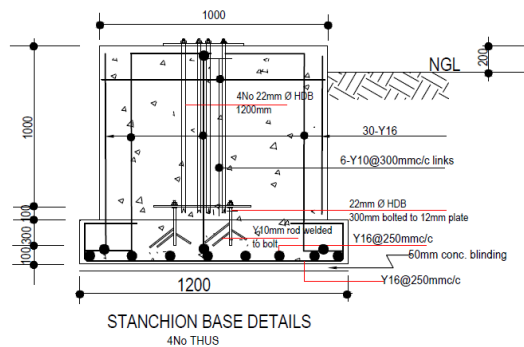
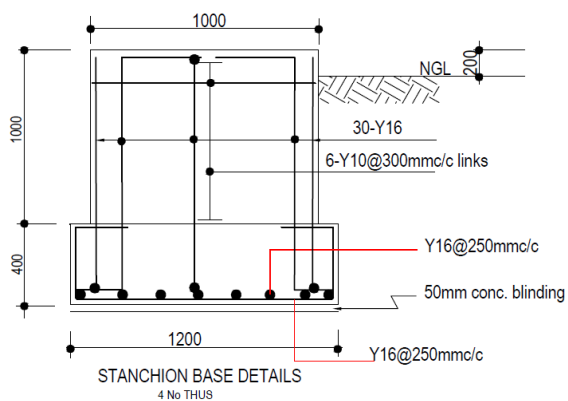
DETAIL-B



DETAIL-A

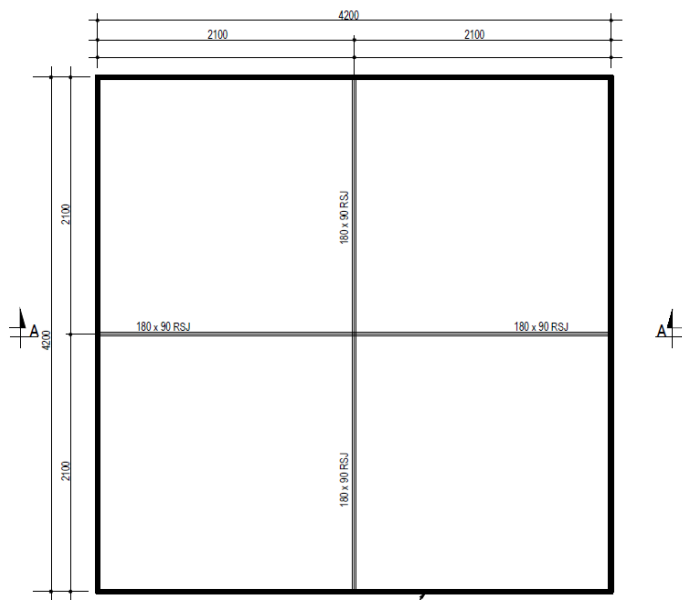


DETAIL-C

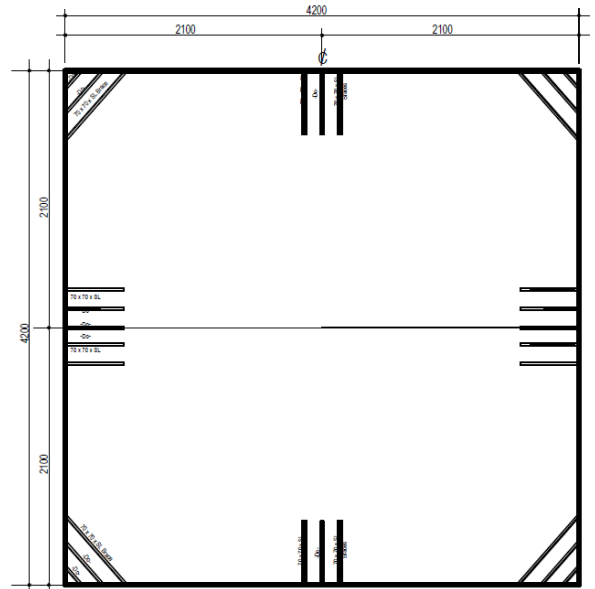


COLUMN BASE PLATE

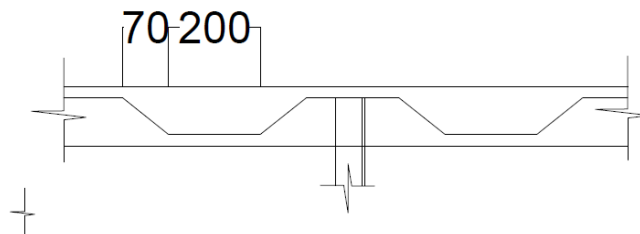
Tender Package — Request for Bid (RFB)



