TURKANA COUNTY GOVERNMENT

GERMAN FINANCIAL COOPERATION WITH GOVERNMENT OF THE REPUBLIC OF KENYA

PROJECT

DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA (DRPNK) BMZ No. 201267301

TENDER DOCUMENT

FOR

THE PROPOSED NAPAK DISPENSARY & SCHOOL BOREHOLE AND WATER RETICULATION PROJECT IN NAPAK VILLAGE, TURKWEL SUB-LOCATION, TURKWEL LOCATION, TURKWEL WARD, LOIMA SUB-COUNTY, TURKANA COUNTY, KENYA.

KfW PROCUREMENT NO. 511709

TENDER NO. TCG/MoALDF/AL/DRPNK/W/045/2026 – 2027

Employer: Turkana County Government

TENDER INVITATION DATE:23/11/2026

TENDER OPENING DATE: 7/12/2026

NOVEMBER, 2026

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INVITATION TO TENDER

PROCURING ENTITY: COUNTY GOVERNMENT OF TURKANA

CONTRACT NAME AND DESCRIPTION: NAPAK DISPENSARY & SCHOOL BOREHOLE AND WATER RETICULATION PROJECT

1. The County Government of Turkana has received financing from KfW Development bank towards the cost of Drought Resilience Programme in Northern Kenya and intends to apply part of the proceeds towards payments under the contract for the proposed *Napak Dispensary & School Borehole and Water Reticulation Project.*

2. The County Government of Turkana under the project of Drought Resilience Programme in Northern Kenya BMZ No.201267301 (DRPNK) now invites sealed tenders from eligible contractors registered with **NCA under Category 6 or above** for the construction and commissioning of Water Supply infrastructure for **Napak Dispensary & School Borehole and Water Reticulation Project.**

   The main works to be undertaken under this Contract shall comprise of the following:

   i) Drilling, testing, equipping and solarization 1 No. borehole – approximately 270 - 350 m Deep;

   ii) Design, Fabrication, assemble/erect & testing of the pressed steel tank at least 36 m^3 including a 12 high Steel Tower;

   iii) Construction and commissioning of the following pipelines and associated appurtenance Structures:

      a. Rising Main Pipeline (OD63 — PN 12.5 – 460 m long);

      b. 1 No. Gravity Main Pipeline (OD63 — PN 12.5 – 380 m long);

   iv) Construction of Water Drawing Points

      a. Water Kiosk — Type 1 (1 No);

      b. Water Stand (3 No);

   v) Construction of Animal Water Point (Troughs) – (1 No.)

   vi) Construction of Sanitation block (Latrine) – (2 No.)

   The construction period is **4 months** and a defect's liability period of **6 months.**

   The civil construction works shall be at Napak Dispensary & School Borehole and Water Reticulation Project area in Napak Village, Turkwel Sub-Location, Turkwel Location, Turkwel Ward, Loima Sub-County, Turkana County, Kenya. The project area lies approximately between latitudes 2.91° to 2.92° and longitudes 35.43° to 35.45°. The area is accessible through the Lodwar – Napak Earth Road. It is approximately 35 Km South-West of Lodwar Town.

3. Tendering will be conducted under an open National method using a standardized tender document. Tendering will be open to all qualified and interested Tenderers. Bidding will be conducted by means of the National Competitive Bidding procedure with qualification and the Selection method 'Lowest evaluated bid'. A firm will be selected in accordance with the procedures described in Public Procurement and Asset Disposal Act 2015, The Public Procurement and Disposal Regulations 2006 and KfW Guidelines for the Procurement of Consulting Services, Works, Goods, Plant and Non-Consulting

Services in Financial Cooperation with Partner Countries, which can be found on the website[1].

4. Qualified and interested tenderers may obtain further information and inspect the Tender Documents during office hours *0900 to 1700 hours* at the address given below. More details on the Services are provided in **PART 2 — Procuring Entity's Requirements,** Section V – Activity Schedule and Scope of Works/ Services of the Tender Document.

5. A complete set of tender documents may be purchased or obtained by interested tenderers upon payment of a **non-refundable fees of Kshs. 1,000** in cash or Banker's Cheque and payable to the address given below. Tender documents may be obtained electronically from the Website www.turkana.go.ke or www.tenders.go.ke. Tender documents obtained electronically will be **free of charge**.

6. Tender documents may be viewed and downloaded for free from the website www.turkana.go.ke or www.tenders.go.ke

7. Tenderers who may wish to seek for further clarifications or addendum regarding the tender document must submit to supplychainoffice@turkana.go.ke and copy: Leone.Comin@gopa.eu , Kibet.Chepkwony@gopa.eu , info.drpnk@turkana.go.ke , procurement.drpnk@turkana.go.ke

8. The Tenderer **shall** sequentially serialize all pages of the tender documents submitted in the format of 1 of x, 2 of x,… x of x. from the cover page to the last page including all attachments.

9. Tenderers shall submit tenders in **one original** and **two copies** in an enclosed **one envelope**.

Completed tenders must be delivered to the address below on or before *07Th December, 2026 at 1000 hours EAT,* coinciding with 14 days **(inclusive of weekends** and **exclusive of public holidays)** after tender publication. Electronic Tenders will not be permitted.

10. Tenders will be opened **immediately** after the deadline date and time specified above or any deadline date and time specified later. Tenders will be **publicly opened** in the presence of the Tenderers' designated representatives who choose to attend at the address below.

11. **Late, incomplete tenders, tenders not received, tenders not opened at tender opening ceremony** shall not be accepted for evaluation irrespective of the circumstance.

12. All Bids **shall** be accompanied by a Bid Security of Kshs. 400,000.

13. The addresses referred to above are:

A. <u>Address for obtaining further information regarding tender documents</u>

1) Name of Procuring Entity: Turkana County Government

2) Physical address for hand Courier Delivery to an office or Tender Box: Supply

[1] https://www.kfw-entwicklungsbank.de/International-financing/KfW-Development-Bank/Publications-Videos/Publication-series/Guidelines-and-contracts/.

Chain Management Services

3) Postal Address: 11 – 30500, Lodwar

4) Director Supply Chain Management Services, supplychainoffice@turkana.go.ke

B. Address for Submission of Tenders.

1) Name of Procuring Entity: Turkana County Government

2) Postal Address: 11-30500, Lodwar

3) Physical address for hand Courier Delivery to an office or Tender Box: Supply Chain Office, Reception

C. Address for Opening of Tenders.

1) Name of Procuring Entity: Turkana County Government

2) Physical address for the location: Supply Chain Offices, Board room

Mr. Samson Nakito

Director

Supply Chain Management Services

Turkana County Government

Signature:_____

Date_____

PART 1 – BIDDING PROCEDURES

Section I. Instructions to Bidders

A. General

1. Scope of Bid

1.1 In connection with the Invitation for Bids specified in the Bid Data Sheet (**BDS**), the Employer, as specified in the **BDS**, issues these Bidding Documents ("Bidding Documents") to Bidders ("Bidders") interested in submitting bids ("Bids") for the Works described in Section VII, Works Requirements. In case the Works are to be bid as individual contracts (i.e. the slice and package procedure), these are listed in the **BDS**. The National Competitive Bidding ("NCB") number corresponding to this bidding process is also provided in the **BDS.**

1.2 The successful Bidder shall be expected to complete the Works by the Intended Completion Date specified in the BDS and in the Appendix to Bid.

1.3 Throughout these Bidding Documents:

(a) The term "in writing" means communicated in written form and delivered against receipt;

(b) Except where the context requires otherwise, words indicating the singular also include the plural and words indicating the plural also include the singular; and

€ "Day" means calendar day.

2. Source of Funds

2.1 The Employer as indicated in the BDS has applied for or received financing (hereinafter called "funds") from KfW Development Bank (hereinafter called "KfW") towards the cost of the project named in the BDS. The Employer intends to apply a portion of the funds to eligible payments under the contract(s) resulting from this bidding process.

3. Corrupt and Fraudulent Practices

3.1 KfW requires compliance with its policy in regard to corrupt and fraudulent practices as set forth in Section VI.

3.2 In further pursuance of this policy, Bidders shall permit and shall cause its agents to provide information and permit KfW or an agent appointed by KfW to inspect on site all accounts, records and other documents relating to bid submission and contract performance (in the case of award), and to have them audited by auditors or agents appointed by KfW.

4. Eligible Bidders

4.1 This Bidding is open to all bidders from eligible countries as defined in KfW's eligibility criteria to bid in Section V, Eligibility Criteria.

4.2 The materials, equipment and services to be supplied under the Contract and financed by the KfW may have their origin in any country subject to the restrictions specified in Section V, Eligibility Criteria, and all expenditures under the Contract will not contravene such restrictions. At the Employer's request, Bidders may be required to provide evidence of the origin of materials, equipment and services.

4.3 Government owned enterprises in the Borrower's country may participate only if they can establish that they (i) are legally and financially autonomous; and (ii) operate under commercial law. No dependent agency of the Borrower or the Sub-borrower under a Bank financed project shall be permitted to bid or submit a proposal for the procurement of goods or works under the project.