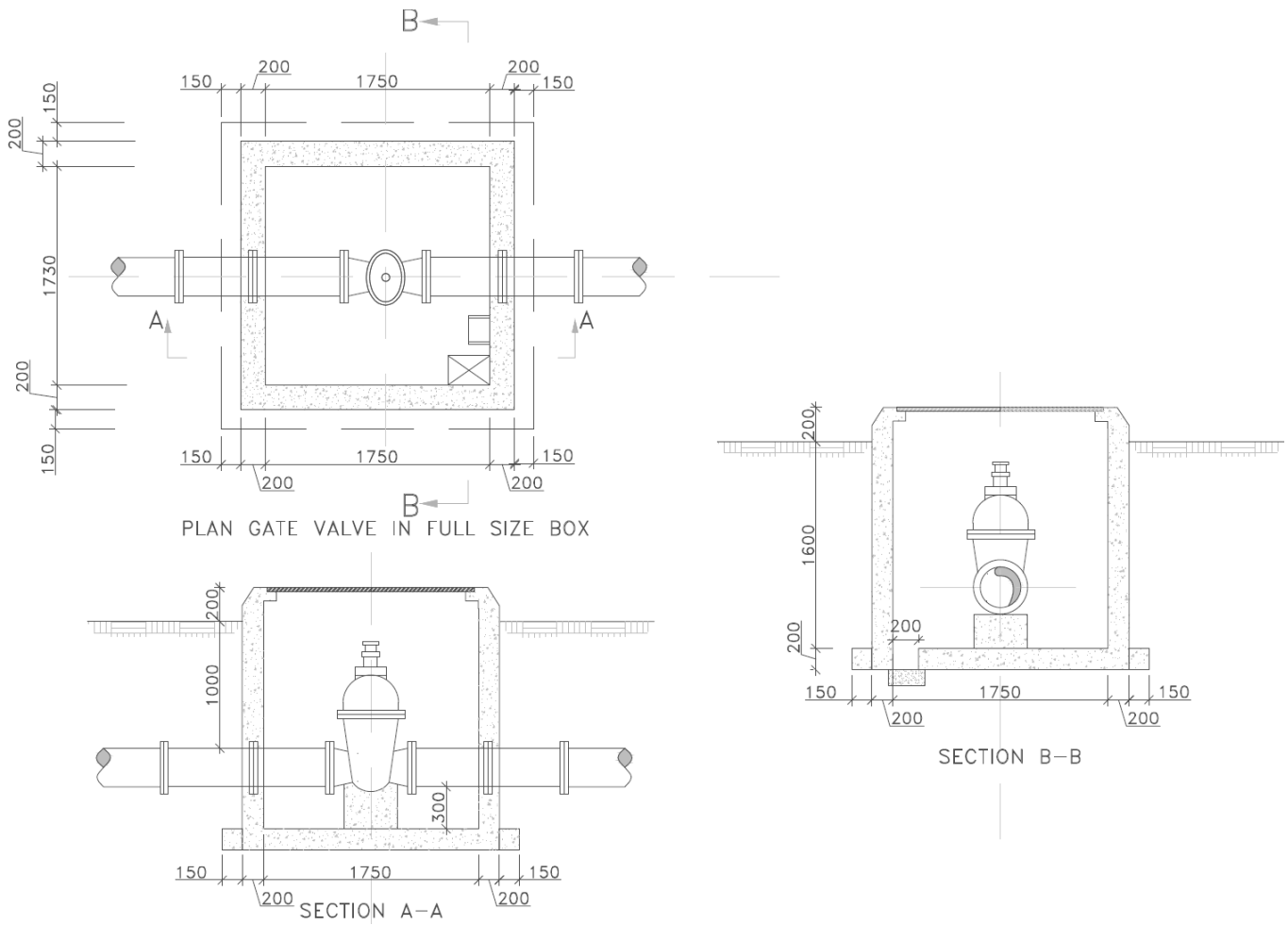
6mm Thick Base Plate
PLAN OF WELDED STEEL TANK
SHOWING INTERNAL PARTITIONING



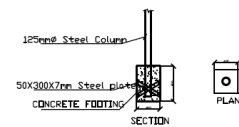
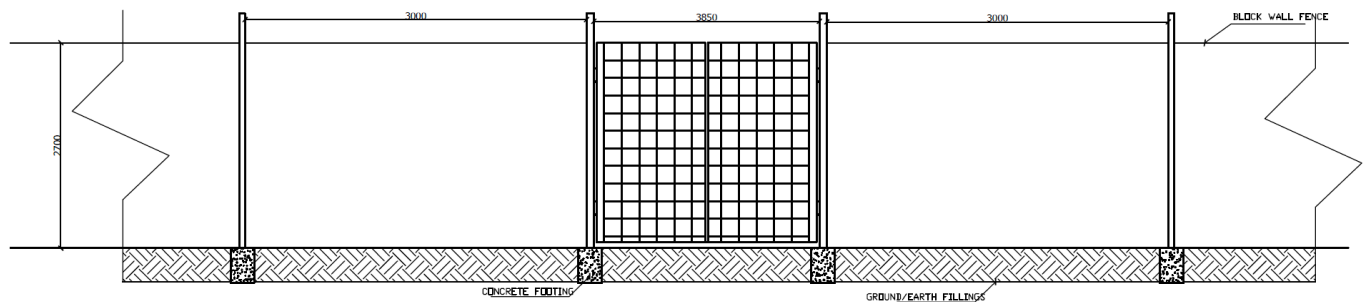
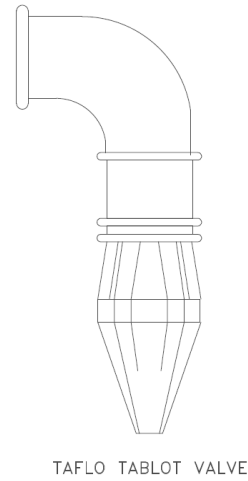
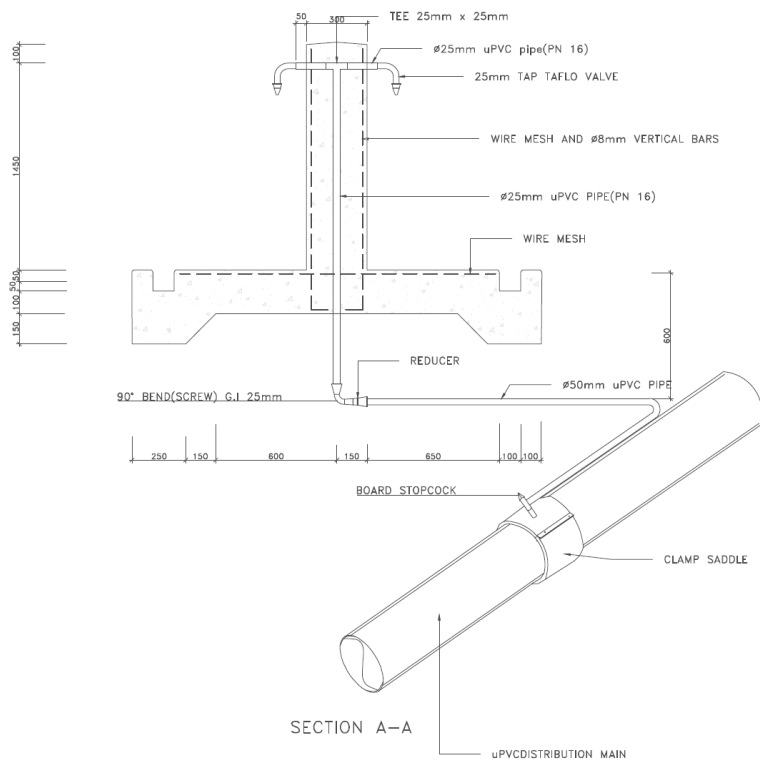
PLAN SHOWING INTERNAL BRACES



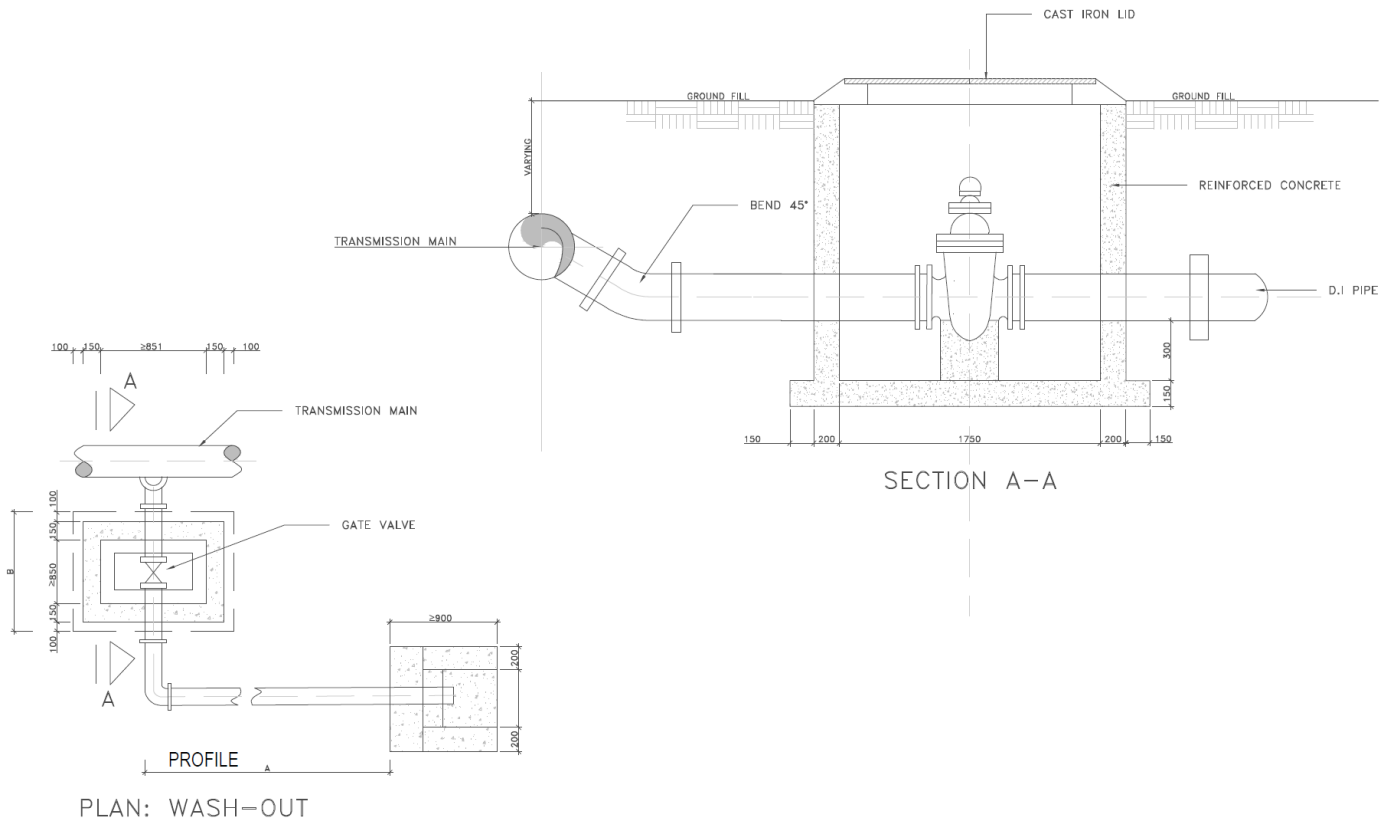
Tender Package — Request for Bid (RFB)