4.4 A Bidder shall not have a conflict of interest. Any Bidder found to have a conflict of interest shall be disqualified. A Bidder may be considered to have a conflict of interest for the purpose of this procurement process, if the Bidder:

(a) Directly or indirectly controls, is controlled by or is under common control with another Bidder; or

(b) Receives or has received any direct or indirect subsidy from another Bidder; or

€ Has the same legal representative as another Bidder; or

(d) Has a relationship with another Bidder, directly or through common third parties, that puts it in a position to influence the bid of another Bidder, or influence the decisions of the Employer regarding this bidding process; or

€ Participates in more than one bid in this bidding process, both as an individual firm and as a JV member. Participation by a Bidder in more than one Bid will result in the disqualification of all Bids in which such Bidder is involved. However, this does not limit the inclusion of the same subcontractor in more than one Bid; or

(f) Any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the works that are the subject of the Bid; or

(g) Any of its affiliates has been hired (or is proposed to be hired) by the Employer as Engineer for the Contract implementation; or

(h) Has a close business or family relationship with a professional staff of the Employer (or of the project implementing agency, or of a recipient of a part of the funds) who: (i) are directly or indirectly involved in the preparation of the bidding documents or specifications of the contract, and/or the bid evaluation process of such contract; or (ii) would be involved in the implementation or supervision of such contract unless the

conflict stemming from such relationship has been resolved in a manner acceptable to the KfW throughout the procurement process and execution of the contract.

4.5 A Bidder shall not be under suspension from bidding by the Employer as the result of the execution of a Bid–Securing Declaration.

4.6 This bidding is open only to eligible Bidders, who will be subject to qualification.

4.7 A Bidder shall provide such evidence of eligibility satisfactory to the Employer, as specified in ITB 17.1 or as the Employer shall reasonably request.

4.8 Partners in a joint venture shall be jointly and severally liable for the execution of the Contract.

5. Qualifications of the Bidder

5.1 All bidders shall provide in Section IV, Bidding and Qualification Forms, a preliminary description of the proposed work method and schedule, including drawings and charts, as necessary.

5.2 To qualify for award of the Contract, bidders shall meet the minimum qualifying criteria specified in the Bid Data Sheet and/or in Section III, Evaluation and Qualification Criteria.

B. Contents of Bidding Documents

6. Sections of Bidding Documents

6.1 The Bidding Documents consist of Parts 1, 2, and 3, which include all the Sections specified below, and which should be read in conjunction with any Addenda issued in accordance with ITB 8.

PART 1 Bidding Procedures

(a) Section I. Instructions to Bidders (ITB);

(b) Section II. Bid Data Sheet (**BDS**);

(c) Section III. Evaluation and Qualification Criteria;

(d) Section IV. Bidding and Qualification Forms;

(e) Section V. Eligibility Criteria;

(f) Section VI. KfW Policy — Corrupt and Fraudulent Practices — Social and Environmental Responsibility;

PART 2 Works Requirements

(g) Section VII. Works Requirements;

PART 3 Conditions of Contract and Contract Forms

(h) Section VIII. General Conditions (GC);

(i) Section IX. Particular Conditions (PC) ;

(j) Section X. Contract Forms.

6.2 The Invitation for Bids issued by the Employer is not part of the Bidding Documents.

6.3 Unless obtained directly from the Employer, the Employer is not responsible for the completeness of the Bidding Documents, responses to requests for clarification, minutes of the pre-Bid meeting (if any), or Addenda in accordance with ITB 8. In case of any contradiction, documents obtained directly from the Employer shall prevail.

6.4 The Bidder is expected to examine all instructions, forms, terms, and specifications in the Bidding Documents and to furnish with its Bid all information and documentation as is required by the Bidding Documents.

7. Clarification of Bidding Documents, Site Visit, Pre-Bid Meeting

7.1 A Bidder requiring any clarification of the Bidding Documents shall contact the Employer in writing at the Employer's address specified in the BDS or raise its enquiries during the pre-bid meeting if provided for in accordance with ITB 7.4. The Employer will respond in writing to any request for clarification, provided that such request is received no later than fourteen (14) days prior to the deadline for submission of Bids. The Employer shall forward copies of its response to all Bidders who have acquired the Bidding Documents in accordance with ITB 6.3, including a description of the inquiry but without identifying its source. If so indicated in the BDS, the Employer shall also promptly publish its response at the web page identified in the BDS. Should the Employer deem it necessary to amend the Bidding Documents as a result of a clarification, it shall do so following the procedure under ITB 8 and ITB 22.2.

7.2 The Bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.

7.3 The Bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the Bidder, its personnel, and agents will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.

7.4 If so specified in the BDS, the Bidder's designated representative is invited to attend a pre-bid meeting. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

7.5 Minutes of the pre-bid meeting, if applicable, including the text of the questions asked by Bidders, without identifying the source, and the

responses given, together with any responses prepared after the meeting, will be transmitted promptly to all Bidders who have acquired the Bidding Documents in accordance with ITB 6.3. Any modification to the Bidding Documents that may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to ITB 8 and not through the minutes of the pre-bid meeting. Unless otherwise specified in the BDS nonattendance at the pre-bid meeting will not be a cause for disqualification of a Bidder.

7.6 Non-attendance during the site visit or pre-Tender meeting will not be a cause for disqualification of a Tenderer unless specified to the contrary in the Bid Data Sheet.

8. Amendment of Bidding Documents

8.1 At any time prior to the deadline for submission of Bids, the Employer may amend the Bidding Documents by issuing an Addendum.

8.2 Any Addendum issued shall be part of the Bidding Documents and shall be communicated in writing to all who have obtained the Bidding Documents from the Employer in accordance with ITB 6.3. The Employer shall also promptly publish the Addendum on the Employer's web page in accordance with ITB 7.1.

8.3 To give Bidders reasonable time in which to take an Addendum into account in preparing their Bids, the Employer may, at its discretion, extend the deadline for the submission of Bids in accordance with ITB 22.2.

C. Preparation of BIDS

9. Cost of Bidding

9.1 The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the Employer will be in no case responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

10. Language of Bid

10.1 The Bid, as well as all correspondence and documents relating to the bid exchanged by the Bidder and the Employer, shall be written in the language specified in the BDS. Supporting documents and printed literature that are part of the Bid may be in another language provided they are accompanied by an accurate translation of the relevant passages in the language specified in the BDS, in which case, for purposes of interpretation of the Bid, such translation shall govern.

11. Documents Comprising the Bid

11.1 The Bid shall comprise the following:

(a) Letter of Bid and the Bidding Forms in accordance with ITB 12;

(b) Priced Bill of Quantities or Schedules, in accordance with ITB 12 and 14 and as indicated in the BDS;

€ Bid Security, in accordance with ITB 19.1;

(d) Qualification Information

€ Alternative Bids, if permissible in accordance with ITB 13;

(f) Technical Proposal in accordance with ITB 17;

(g) Any other document required in the BDS.

11.2 In addition to the requirements under ITB 11.1, Bids submitted by a JV shall include a copy of the Joint Venture Agreement entered into by all members. Alternatively, a letter of intent to execute a Joint Venture Agreement in the event of a successful Bid shall be signed by all members and submitted with the Bid, together with a copy of the proposed Agreement.

11.3 The Bidder shall furnish information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this Bid.

12. Letter of Bid, Declaration of Undertaking, Qualification Information,

12.1 The Letter of Bid, the Declaration of Undertaking, the Bidding Forms and Schedules, including the Bill of Quantities for unit price contracts or the Schedule of Prices in case of lump sum contracts, shall be prepared using the relevant forms furnished in Section IV, Bidding and Qualification Forms. The Letter of Bid must be completed without any alterations to the text, and no substitutes shall be accepted except as provided under ITB 20.4. All blank spaces shall be filled in with the information requested.

13. Alternative Bids

13.1 Unless otherwise specified in the BDS, alternative Bids shall not be considered.

13.2 When alternative times for completion are explicitly invited, a statement to that effect will be included in the **BDS**, and the method of evaluation shall be included in Section III, Evaluation and Qualification Criteria.

13.3 Except as provided under ITB 13.4 below, Bidders wishing to offer technical alternatives to the requirements of the Bidding Documents must first price the Employer's design as described in the Bidding Documents and shall further provide all information necessary for a complete evaluation of the alternative by the Employer, including drawings, design calculations, technical specifications, breakdown of prices, and proposed construction methodology and other relevant details. Only the technical alternatives, if any, of the lowest evaluated Bidder conforming to the Employer's design of the Bidding Documents shall be considered by the Employer.

13.4 When specified in the **BDS**, Bidders are permitted to submit alternative technical solutions for specified parts of the Works, and such parts will be identified in Section VII, Works Requirements. The methods for their evaluation shall be described in Section III, Evaluation and Qualification Criteria.

14. Bid Prices and Discounts

14.1 The prices and discounts quoted by the Bidder in the Letter of Bid and in the Schedules shall conform to the requirements specified below.

14.2 The Bidder shall submit a Bid for the whole of the Works described in ITB 1.1, by filling in price(s) for all items of the Works, as identified in Section IV, Bidding and Qualification Forms. The Bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by the Bidder shall be deemed covered by the rates for other items in the Bill of Quantities and will not be paid for separately by the Employer. An item not listed in the priced Bill of Quantities shall be assumed to be not included in the Bid, and provided that the Bid is determined substantially responsive notwithstanding this omission, the highest price of the item quoted by substantially responsive Bidders will be added to the Bid price and the equivalent total cost of the Bid so determined will be used for price comparison.

14.3 The price to be quoted in the Letter of Bid shall be the total price of the Bid, excluding any discounts offered.

14.4 The Bidder shall quote any discounts and the methodology for their application in the Letter of Bid.

14.5 Unless otherwise specified in the **BDS** and the Contract, the rate(s) and price(s) quoted by the Bidder are not subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract. In such a case, the Bidder shall furnish the indices and weightings for the price adjustment formulae in the Schedule of Adjustment Data and the Employer may require the Bidder to justify its proposed indices and weightings.

14.6 If so specified in ITB 1.1, Bids are being invited for individual lots (contracts) or for any combination of lots (packages). Bidders wishing to offer discounts for the award of more than one Contract shall specify in their Bid the price reductions applicable to each package, or alternatively, to individual Contracts within the package. Discounts shall be submitted in accordance with ITB 14.4, provided the Bids for all lots (contracts) are opened at the same time.