Tender Package — Request for Bid (RFB)



Tender Package — Request for Bid (RFB)



Tender Package — Request for Bid (RFB)

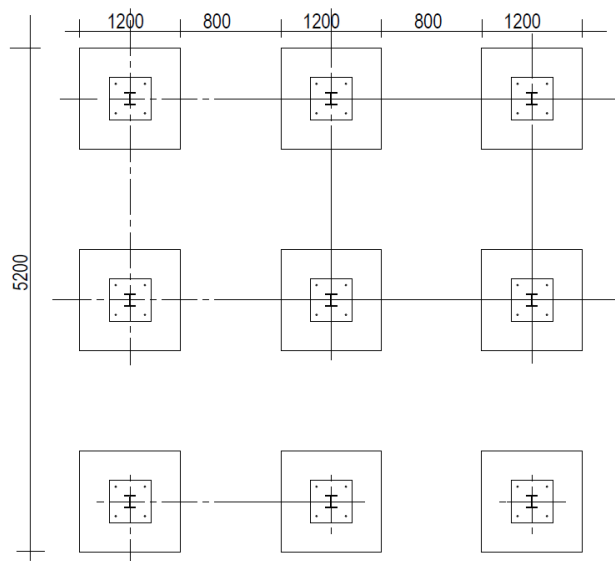
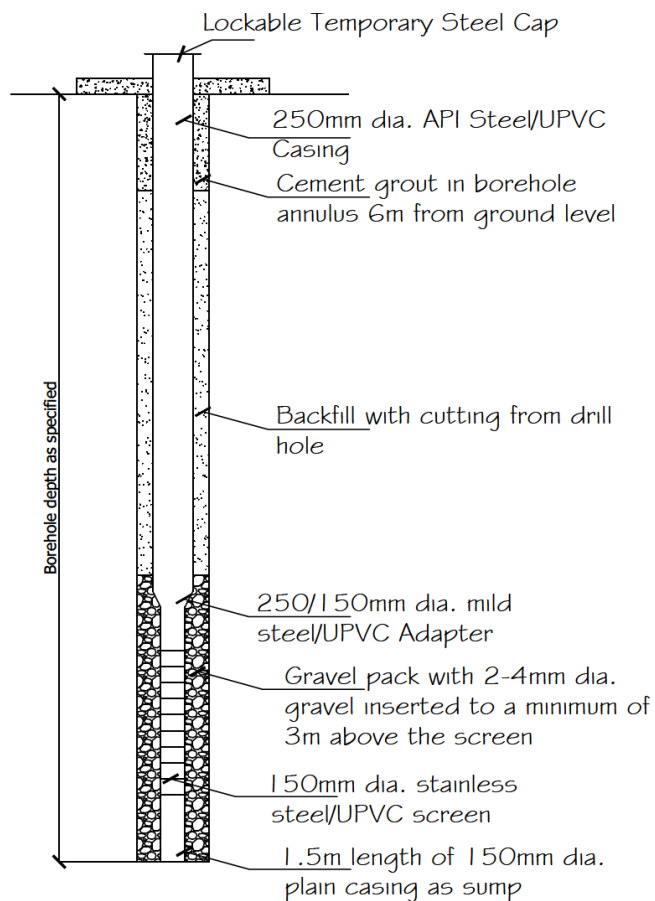


8.6 Shani – Wagani I



WAGINI I WATER SCHEME

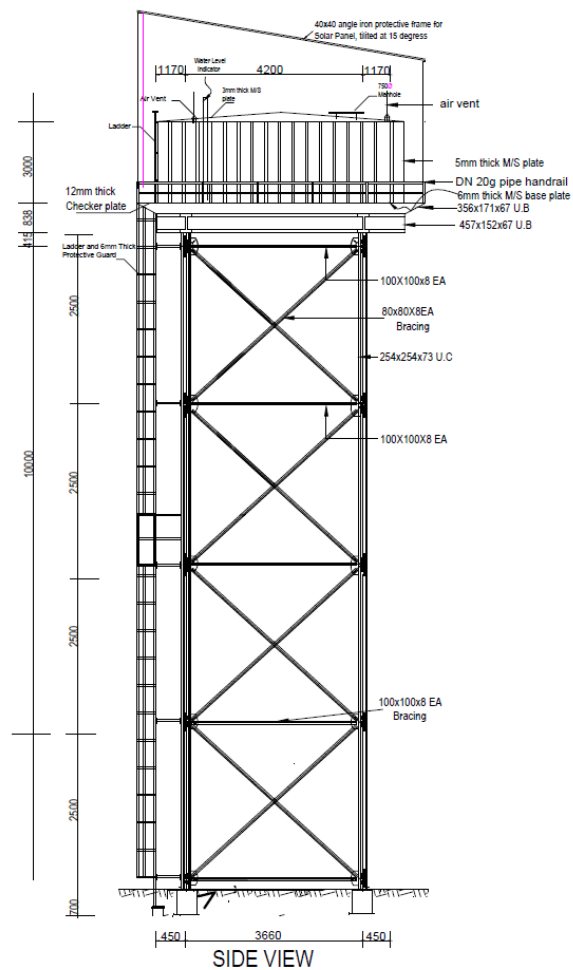
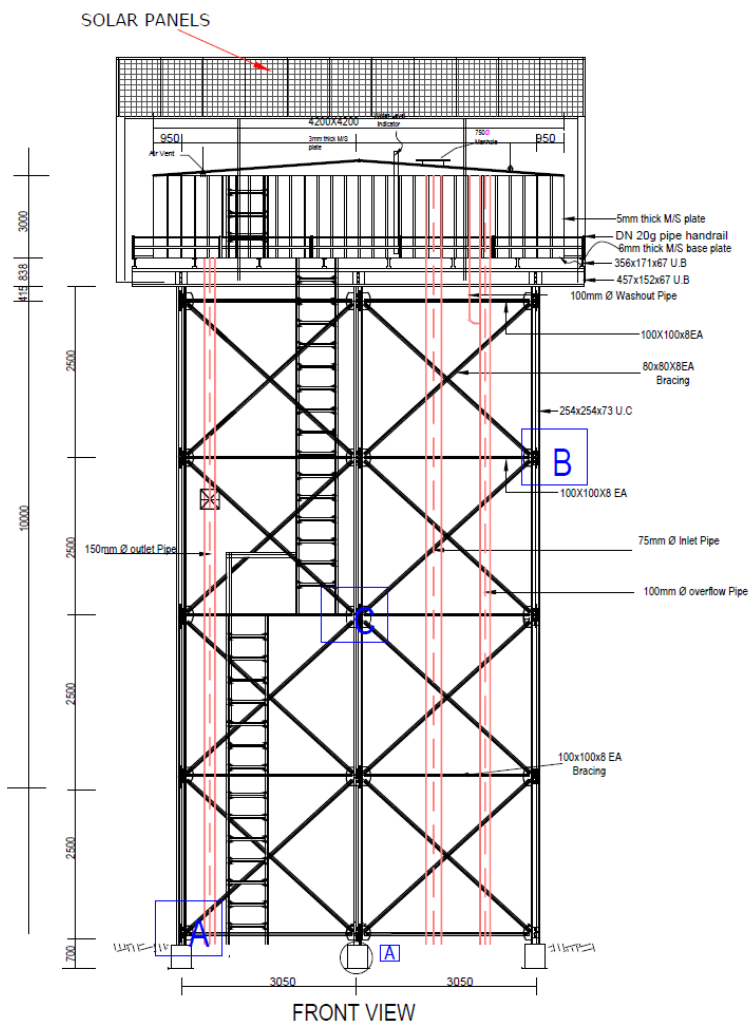
Tender Package — Request for Bid (RFB)



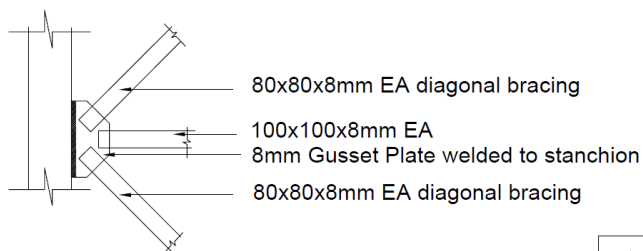
TANK FOOTING PLAN VIEW

Tender Package — Request for Bid (RFB)