14.7 Unless otherwise specified in the **BDS**, the Bid price shall estimate, as separate amounts, (a) import duties and (b) taxes, fees, levies and other charges, which shall apply, in terms of the Applicable Law, to the Contractor and its sub-Contractors, including their personnel, other than nationals or permanent residents in the Employer's country as of the date 28 days prior to the deadline for submission of Bids. Unless otherwise stated in the **BDS**, the Contractor and its sub-Contractors are responsible for meeting all tax liabilities arising out of the Contract.

15. Currencies of Bid and Payment

15.1 The currency(ies) of the Bid and the currency(ies) of payments shall be as specified in the **BDS**.

15.2 Bidders may be required by the Employer to justify, to the Employer's satisfaction, their local and foreign currency requirements, and to substantiate that the amounts included in the prices shown in the Schedule of Adjustment Data in the Appendix to Bid are reasonable, in which case a detailed breakdown of the foreign currency requirements shall be provided by Bidders.

16. Documents Establishing the Qualifications of the Bidder

16.1 In accordance with Section III, Evaluation and Qualification Criteria, qualification applies as specified in ITB 4.5 and the Bidder shall provide the following information as requested in the corresponding information sheets included in Section IV, Bidding and Qualification Forms, unless otherwise stated in the BDS:

(a) copies of original documents defining the constitution or legal status, place of registration, and principal place of business of the Bidder; written power of attorney of the signatory of the Bid to commit the Bidder;

(b) total monetary value of construction works performed for each of the last five years;

€ experience in works of a similar nature and size for each of the last five years, and details of work under way or contractually committed; and clients who may be contacted for further information on those contracts;

(d) major items of construction equipment proposed to carry out the Contract;

€ qualifications and experience of key site management and technical personnel proposed for the Contract;

(f) reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the past five years;

(g) evidence of adequacy of working capital for this Contract (access to line(s) of credit and availability of other financial resources);

(h) authority to seek references from the Bidder's bankers;

(i) information regarding any litigation, current or during the last five years, in which the Bidder was/is involved, the parties concerned, and the disputed amounts; and awards;

(j) proposals for subcontracting components of the Works amounting to more than 10 percent of the Contract Price. The ceiling for sub contractor's participation is stated in the BDS.

17. Documents Comprising the Technical Proposal

17.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, Schedules and any other information as stipulated in Section IV Bidding and Qualification Forms,

in sufficient detail to demonstrate the adequacy of the Bidder's proposal to meet the Work requirements and the completion time.

18. Period of Validity of Bids

18.1 Bids shall remain valid for the period specified in the **BDS** after the Bid submission deadline date prescribed by the Employer in accordance with ITB 22.1. A Bid valid for a shorter period shall be rejected by the Employer as non-responsive.

18.2 In exceptional circumstances, prior to the expiration of the Bid validity period, the Employer may request Bidders to extend the period of validity of their Bids. The request and the responses shall be made in writing. If a bid security is requested in accordance with ITB 19, it shall also be extended for twenty-eight (28) days beyond the deadline of the extended validity period. A Bidder may refuse the request without forfeiting its bid security. A Bidder granting the request shall not be required or permitted to modify its Bid.

19. Bid Security

19.1 The Bidder shall furnish as part of its Bid a Bid Security as specified in the **BDS**, in original form and in the amount and currency specified in the **BDS**.

19.2 Reserved.

19.3 The Bid Security shall be a demand guarantee in the form of an unconditional guarantee issued by a bank or financial institution (such as an insurance, bonding or surety company) from a reputable source from an eligible country as specified in Section V, Eligibility Criteria. If the unconditional guarantee is issued by a financial institution located outside the Employer's Country, the issuing financial institution shall have a correspondent financial institution located in the Employer's Country to make it enforceable. The Bid Security shall be submitted either using the Bid Security Form included in Section IV, Bidding and Qualification Forms, or in another substantially similar format approved by the Employer prior to bid submission. The Bid Security shall be valid for forty-two (42) days beyond the original validity period of the Bid, or beyond any period of extension if requested under ITB 18.2.

19.4 Any Bid not accompanied by a substantially responsive Bid Security shall be rejected by the Employer as non-responsive.

19.5 The Bid Security of unsuccessful Bidders shall be returned as promptly as possible upon the successful Bidder's signing the Contract and furnishing the Performance Security pursuant to ITB 43.

19.6 The Bid Security of the successful Bidder shall be returned as promptly as possible once the successful Bidder has signed the Contract and furnished the required Performance Security.

19.7 The Bid Security may be forfeited:

(a) If a Bidder withdraws its Bid during the period of bid validity specified by the Bidder on the Letter of Bid, or any extension thereto provided by the Bidder; or

(b) If the successful Bidder fails to:

(0) Sign the Contract in accordance with ITB 42; or

(ii) Furnish a Performance Security in accordance with ITB 43.

19.8 The Bid Security of a JV shall be in the name of the JV that submits the Bid. If the JV has not been legally constituted into a legally enforceable JV at the time of bidding, the Bid Security shall be in the names of all future members as named in the letter of intent referred to in ITB 4.1 and ITB 11.2.

20. Format and Signing of Bid

20.1 The Bidder shall prepare one original of the Bid comprising the documents as described in ITB 11 and clearly mark them "Original." Alternative bids, if permitted in accordance with ITB 13, shall be clearly marked "Alternative." In addition, the Bidder shall submit copies of the Bid, in the number specified in the **BDS** and clearly mark them "Copy." In the event of any discrepancy between the original and the copies, the original shall prevail.

20.2 The original and all copies of the Bid shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Bidder. This authorization shall consist of a written confirmation as specified in the **BDS** and shall be attached to the Bid. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the Bid where entries or amendments have been made shall be signed or initialled by the person signing the Bid. If the person signing on behalf of the Bidder is the owner, member, or director of the Bidder, if the Bidder is a single entity, or of the Bidder's Lead Member, if the Bidder is a JV, as demonstrated in the Bidder's Application, then no authorization shall be required.

20.3 In case the Bidder is a JV, the Bid shall be signed by an authorized representative of the JV on behalf of the JV, and so as to be legally binding on all the members as evidenced by a power of attorney signed by their legally authorized representatives. If the JV has not been legally constituted into a legally enforceable JV at the time of bidding, then the Bid shall be signed by every member of the proposed JV.

20.4 Any inter-lineation, erasures, or overwriting shall be valid only if they are signed or initialled by the person signing the Bid.

D. Submission and Opening of Bids

21. Sealing and Marking of Bids

21.1 The Bidder shall enclose the original and all copies of the Bid, including alternative Bids, if permitted in accordance with ITB 13, in separate sealed envelopes, duly marking the envelopes as "Bid — Original", "Bid — Alternative" and "Bid — Copy."

These envelopes containing the original and the copies shall then be enclosed in one single envelope marked "Bid".

21.2 The inner and outer envelopes shall:

(a) Bear the name and address of the Bidder;

(b) Be addressed to the Employer in accordance with ITB 22.1;

(c) Bear the specific identification of this bidding process specified in the **BDS** 1.1; and

(d) Bear a warning not to open before the time and date for Bid opening.

21.3 If all envelopes are not sealed and marked as required, the Employer will assume no responsibility for the misplacement or premature opening of the Bid.

22. Deadline for Submission of Bids

22.1 Bids must be received by the Employer in accordance with the instructions, including the address and deadline, specified in the **BDS**.

22.2 The Employer may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents in accordance with ITB 8, in which case all rights and obligations of the Employer and Bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.

23. Late Submissions

23.1 The Employer shall not consider any Bid that arrives after the deadline for submission of Bids, in accordance with ITB 22. Any Bid received by the Employer after the deadline for submission of Bids shall be declared late, rejected, and returned unopened to the Bidder.

24. Withdrawal, Substitution, and Modification of Bids

24.1 A Bidder may withdraw, substitute, or modify its Bid after it has been submitted by sending a written notice, duly signed by an authorized representative, and shall include a copy of the authorization in accordance with ITB 20.2. The corresponding substitution or modification of the Bid must accompany the respective written notice. All notices must be:

(a) Prepared and submitted in accordance with ITB 20 and ITB 21 (except that withdrawals notices do not require copies), and in addition, the respective envelopes shall be clearly marked "Withdrawal", "Substitution", "Modification"; and

(b) Received by the Employer prior to the deadline prescribed for submission of Bids, in accordance with ITB 22.

24.2 Bids requested to be withdrawn in accordance with ITB 24.1 shall be returned unopened to the Bidders.

24.3 No Bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of Bids and the expiration of the period of bid validity specified by the Bidder on the Letter of Bid or any extension thereof.

25. Bid Opening

25.1 Except in the cases specified in ITB 23 and 24, the Employer shall publicly open and read out in accordance with ITB 25 all Bids received by the deadline (regardless of the number of Bids received), at the date, time and place specified in the **BDS**, in public and in the presence of Bidders` designated representatives**.**

25.2 First, envelopes marked "Withdrawal" shall be opened and read out and the envelope with the corresponding Bid shall not be opened, but returned to the Bidder. No Bid withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out at the Bid opening. Next, envelopes marked "Substitution" shall be opened and read out and exchanged with the corresponding Bid being substituted, and the substituted Bid shall not be opened, but returned to the Bidder. No Bid substitution shall be permitted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out at the opening. Envelopes marked "Modification" shall be opened and read out with the corresponding Bid. No Bid modification shall be permitted unless the corresponding modification notice contains a valid authorization to request the modification and is read out at the Bid opening. Only Bids that are opened and read out at Bid opening shall be considered further.