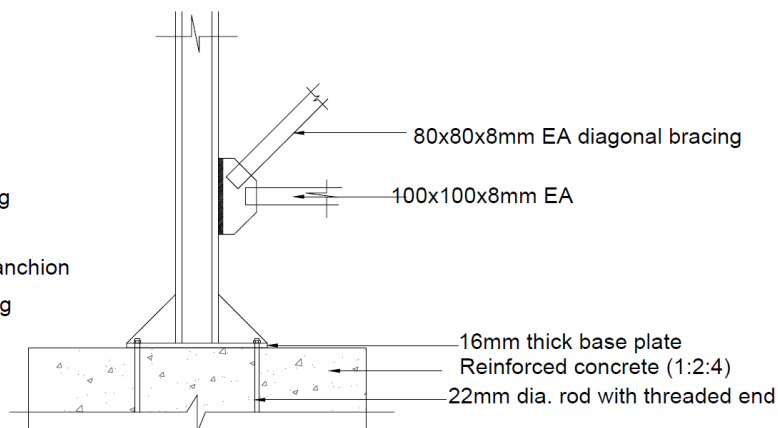
NOTE:
Soil bearing capacity is to be determined by contractor on site for the foundation of tower.



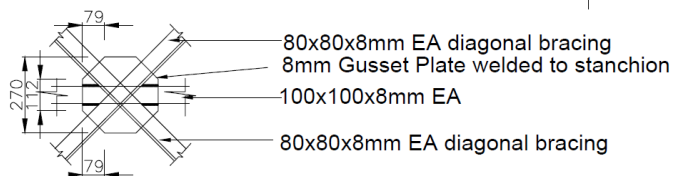
Tender Package — Request for Bid (RFB)



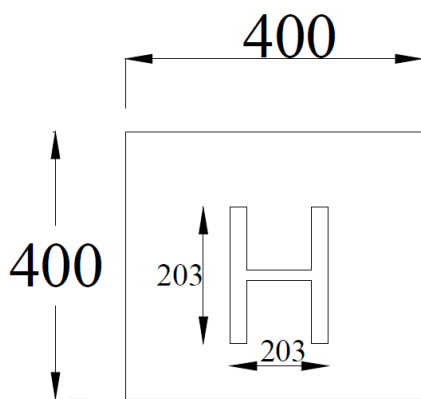
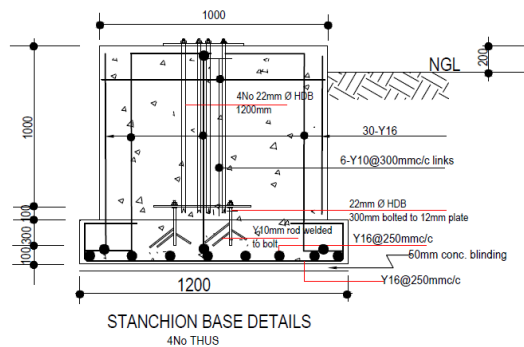
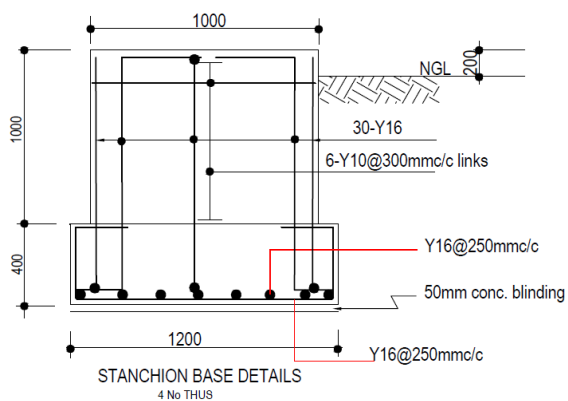
DETAIL-B