25.3 All other envelopes shall be opened one at a time, reading out: the name of the Bidder and whether there is a modification; the total Bid Price, per lot (contract) if applicable, including any discounts and alternative bids; the presence or absence of a bid security, signed Letter of Bid, Power of Attorney, nominating the Bidder's authorized representative, Declaration of Undertaking, and any other details as the Employer may consider appropriate. Only discounts and alternative bids read out at bid opening shall be considered for evaluation. The Letter of Bid and the Schedules are to be initialled by a minimum of three representatives of the Employer attending bid opening. At bid opening, the Employer shall neither discuss the merits of any bid nor reject any bid (except for late bids, in accordance with ITB 23.1).

25.4 The Employer shall prepare a record of the Bid opening that shall include, as a minimum: the name of the Bidder and whether there is a withdrawal, substitution, or modification; Power of Attorney, nominating the

Bidder's authorized representative, and Declaration of Undertaking. The Bidders' representatives who are present shall be requested to sign the record. The omission of a Bidder's signature on the record shall not invalidate the contents and effect of the record. A copy of the record shall be distributed to all Bidders.

E. Evaluation and Comparison of Bids

26. Confidentiality

26.1 Information relating to the examination, evaluation, and comparison of the Bids, and recommendation of contract award shall not be disclosed to Bidders or any other persons not officially concerned with the bidding process until information on Contract award is communicated to all Bidders in accordance with ITB 41.

26.2 Any attempt by a Bidder to influence the Employer in the examination, evaluation, and comparison of the Bids, and qualification of the Bidders, or Contract award decisions may result in the rejection of its Bid.

26.3 Notwithstanding ITB 26.2, from the time of Bid opening to the time of Contract award, if a Bidder wishes to contact the Employer on any matter related to the bidding process, it shall do so in writing.

27. Clarification of Bids

27.1 To assist in the examination, evaluation, and comparison of the Bids, and qualification of the Bidders, the Employer may, at its discretion, ask any Bidder for a clarification of its Bid, given a reasonable time for a response. Any clarification submitted by a Bidder that is not in response to a request by the Employer shall not be considered. The Employer's request for clarification and the response shall be in writing. No change, including any voluntary increase or decrease, in the prices or substance of the Bid shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids, in accordance with ITB 31.

27.2 If a Bidder does not provide clarifications of its Bid by the date and time set in the Employer's request for clarification, its Bid may be rejected.

28. Deviations, Reservations, and Omissions

28.1 During the evaluation of Bids, the following definitions apply:

(a) "Deviation" is a departure from the requirements specified in the Bidding Documents;

(b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Documents; and

(c) "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Documents.

29. Determination of Responsiveness

29.1 The Employer's determination of a Bid's responsiveness is to be based on the contents of the Bid itself, as defined in ITB 11.

29.2 A substantially responsive Bid is one that meets the requirements of the Bidding Documents without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that,

(a) If accepted, would:

(i) Affect in any substantial way the scope, quality, or performance of the Works specified in the Contract; or

(ii) Limit in any substantial way, inconsistent with the Bidding Documents, the Employer's rights or the Bidder's obligations under the proposed Contract; or

(b) If rectified, would unfairly affect the competitive position of other Bidders presenting substantially responsive Bids.

29.3 The Employer shall examine the technical aspects of the Bid submitted in accordance with ITB 17, in particular, to confirm that all requirements of Section VII, Works Requirements have been met without any material deviation, reservation or omission.

29.4 If a Bid is not substantially responsive to the requirements of the Bidding Documents, it shall be rejected by the Employer and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.

30. Nonmaterial Nonconformities

30.1 Provided that a Bid is substantially responsive, the Employer may waive any nonmaterial nonconformities in the Bid.

30.2 Provided that a Bid is substantially responsive, the Employer may request that the Bidder submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial nonconformities in the Bid related to documentation requirements. Requesting information or documentation on such nonconformities shall not be related to any aspect of the price of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.

30.3 Provided that a Bid is substantially responsive, the Employer shall rectify quantifiable nonmaterial nonconformities related to the Bid Price. To this effect, the Bid Price shall be adjusted, for comparison purposes only, to reflect the price of a missing or non-conforming item or component.

31. Correction of Arithmetical Errors

31.1 Provided that the Bid is substantially responsive, the Employer shall correct arithmetical errors on the following basis:

(a) If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected, unless in the opinion of the Employer there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected;

(b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

€ If there is a discrepancy between words and figures, the amount in words shall prevail, unless, only for admeasurement contracts, the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

31.2 Bidders shall be requested to accept correction of arithmetical errors. Failure to accept the correction in accordance with ITB 31.1 shall result in the rejection of the Bid.

32. Conversion to Single Currency

32.1 For evaluation and comparison purposes, the currency(ies) of the Bid shall be converted into a single currency as specified in the BDS.

33. Margin of Preference

33.1 A margin of preference for domestic Bidders shall not apply in National Competitive Bidding.

34. Subcontractors

34.1 Unless otherwise stated in the BDS, the Employer does not intend to execute any specific elements of the Works by sub-contractors selected in advance by the Employer (nominated sub-contractors).

35. Evaluation of Bids

35.1 The Employer shall use the criteria and methodologies listed in this Clause. No other evaluation criteria or methodologies shall be permitted.

35.2 To evaluate a Bid, the Employer shall consider the following:

(a) The Bid price, excluding Provisional Sums unless priced competitively and the provision, if any, for contingencies in the Schedules, but including Daywork items, where priced competitively;

(b) Price adjustment for correction of arithmetic errors in accordance with ITB 31.1;

€ Price adjustment due to missing items, missing rates, or discounts offered in accordance with ITB 14.2 and 14.4;

(d) Price adjustment due to quantifiable nonmaterial nonconformities in accordance with ITB 30.3;

€ Converting the amount resulting from applying (a) to (d) above, if relevant, to a single currency in accordance with ITB 32;

(f) The additional evaluation factors as specified in Section III, Evaluation and Qualification Criteria.

35.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in Bid evaluation.

35.4 If these Bidding Documents allow Bidders to quote separate prices for different lots (contracts), the methodology to determine the lowest evaluated price of the lot (contract) combinations, including any discounts offered in the Letter of Bid, is specified in Section III, Evaluation and Qualification Criteria.

35.5 If the Bid, which results in the lowest Evaluated Bid Price, is significantly lower than the Employer's estimate, the Employer shall require the Bidder to produce detailed price analyses for any or all items of the Schedules, to demonstrate the internal consistency of those prices with the construction methods, resources and schedule proposed. Notwithstanding the provisions of ITB 14.2 which shall not be applicable, if one or several inconsistencies are evidenced, the Bid shall be declared non-compliant and rejected. If the Bid is seriously unbalanced or front loaded in the opinion of the Employer and after evaluation of the price analyses, taking into consideration the schedule of estimated Contract payments, the Employer may require that the amount of the performance security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

36. Comparison of Bids

36.1 The Employer shall compare the evaluated prices of all substantially responsive Bids established in accordance with ITB 35.2 to determine the lowest evaluated Bid.

37. Qualification of the Bidder

37.1 The Employer shall determine to its satisfaction whether the eligible Bidder that is selected as having submitted the lowest evaluated cost and substantially responsive Bid meets the qualifying criteria specified in Section III, Evaluation and Qualification Criteria.

37.2 The determination shall be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB 17. The determination shall not take into consideration the qualifications of other firms such as the Bidder's subsidiaries, parent entities, affiliates, subcontractors (other than Specialized Subcontractors if permitted in the bidding document), or any other firm(s) different from the Bidder.

37.3 An affirmative determination of qualification shall be a prerequisite for award of the Contract to the Bidder. A negative determination shall result in disqualification of the Bid, in which event the Employer shall proceed to the substantially responsive Bid which offers the next lowest evaluated cost to make a similar determination of that Bidder's qualifications to perform satisfactorily.

38. Most Advantageous Bid

38.1 Having compared the evaluated costs of Bids, the Employer shall determine the Most Advantageous Bid. The Most Advantageous Bid is the Bid of the Bidder that meets the Qualification Criteria and whose Bid has been determined to be:

(a) substantially responsive to the bidding document; and

(b) the lowest evaluated cost.

39. Employer's Right to Reject All Bids

39.1 The Employer reserves the right to annul the bidding process and reject all Bids at any time prior to contract award, without thereby incurring any liability to Bidders. In case of annulment, all Bids submitted and specifically, bid securities, shall be promptly returned to the Bidders.

F. Award of Contract

40. Award Criteria

40.1 Subject to ITB 39.1, the Employer shall award the Contract to the successful Bidder. This is the Bidder whose Bid has been determined to be the Most Advantageous Bid as specified in ITB 38.

41. Notification of Award

41.1 Prior to the expiration of the period of Bid validity, the Employer shall notify the successful Bidder, in writing, that its Bid has been accepted. The notification letter (hereinafter and in the Conditions of Contract and Contract Forms called the "Letter of Acceptance") shall specify the sum that the Employer will pay the Contractor in consideration of the execution and completion of the Works and the requirement for the Contractor to remedy any defects therein (hereinafter and in the Conditions of Contract and Contract Forms called "the Contract Price"). Subsequently, the Employer shall also notify all other Bidders of the results of the bidding.

41.2 Until a formal contract is prepared and executed, the Letter of Acceptance shall constitute a binding Contract.

41.3 The Employer shall promptly respond in writing to any unsuccessful Bidder who, after notification of award in accordance with ITB 41.1, requests in writing the grounds on which its Bid was not selected.

41.4 In exceptional circumstances, the Employer may need to communicate with the successful Bidder, established in terms of ITB 38.1, certain aspects of Contract performance prior to sending the Letter of Acceptance. Should such a need arise, this communication shall be limited to the following topics, as identified in the evaluation report,

(a) coordination of mobilization timing;

(b) coordination of actions or inputs involving the Employer and the Engineer;

€ technical alternatives offered by the successful Bidder.

Any such discussions and agreements as there shall occur between the Employer and the successful Bidder (1) may not be interpreted as having the same legal effect as the Letter of Acceptance, (2) shall be summarized in Minutes, which shall be attached to the Letter of Acceptance.

42. Signing of Contract

42.1 Promptly upon notification, the Employer shall send the successful Bidder the Contract Agreement.

42.2 Within twenty-eight (28) days of receipt of the Contract Agreement, the successful Bidder shall sign, date, and return it to the Employer.

43. Performance Security

43.1 Within twenty-eight (28) days of the receipt of the Letter of Acceptance from the Employer, the successful Bidder shall furnish the performance security in accordance with the General Conditions of Contract, subject to ITB 35.5, using for that purpose the Performance Security Form included in Section X, Contract Forms, or another form acceptable to the Employer. If the performance security furnished by the successful Bidder is in the form of a bond, it shall be issued by a bonding or insurance company that has been determined by the successful Bidder to be acceptable to the Employer. A foreign institution providing a bond shall have a correspondent financial institution located in the Employer's Country.

43.2 Failure of the successful Bidder to submit the above-mentioned Performance Security or sign the Contract shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid security. In that event, the Employer may award the Contract to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Employer to be qualified to perform the Contract satisfactorily.

Section II. Bid Data Sheet

A. Introduction	
ITB 1.1	The Employer is County Government of Turkana
ITB 1.1	The name of the NCB is proposed construction of *Napak Dispensary & School Borehole and Water Reticulation Project area in Napak Village, Turkwel Sub-Location, Turkwel Location, Turkwel Ward, Loima Sub-County, Turkana County, Kenya.* The identification number of the NCB is TCG/MoALDF/AL/DRPNK/W/045/2026 – 2027. The number and identification of lots (contracts) comprising this NCB is: **Not Applicable**
ITB 2.1	The name of the Project is Proposed construction of ***Napak Dispensary & School Borehole and Water Reticulation Project area in Napak Village, Turkwel Sub-Location, Turkwel Location, Turkwel Ward, Loima Sub-County, Turkana County, Kenya.*** The scope of works proposed to be undertaken include: *i) Drilling, testing, equipping and solarization 1 No. borehole – approximately 270 - 350 m Deep;* *ii) Design, Fabrication, assemble/erect & testing of the pressed steel tank at least 36 m^3 including a 12 high Steel Tower;* *iii) Construction and commissioning of the following pipelines and associated appurtenance Structures:* *a. Rising Main Pipeline (OD63 — PN 12.5 – 460 m long);* *b. 1 No. Gravity Main Pipeline (OD63 — PN 12.5 – 380 m long);* *iv) Construction of Water Drawing Points* *a. Water Kiosk — Type 1 (1 No);* *b. Water Stand (3 No);* *v) Construction of Animal Water Point (Troughs) – (1 No.)* vi) *Construction of Sanitation block (Latrine) – (2 No.)*
ITB 4.1	Maximum number of members in the JV shall be: **N/A**
ITB 5.2	(a) Average annual financial amount of construction work over a period of 3 years of at least *Kshs. 3,000,000*. (b) Experience as prime contractor in the construction of at least 5 works of a nature and complexity equivalent to the Works over the period of 3 years. (c) Essential equipment required for the project:

	<table><tr><th>Description</th><th>Minimum Quantity (No.)</th></tr><tr><td>Van or Utility vehicle</td><td>1</td></tr><tr><td>Drilling Rig</td><td>1</td></tr><tr><td>Generator</td><td>1</td></tr><tr><td>Concrete mixer</td><td>1</td></tr><tr><td>Compressor</td><td>1</td></tr><tr><td>Compactor,</td><td>1</td></tr><tr><td>Backhoe Loader</td><td>1</td></tr><tr><td>Tipper</td><td>1</td></tr><tr><td>Concrete vibrator</td><td>1</td></tr><tr><td>Level machine</td><td>1</td></tr><tr><td>Water Pump</td><td>1</td></tr><tr><td>HDPE Butt Fusion Machine</td><td>1</td></tr></table> (d) Liquid assets and/or credit facilities, net of other contractual commitments and exclusive of any advance payments which may be made under the Contract, of no less than *Kshs. 5,000,000*
B. Bidding Documents	
ITB 7.1	For **clarification purposes** only, the Employer's address is: Attention: Mr. Samson Nakito, Director Supply Chain Management Services Address: P.O Box 11 – 30500, Lodwar Fax: Not Applicable Electronic mail address: *supplychainoffice@turkana.go.ke* *copy: Leone.Comin@gopa.eu , Kibet.Chepkwony@gopa.eu , info.drpnk@turkana.go.ke and procurement.drpnk@turkana.go.ke*
ITB 7.1	Web page: *www.turkana.go.ke and www.tenders.go.ke*
ITB 7.4	A Pre-Bid meeting **shall** take place at the following date, time and place: Date: 25*th November, 2026* Time: 9:30 a.m. EAT Place: Hybrid (Virtual and / or physical meeting (DRPNK Boardroom) A site visit shall be organized by the Employer. Each party or entity to cater for any logistical arrangements for the site visit. **Site visit certificate** shall be issued to firm (s) or contractors at the site.
ITB 8.2	Web page: www.tenders.go.ke and www.turkana.go.ke
C. Preparation of Bids	
ITB 10.1	The language of the Bid is English All correspondence exchange shall be in the English language. Language for translation of supporting documents and printed literature is English.
ITB11.1 (ii)	The following schedules shall be submitted with the Bid:

	Bill of Quantities
ITB 11.1 (vi)	The Bidder shall submit with its Bid the following additional documents: Not applicable
ITB 13.3 Unsolicited alternative Bids	**Not Applicable**
ITB 13.4 Technical alternatives designed by the Employer	**Not Applicable**
ITB 14.5	The prices quoted by the Bidder shall be **Fixed.**
ITB 14.7	In reference to Separate Agreement (SA) and Finance Agreement (FA) for Drought Resilience Programme in Northern Kenya, the Contractor shall be exempted from Value Added Taxes (VAT) only. Contractor(s) shall not be exempted from income tax, withholding tax, duties and other levies as specified by tax related Regulations of the Republic of Kenya. Tax exemption for VAT shall be processed in compliance with National Treasury Circular No. 9 of 2018 on Guidelines / Framework for Requesting, Processing and Granting of Tax Exemption/Waiver/Variation/Remission on National Tax, A Fee or A charge[2].
ITB 15.1	The currency of the Bid and the payment currency shall be in accordance with Option *B* as described below: **Option B (Bidders allowed to quote in local and foreign currencies):** (a) The unit rates and prices shall be quoted by the Bidder in the Schedules in the following currencies: (i) for those inputs to the Works that the Bidder expects to supply from within the Employer's country, in *Kenya Shillings (KES)*. (ii) for those inputs to the Works that the Bidder expects to supply from outside the Employer's country (referred to as "the foreign currency requirements"), in Euro (EUR).
ITB 17	The Bid shall include the ESMP signed by the Bidder as provided for this purpose in annex 3, A Bid not comprising the **signed** and **stamped** ESMP shall be rejected.
ITB 18.1	The bid validity period shall be 120 days.

[2] https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.treasury.go.ke/wp-content/uploads/2021/03/Circular-No.9-2018-on-tax-exception-waiver-variation-remission-on-a-National-Tax-a-Fee-or-a-Charge.pdf&ved=2ahUKEwjt4L2j9OKHAxUoQ_EDHXCUDc4QFnoECBoQAQ&usg=AOvVaw32JzOzlAkEbAmEbZjZ_RWv

ITB 19.1	The amount and currency of the bid security shall be: *–KES 400,000.*
ITB 20.1	In addition to the **originals** of the Bid, the number of copies is **two** paper copies (hard copies).
ITB 20.2	The **written** confirmation of authorization to sign on behalf of the Bidder shall consist of a Power of Attorney established in the name of the signatory of the Bid.
D. Submission and Opening of Bids	
ITB 22.1	The Original Bid and its copies shall be submitted not later than Date: 07th *December, 2026.* Time: *10:00 a.m. EAT* at the following address, which shall be the controlling address for the purposes of the timely submission of the Bid: Attention: *Mr. Samson Nakito, Director Supply Chain Management Services.* Address: *P.O Box 11 – 30500, Lodwar, Kenya.* City: Nairobi ZIP Code: *30500* Country: *Kenya*
ITB 25.1	The Bid opening shall take place at: Address: *Procurement Office Headquarters,* Town: *Lodwar* ZIP Code:*30500* Country: *Kenya* Date: 07th *December, 2026.* Time: *10:00 a.m. EAT* No minimum number of Bids is required in order to proceed to bid opening.
E. Evaluation and Comparison of Bids	
ITB 29	A Bid that does not include a signed and stamped ESMP (Annex 5) shall be **rejected**.
ITB 32.1	The Kenya shilling currency that shall be used for bid evaluation and comparison purposes. The currency of the Bid and the payment currency shall be in accordance with Option *B* as described below: **Option B (Bidders allowed to quote in local and foreign currencies):** (a) The unit rates and prices shall be quoted by the Bidder in the Schedules in the following currencies: (i) for those inputs to the Works that the Bidder expects to supply from within the Employer's country, in *Kenya Shillings (KES)*.

	(ii) for those inputs to the Works that the Bidder expects to supply from outside the Employer's country (referred to as "the foreign currency requirements"), in Euro (EUR).
ITB 34.1	At this time the Employer ***does not intend*** to execute certain specific parts of the Works by sub-contractors selected in advance (nominated subcontractors).
ITB 37	The Employer shall evaluate the qualifications of the responsive Bidders using the factors, methods, criteria, and requirements defined in Section III, Evaluation and Qualification Criteria, to evaluate the qualifications of the Bidders, and no other methods, criteria, or requirements shall be used.