DETAIL-A

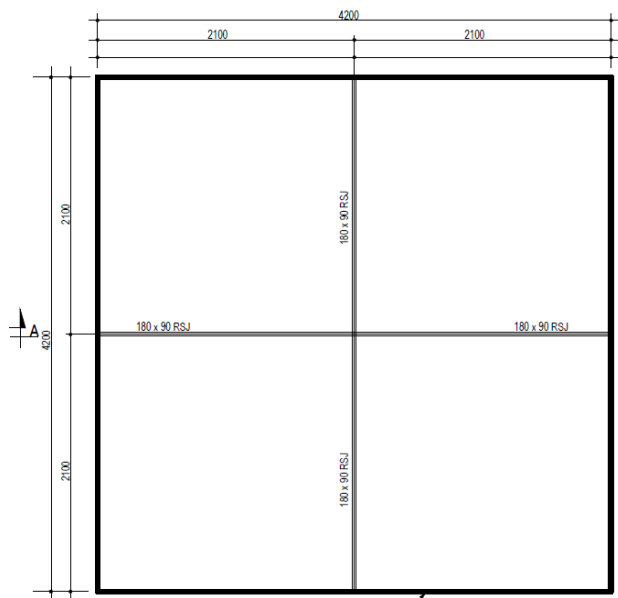


DETAIL-C

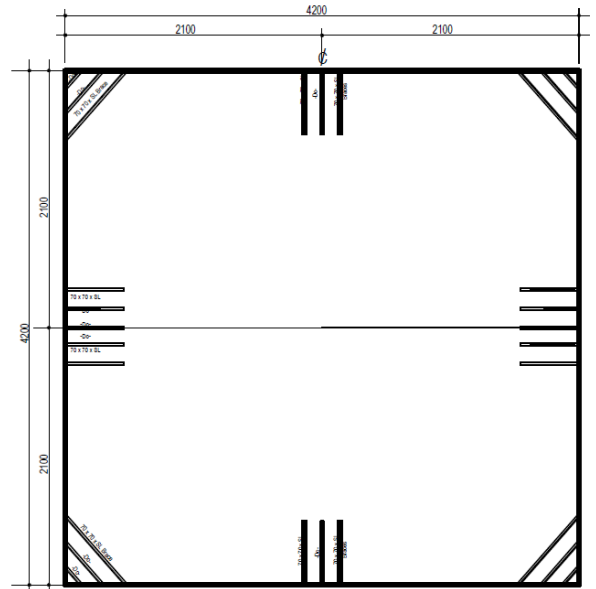


COLUMN BASE PLATE

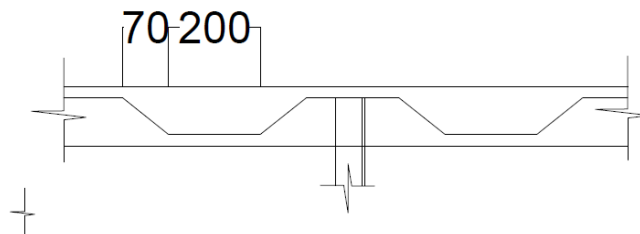
Tender Package — Request for Bid (RFB)