Section III. Evaluation and Qualification Criteria

This Section contains all the criteria that the Employer shall use to evaluate the Bids and to determine the qualification of Bidders. In accordance with ITB 35 and ITB 37, no other factors, methods or criteria shall be used. The Bidder shall provide all the information requested in the forms included in Section IV, Bidding and Qualification Forms.

1. Evaluation of Bids

In addition to the criteria listed in ITB 35.2 (a) – € the following criteria shall apply:

0.g **Assessment of adequacy of Technical Proposal with Requirements**

The assessment of the **Technical Proposal** submitted by a Bidder shall comprise (a) evaluation of the Bidder's plan to mobilize key equipment and key personnel to carry out the works, (b) construction method, (c) construction schedule and (d) sufficiently detailed supply sources, in accordance with requirements specified in Section VII, Works Requirements. A Bid not comprising Technical Proposal or a Bid for which the Technical Proposal is not substantially responsive (i.e. with material deviation, reservation or omission) shall be rejected.

0.g **Assessment of commitment to the ESMP.**

A Bid which does not include a signed and stamped ESMP shall be rejected.

2. Evaluation of Eligibility and Qualification

2.1 Eligibility

This Bidding is open to all bidders from eligible countries as defined in ITB 4 and KfW's eligibility criteria to bid in Section V, Eligibility Criteria.

2.2 Qualification

To qualify for award of the Contract, bidders shall meet the following minimum qualifying criteria

a) an average annual financial amount of construction work over the period specified in the **BDS** of at least the multiple indicated in the **BDS**;
b) experience as prime contractor in the construction of at least the number of works of a nature and complexity equivalent to the Works over the period **specified in the BDS** (to comply with this requirement, works cited should be at least **70 percent complete**);
c) proposals for the timely acquisition (own, lease, hire, etc.) of the essential equipment **listed in the BDS**;
d) Contract Manager with five years' experience in works of an equivalent nature and volume, including no less than three years as Manager; and
e) liquid assets and/or credit facilities, net of other contractual commitments and exclusive of any advance payments which may be made under the Contract, of no less than the amount **specified in the BDS**.[3]
f) A consistent history of litigation or arbitration awards against the Applicant may result in disqualification.

[3] Usually the equivalent of the estimated payments flow over 4-6 months at the average (straight line distribution) construction rate. The actual period of reference shall depend on the speed with which the Employer shall pay the Contractor's monthly certificates.

Section IV. Bidding and Qualification Form

Letter of Bid

[The Bidder shall prepare his Letter of Bid on a Letterhead paper specifying his name and address]

Date: _____

Tender No.: _____

To: _____

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB 8)_____;

(b) We have no conflict of interest in accordance with ITB 4;

(c) We have not been suspended nor declared ineligible by the Employer based on execution of a Bid Securing Declaration in the Employer's country in accordance with ITB 4.4;

(d) We offer to execute in conformity with the Bidding Documents the following Works: _____

_____;

(e) The total price of our Bid, excluding taxes and excluding any discounts offered in item (f) below is:

i) total price (excluding VAT taxes) of the Bid KES _____

(f) Our Bid shall be valid for a period of _____ days from the date fixed for the bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(g) If our Bid is accepted, we commit to obtain a performance security in accordance with ITB 42 of the Bidding Documents;

(h) We are not participating, as a Bidder, in more than one Bid in this bidding process;

(j) We understand that this Bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed; and

(k) We acknowledge and agree that the Employer reserves the right to annul the bidding process and reject all Bids at any time prior to contract award without thereby incurring any liability to us;

(l) We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in any type of fraud and corruption.

Name of the Bidder_____

Title of the person signing the Bid_____

Signature of the person named above_____

Date signed _____ day of _____, _____

Appendix to Bid

This Appendix forms part of the Agreement.

[Note: with the exception of the items for which the Employer's requirements have been inserted, the Contractor shall complete the following information before submitting his offer.]

Item		Sub-Clause	Data
Documents forming the Contract listed in the order of priority		1.1.1……	
Document (delete if not applicable)			**Document Identification**
(a)	The Agreement		_____
(b)	Particular Conditions …….		_____
€	General Conditions ……		_____
(d)	The Specification ……...		_____
€	The Drawings …….		_____
(f)	The Contractor 's tendered design ……..….		_____
(g)	The bill of quantities ……		_____
(h)	.....		_____
(i)	.....		_____
Time for Completion……		1.1.9……	_____days

Law of the Contract…….	1.4……	Law of Kenya_____ _____
Language…….	1.5……	_____
Provision of Site…….	2.1……...	On the Commencement Date*_____ _____
Authorised person	3.1……	_____
Name and address of Employer's representative (if known) …….	3.2……	_____
Performance security (if any):		
Amount…….	4.4……...	_____
Form……	4.4……	_____(details)
Time for delivery of security	4.4……	Within 28 days of the Commencement Date.

*Employer to amend as appropriate

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Item	Sub-Clause	Data
Requirements for Contractor's design (if any) ……	5.1…… ……	Specification Clause No's _____
Programme:		
Time for submission.....	7.2… …… ……	Within 14 days* of the Commencement Date.
Form of programme……..	7.2… …… ……	_____ _____

Amount payable due to failure to complete……	7.4……	_____per day up to a maximum of 10%* of sum stated in the Agreement
Period for notifying defects…….	9.1 & 11.5..	365 days* calculated from the date stated in the notice under Sub-Clause 8.2
Variation procedure		
Daywork rates……	10.2……	_____ _____(details)
Valuation of the Works*		
Lump sum Price …….	11.1……	_____(details)
Lump sum price with schedules of rates……	11.1……	_____(details)
Lump sum price with bill of quantities……	11.1……	_____(details)
Remeasurement with tender bill of quantities…….	11.1……	_____(details)
Cost reimbursable ……..	11.1……	_____(details)
Percentage of value of Materials and Plant……	11.2……	Materials_____80%
		Plant_____ 90%*
* Employer to amend as appropriate		

Item	Sub-Clause	Data
Percentage of retention …….……	11.3	_____5%
Currency of payment ……...……	11.7	_____
Rate of interest ……	11.8	_____% per annum
Insurances……	14.1	
Type of cover*	**Amount of cover***	**Exclusions***
The Works, Materials, Plant and fees	The sum stated in the Agreement plus 15%	_____
Contractor's Equipment	Full replacement cost	_____
Third Party injury to persons and damage to property	_____	_____
Workers	_____	_____
Other cover*	_____	_____
Arbitration		

Rules……	15.3……	UNCITRAL Arbitration
……	……	Rules*_____(details)
Appointing authority…….	15.3…… ……	President of FIDIC or his nominee* _____(details)
Place of Arbitration		
	15.3…… ……	The Country*_____

*Employer to amend as appropriate

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Section V. Eligibility Criteria

Eligibility in KfW-Financed Procurement

1. Consulting Services, Works, Goods, Plant and Non-Consulting Services are eligible for KfW financing regardless of the country of origin of the Contractors (including Subcontractors and suppliers for the execution of the Contract), except where an international embargo or sanction by the United Nations, the European Union or the German Government applies.

2. Applicants/Bidders (including all members of a Joint Venture and proposed or engaged Subcontractors) shall not be awarded a KfW-financed Contract if, on the date of submission of their Application/Offer or on the intended date of Award of a Contract, they:

   2.1 are bankrupt or being wound up or ceasing their activities, are having their activities administered by courts, have entered into receivership, or are in any analogous situation;

   2.2 have been

   (a) convicted by a final judgement or a final administrative decision or subject to financial sanctions by the United Nations, the European Union and/or the German Government for involvement in a criminal organisation, money laundering, terrorist-related offences, child labour or trafficking in human beings; this criterion of exclusion is also applicable to legal Persons, whose majority of shares are held or factually controlled by natural or legal Persons which themselves are subject to such convictions or sanctions;

   (b) convicted by a final court decision or a final administrative decision by a court, the European Union or national authorities in the Partner Country or in Germany for Sanctionable Practice during any Tender Process or the performance of a Contract or for an irregularity affecting the EU's financial interests, unless they provide supporting information together with their Declaration of Undertaking (Form available as Appendix to the Application/Offer which shows that this conviction is not relevant in the context of this Contract and that adequate compliance measures have been taken in reaction;

   2.3 have been subject within the past five years to a Contract termination fully settled against them for significant or persistent failure to comply with their contractual obligations during Contract performance, unless this termination was challenged and the dispute resolution is still pending or has not confirmed a full settlement against them;

   2.4 have not fulfilled applicable fiscal obligations regarding payments of taxes either in the country where they are constituted or the PEA's country;

   2.5 are subject to an exclusion decision of the World Bank or any other multilateral development bank and are listed in the respective table with debarred and cross-debarred firms and individual available on the World Bank's website or any other multilateral development bank unless they provide supporting information together with their Declaration of Undertaking which shows that this exclusion is not relevant in the context of this Contract or

   2.6 have given misrepresentation in documentation requested by the PEA as part of the Tender Process of the relevant Contract.

3. State-owned entities may compete only if they can establish that they (i) are legally and financially autonomous, and (ii) operate under commercial law. To be eligible, a state-owned entity shall establish to KfW's satisfaction, through all relevant documents, including its charter and other information KfW may request, that it: (i) is a legal entity separate from their state (ii) does not currently receive substantial subsidies or budget support; (iii) operates like any commercial enterprise, and, inter alia, is not obliged to

pass on its surplus to their state, can acquire rights and liabilities, borrow funds and be liable for repayment of its debts, and can be declared bankrupt.

Section VI. KfW Policy – Sanctionable Practice – Social and Environmental Responsibility

1. Sanctionable Practice

The PEA and the Contractors (including all members of a Joint Venture and proposed or engaged Subcontractors) must observe the highest standard of ethics during the Tender Process and performance of the Contract.

By signing the Declaration of Undertaking the Contractors declare that (i) they did not and will not engage in any Sanctionable Practice likely to influence the Tender Process and the corresponding Award of Contract to the PEA's detriment, and that (ii) in case of being awarded a Contract they will not engage in any Sanctionable Practice.

Moreover, KfW requires to include in the Contracts a provision pursuant to which Contractors must permit KfW and in case of financing by the European Union also to European institutions having competence under European law to inspect the respective accounts, records and documents relating to the Tender Process and the performance of the Contract , and to have them audited by auditors appointed by KfW.

KfW reserves the right to take any action it deems appropriate to check that these ethics rules are observed and reserves, in particular, the rights to:

(a) reject an Offer for Award of Contract if during the Tender Process the Bidder who is recommended for the Award of Contract has engaged in Sanctionable Practice, directly or by means of an agent in view of being awarded the Contract;

(b) declare mis procurement and exercise its rights on the ground of the Funding Agreement with the PEA relating to suspension of disbursements, early repayment and termination if, at any time, the PEA, Contractors or their legal representatives or Subcontractors have engaged in Sanctionable Practice during the Tender Process or performance of the Contract without the PEA having taken appropriate action in due time satisfactory to KfW to remedy the situation, including by failing to inform KfW at the time they knew of such practices.

KfW defines, for the purposes of this provision, the terms set forth below as follows:

Coercive Practice	The impairing or harming, or threatening to impair or harm, directly or indirectly, any person or the property of the person with a view to influencing improperly the actions of a person.
Collusive Practice	An arrangement between two or more persons designed to achieve an improper purpose, including influencing improperly the actions of another person.
Corrupt Practice	The promising, offering, giving, making, insisting on, receiving, accepting or soliciting, directly or indirectly, of any illegal payment or undue advantage of any nature, to or by any person, with the

	intention of influencing the actions of any person or causing any person to refrain from any action.
Fraudulent Practice	Any action or omission, including misrepresentation that knowingly or recklessly misleads, or attempts to mislead, a person to obtain a financial benefit or to avoid an obligation.
Obstructive Practice	Means (i) deliberately destroying, falsifying, altering or concealing evidence material to the investigation or the making of false statements to investigators, in order to materially impede an official investigation into allegations of a Corrupt Practice, Fraudulent Practice, Coercive Practice or Collusive Practice, or threatening, harassing or intimidating any Person to prevent them from disclosing their knowledge of matters relevant to the investigation or from pursuing the investigation, or (ii) any act intended to materially impede the exercise of KfW's access to contractually required information in connection with an official investigation into allegations of a Corrupt Practice, Fraudulent Practice, Coercive Practice or Collusive Practice.
Sanctionable Practice	Any Coercive Practice, Collusive Practice, Corrupt Practice, Fraudulent Practice or Obstructive Practice (as such terms are defined herein) which is unlawful under the Financing Agreement.

2. Social and Environmental Responsibility

Projects financed in whole or partly in the framework of Financial Cooperation have to ensure compliance with international Environmental, Social, Health and Safety (ESHS) standards (including issues of sexual exploitation and abuse and gender-based violence) Contractors in KfW-financed projects shall consequently undertake in the respective Contracts to:

(a) comply with and ensure that all their Subcontractors and major suppliers, i.e. for major supply items comply with international environmental and labour standards, consistent with applicable law and regulations in the country of implementation of the respective Contract and the fundamental conventions of the International Labour Organisation[4] (ILO) and international environmental treaties and;

(b) implement any environmental and social risks mitigation measures, as identified in the environmental and social impact assessment (ESIA) and further detailed in the environmental and social management plan (ESMP) as far as these measures are relevant to the Contract and implement measures for the prevention of sexual exploitation and abuse and gender-based violence.

[4]In case ILO conventions have not been fully ratified or implemented in the Employer's country the Applicant/Bidder/Contractor shall, to the satisfaction of the Employer and KfW, propose and implement appropriate measures in the spirit of the said ILO conventions with respect to a) workers grievances on working conditions and terms of employment, b) child labour, c) forced labour, d) worker's organisations and e) non-discrimination.

PART 2 – WORKS REQUIREMENTS

1. Specifications

a) Technical Specifications

b) Drawings

c) Bill of Quotations (BoQ)

2. Environmental and Social Management Plan (ESMP)

Section VII. Technical Specifications

Specifications

Wherever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract. Where such standards and codes are national, or relate to a particular country or region, other authoritative standards that ensure a substantially equal or higher quality than the standards and codes specified will be accepted subject to the Project Manager's prior review and written consent. Differences between the standards specified and the proposed alternative standards shall be fully described in writing by the Contractor and submitted to the Project Manager at least 28 days prior to the date when the Contractor desires the Project Manager's consent. In the event the Project Manager determines that such proposed deviations do not ensure substantially equal or higher quality, the Contractor shall comply with the standards specified in the documents.

SPECIFICATIONS

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1 GENERAL

1.1 General Description of the Works

The name of the Project is Proposed construction and commissioning of Napak Dispensary & School Borehole and Water Reticulation Project in Napak Village, Turkwel Sub-Location, Turkwel Location, Turkwel Ward, Loima Sub-County, Turkana County, Kenya.

The scope of works proposed to be undertaken include:

i) *Drilling, testing, equipping and solarization 1 No. borehole – approximately 270 - 350 m Deep;*

ii) *Design, Fabrication, assemble/erect & testing of the pressed steel tank at least 36 m^3 including a 12 high Steel Tower;*

iii) *Construction and commissioning of the following pipelines and associated appurtenance Structures:*

   a. *Rising Main Pipeline (OD63 — PN 12.5 – 460 m long);*

   b. *1 No. Gravity Main Pipeline (OD63 — PN 12.5 – 380 m long);*

iv) *Construction of Water Drawing Points*

   a. *Water Kiosk — Type 1 (1 No);*

   b. *Water Stand (3 No);*

v) *Construction of Animal Water Point (Troughs) – (1 No.)*

vi) *Construction of Sanitation block (Latrine) – (2 No.)*

1.2 Location of the Works

The proposed Napak Dispensary & School Borehole and Water Reticulation Project area is in Napak Village, Turkwel Sub-Location, Turkwel Location, Turkwel Ward, Loima Sub-County, Turkana County, Kenya.

The project area lies approximately between latitudes 2.91° to 2.92° and longitudes 35.43° to 35.45°. The area is accessible through the Lodwar – Napak Earth Road. It is approximately 35 Km South-West of Lodwar Town.

1.3 Climatic Conditions

Turkana County is among the driest counties of Kenya. It experiences very high temperatures of between 25 — 35°C during the day and moderate temperatures during the night all year round. The county receives between 52 mm and 480 mm of rainfall annually, with average precipitation being 200 mm. The Rainfall pattern and distribution are erratic and unreliable both with time and space and at times Turkana receives no rain in a whole year.

There are two rainfall seasons: Long rains (between April and July) and Short rains (between October and November). The driest periods are January, February and September. The rainfall is brief with violent storms resulting in flash floods. The surface runoffs and potential evaporation rates are extremely high. As a result, the residents of Turkana County are often faced with a persistent threat of food insecurity and starvation.

1.4 Quality and Approvals

The materials and workmanship shall be the best of their respective kinds and to the approval of the Engineer. The words "to the approval of the Engineer" shall be deemed to be included in the description of all items relating to design, construction, installation and materials and workmanship for the due execution of the Works.

The Contractor shall submit all data, details and samples as necessary and as reasonably requested by the Engineer of all materials that the Contractor proposes to use in the Works. Method statements which adequately demonstrate the Contractor's proposed method of working, methods of maintaining safety and compliance with the programme shall be submitted for the Engineer's approval prior to the commencement of work on any area of the Site.

No materials, Plant or equipment shall be procured for the Contract and no work, permanent or temporary, shall commence without first obtaining the Engineer's approval.

All materials, Plant and equipment supplied shall be designed for operation under the above-described conditions.

1.5 Drawings and Documents

The drawings listed in Section 5 of the Tender Documents and any modifications to those drawings and any other drawings that may be prepared by the Contractor and approved by the Engineer shall subsequently become the Contract Drawings.

For the purpose of carrying out the Contract, the Contractor will be provided with two sets of the Contract Documents and full size (A2) Contract Drawings.

1.6 Drawings Designed by the Contractor

All drawings, calculations, plans, reports, instruction manuals, pamphlets, data and all other documents required to be submitted by the Contractor under the Contract shall be clear and readable. The Contractor shall submit these drawings and documents in a logical order to the Engineer for review or approval at least thirty (30) calendar days prior to execution of the Works. Unless otherwise specified the Contractor shall allow a minimum of 7 days, after the date of receipt by the Engineer for approval of drawings and documents by the Engineer.

All shop drawings, including field erection, layout and construction details shall be furnished by the Contractor for the approval of the Engineer. All drawings and/or documents to bear standard title block to Engineer's approved details.

All the drawings and calculation to substantiate the design shall be checked, signed and approved by the Contractor prior to submission. The drawings shall also be signed by a qualified engineer responsible for the design and submitted in triplicate. Following approval, the contractor shall supply a further five copies to the Engineer. Construction Documents shall not be varied from without the approval of the Engineer.

Approval of the drawings by the Engineer shall not be construed as a complete check but will indicate only that the general method and detailing is satisfactory. The approval by the Engineer shall not relieve the Contractor of the requirements of the Contract or responsibility for correct installation and assembly of parts in final position or responsibility for the adequacy of the method of construction.