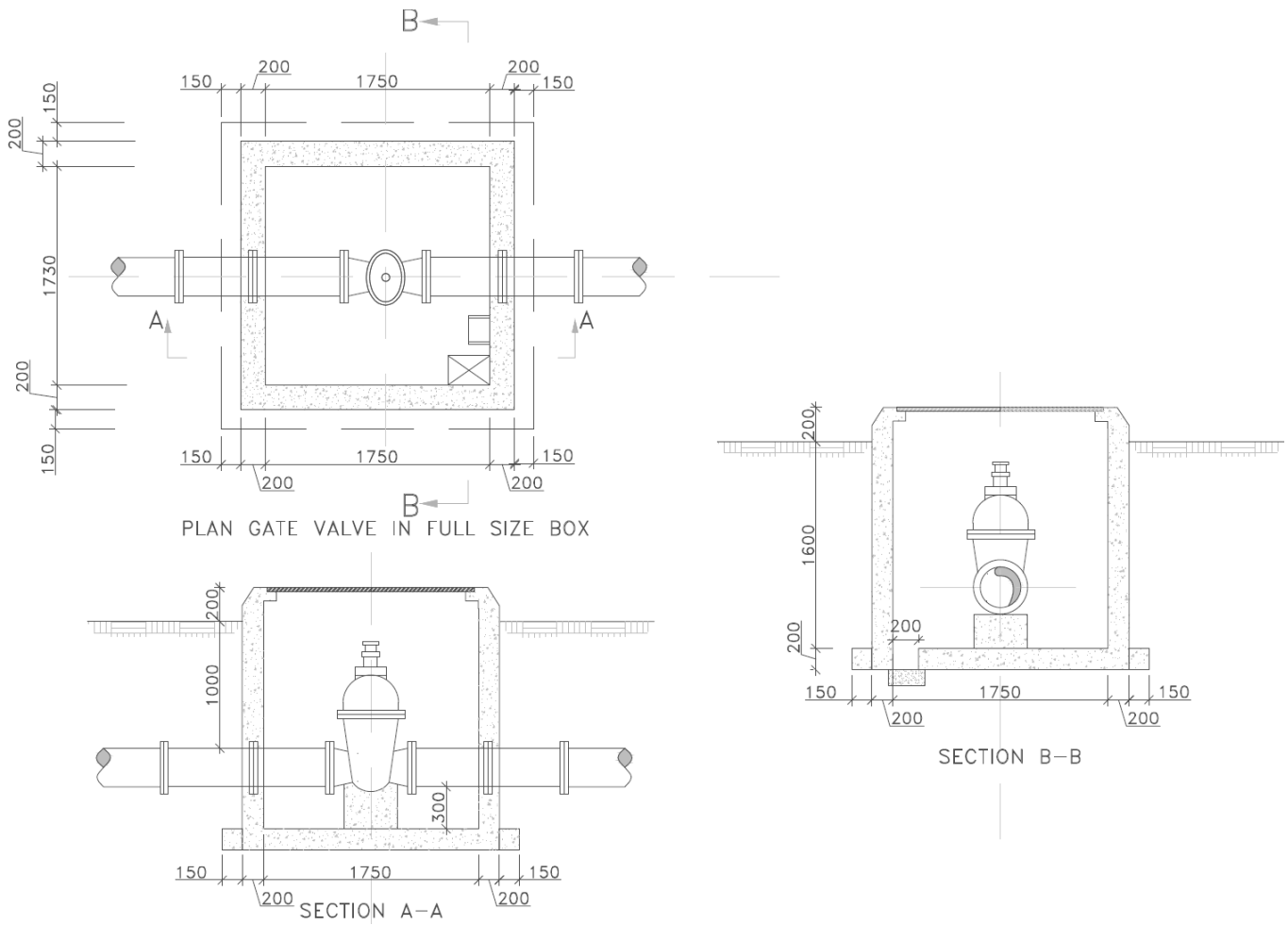
PLAN OF WELDED STEEL TANK
SHOWING INTERNAL PARTITIONING



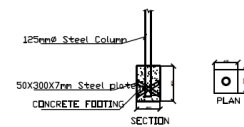
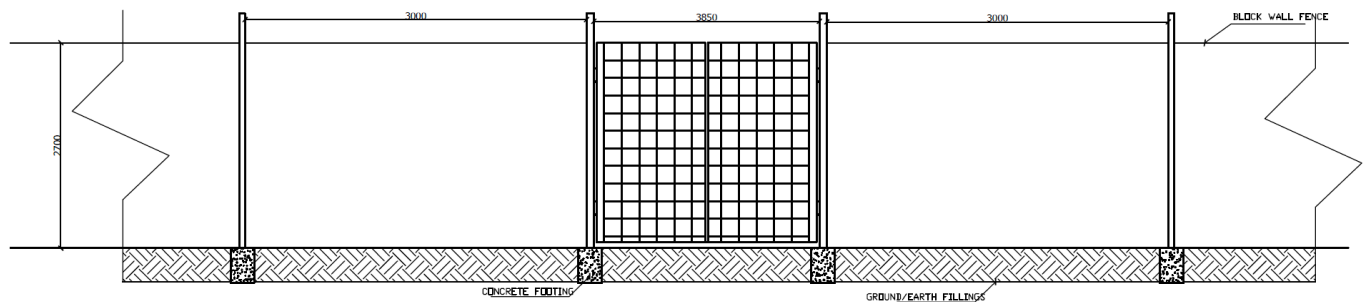
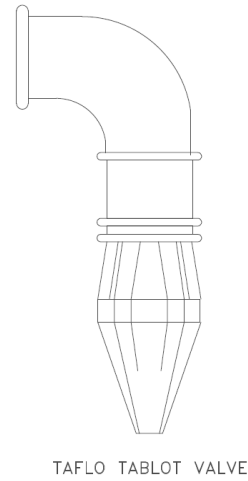
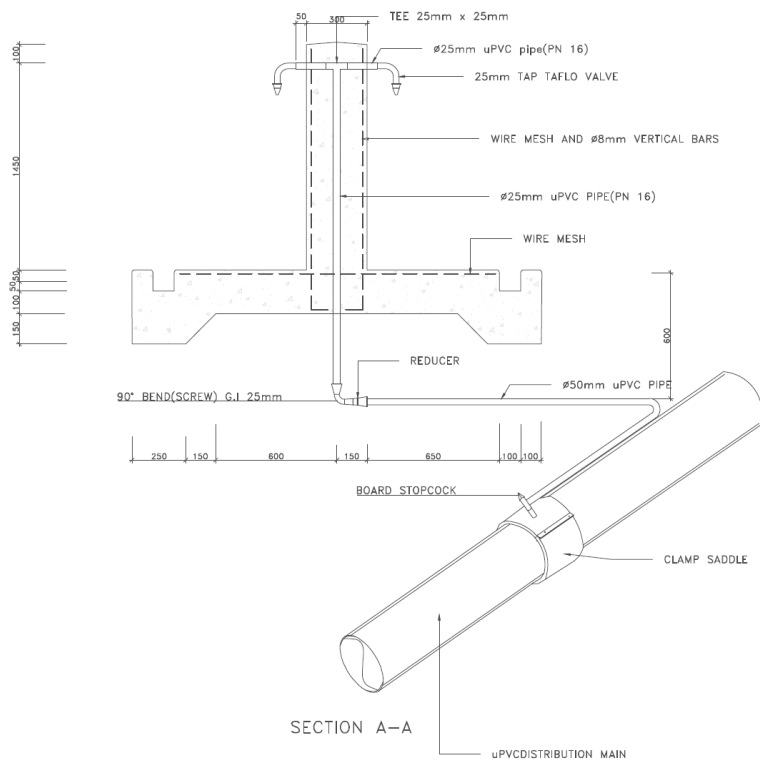
PLAN SHOWING INTERNAL BRACES



Tender Package — Request for Bid (RFB)



Tender Package — Request for Bid (RFB)



Tender Package — Request for Bid (RFB)