All the cost thereof will be deemed to be included in the Contractor's unit rates and Contract Price.

1.7 "As Built" Drawings

Within sixty (60) days after the receipt of the Completion Certificate, the Contractor shall submit to the Engineer all the approved drawings and documents (including operation and maintenance manuals), clearly revised and brought up to date by the Contractor to show the permanent construction actually made. The submission shall be made in the following manner and quantity:

(a) One (1) set of the A1 size reproducible drawings on high quality polyester transparent film or similar material,

(b) One (1) bound set of reduced size, clearly photocopied drawings with hard cover (A3 size).

The submission shall contain the drawing index.

No separate payments will be made for the provision of the drawings as the cost thereof shall be deemed to be included in the unit rates and the Contract Price.

For sites where the Contractor undertakes permanent works Record Drawings shall be submitted to the Engineer, for approval, in the form of As Built Drawings. In the case of repairs and rehabilitation the Record Drawings shall be submitted for approval within a period of 21 days following execution of the work.

"As Built" and/or Record Drawings shall be prepared to an approved format, and scale in line with the construction drawing.

1.8 Operation and Maintenance Manuals

The Contractor shall prepare and submit to the Engineer for approval 2 hard copies and a soft copy of the Operation and Maintenance (O&M) Manuals as described in the Works Contract.

The Contractor shall supply the final version of the O&M Manuals prior to the issue of the Taking-Over Certificate for either the whole of the Works or the respective Section or part of the Works. Each set shall be bound together in a stout plastic or other approved cover.

O&M Manuals prepared shall be in English language, all parts and equipment listings shall be in English.

1.9 Standard Specifications

For convenience, and in order to establish the necessary standards of quality, reference will be made to specifications issued by national or other widely recognized bodies. Such specifications shall be referred to as "Standard Specifications" and shall be the latest editions of such Standard Specifications issued prior to the issue of Tender Documents, together with such additions and amendments as may have been issued prior to the same date.

Subject to the written approval of the Engineer, any other internationally accepted standard which requires an equal quality of work may be used.

In referring to Standard Specifications, the following abbreviations are used:

BS	British Standard
ISO	International Organization for Standardization
AASHTO	American Association of State Highways and Transportation Officials

ASTM	American Society for Testing and Materials
ASA	American Standards Association
KS	Kenya Standard
EN	Normalized European Standards

In cases where no particular Specification or Standard is given for any article or material to be used in the Contract the relevant Specification of the British Standards Institution or other relevant Standard shall apply unless otherwise stated. The latest version of the standards referred to shall be used where applicable.

If the Contractor proposes to use a Standard Specification other than that specified, three copies of the proposed Standard Specification, in the English Language, shall be submitted to the Engineer not less than 28 days before approval of the Standard Specification is required.

1.10 Quality Control

The Contractor shall be responsible for his own quality control and shall provide sufficient competent personnel for supervising the Works, taking and preparing samples and for carrying out all necessary tests.

1.11 Site/Progress Meetings

The Contractor shall provide a suitable venue, near the vicinity of the Site, and arrange progress review meetings to be chaired by the Employer/Engineer at monthly intervals to coincide with submission of monthly progress submissions. The Contractor shall allow for attendance by the Engineer and representatives of the Employer. The meetings shall be attended by the Contractor's senior representatives, Site Agent and other members of his senior staff as may be deemed necessary. The Engineer shall invite the Employer for such meetings.

1.12 Progress Photographs

The Contractor shall furnish the Engineer with coloured photographs (not less 8 cm x 120 cm size) of the work in progress throughout the Contract period. The photographs shall be taken at the start, during and at the completion of each major task of the work as directed by the Engineer. A brief description and date of each photograph shall be included.

The Contractor shall make a soft copy of all the photos. This copy will be retained on the site and on completion of the Works the negatives shall become the property of the Employer.

1.13 Level Datum

The survey control points and bench marks shown on the drawings shall be handed over to the Contractor as basis for surveying and setting out of the Works. The Contractor shall be responsible for carrying out the field surveys for the performance of the Works. Before using the control points and bench marks for setting out of the Works, the Contractor shall carry out a check survey thereon and satisfy himself as to their accuracy. The Employer shall bear no responsibility for the accuracy of any control point or bench mark.

Where the survey control points are not provided or unavailable, before the commencement of constructional work, the Contractor shall establish (to national height datum as defined by the Survey of Kenya) in a position to the approval of the Engineer, steel datum pegs which shall be securely concreted in. The level of these pegs shall be established and agreed with the Engineer and all levels used in the construction of the Works shall be referred to these established datum

points. The correctness of this datum shall be checked at regular intervals during the construction period as agreed with the Engineer.

The Contractor may establish additional temporary bench marks for his own convenience but each temporary bench mark shall be of a design and in a location approved by the Engineer and shall be accurate in relation to the bench marks established by the Engineer.

The Contractor shall protect the reference points and level bench marks and in the event of any damage he shall re-survey and re-establish the points and bench marks all to the satisfaction of the Engineer.

1.14 Setting Out of the Works

The site layout drawings show indicative site layouts. Prior to commencing construction, the Engineer will agree with the Contractor the basic information supplementary to that shown on the Drawings such as the position of manholes, chambers, centre-lines and base-lines sufficient for the Contractor to locate the Works.

The Contactor shall prepare detailed setting out drawings and data sheets as necessary and submit them to the Engineer in triplicate for approval. Any modifications to the setting out drawings or data sheets required by the Engineer shall be made by the Contractor and resubmitted for final approval. Should it be necessary during setting out or during construction for the approved setting out details to be amended, the Contractor shall amend the drawings or data sheets or make new ones for approval as required by the Engineer.

Where directed by the Engineer, the Contractor shall take such levels and dimensions as may be required for the purposes of measurements prior to disturbance of the ground. These shall be agreed between the Contractor and the Engineer in writing before any of the surface is disturbed or covered up.

For pipelines, the Contractor shall in the presence of the Engineer set-out the pipeline alignments in accordance with the indicative alignments shown on the drawings taking into account physical features on the ground, any existing services, any requirements of relevant Authorities and any changes deemed necessary by the Engineer, confirming the locations of all valves, air valves, washouts, hydrants and bends.

The Contractor shall prepare and submit to the Engineer, at an approved scale, plans of the pipeline route and profiles of ground levels after any initial clearing of the way leave or easement showing the proposed pipe invert levels and precise chainages for all valves and fittings for approval.

1.15 Construction and Checking of Work

The Contractor shall be solely responsible for and shall provide all labour, tools, lifting tackle and other equipment required for the construction and checking of the Works.

No operatives shall be allowed to execute any type of work, which is normally carried out by a skilled tradesman, unless the operative is thoroughly experienced and proficient in the trade concerned. Supervisors and operatives may be required to demonstrate their proficiency or produce certificate of competence to the satisfaction of the Engineer.

As each part of the work is carried out it shall be subject to the approval by the Engineer.

1.16 Supervision and Labour

The Contractor will be required to maintain a competent supervising Site Agent and staff on site throughout the construction period until completion of the Works, and thereafter as may be required during the period of maintenance. The Engineer shall give prior approval to the appointment of this supervising Site Agent and shall have authority to withdraw this approval at any time in accordance with the Conditions of Contract.

All staff and labour employed on the Works shall be employed in accordance with the local labour and employment laws and regulations.

1.17 Works Executed by the Employer or by other Contractors

The Employer reserves the right to execute, on the site, works not included under this Contract and to employ for this purpose either his own employees or other contractors whose contracts may be either a sub-contract under this Contract, or an entirely separate contract. The Contractor shall ensure that neither his own operations nor trespass by his employees shall interfere with the operations of the Employer, or his contractors employed on such works and the same obligations shall be imposed on the Employer or other contractors in respect of work being executed under this Contract.

1.18 Contractor's Site Offices, Workshops, Storage and Working Areas

The Contractor shall establish the office, housing, workshop, stores, accommodation and camp for self and its employees. In which case, the Contractor shall provide erect, service and maintain all necessary buildings as offices, housing or workshop/stores for himself, his staff and his employees. These buildings shall form the time of their erection until the completion of the Contract is the property of the Employer and the Contractor shall not demolish or remove any buildings or part of any buildings without the written permission of the Engineer.

All huts, buildings, fixtures and fittings provided by the Contractor shall be removed and the site reinstated at the end of the Contract.

The location of all the offices, stores and the like shall be to the approval of the Engineer.

The Contractor shall be deemed to have included for the costs thereof in his Tender.

1.19 Contractor's Staff and Workmen

The Contractor shall agree to employ Kenyan workers to the maximum extent possible. The Contractor shall provide a competent Site Agent to the approval of the Engineer to be in charge of the work who shall not be changed except with the consent of the Engineer.

The Contractor agrees that his workmen and employees shall be considered for all purposes in his direct pay and employ and under his supervision and control. He shall be directly and personally responsible for discharging all obligations, financial or other, which may be or becoming owing to any such workman or employee or to his successors, assignees or personal representatives. There shall be no contractual or legal relations of any kind whatsoever between the Employer and any such workman, employee or any person employed in the performance of the Contractor's obligations under this Contract.

The Engineer may request and the Contractor agrees to accept the request for the immediate removal from the site of any employee or worker of the Contractor adjudged by the Engineer to be

incompetent, disorderly, and unreliable or of bad character. Such employee shall not again be employed on the Works.

1.20 Definition and Use of the Site

1.20.1 Definition of the Site

The Site shall include all those areas of land which, being public or private:

(a) Are being provided by the Employer for the purpose of constructing the permanent works.

(b) Are being provided by the Employer or leased by the Contractor for Temporary Works, including camps, offices and stores.

(c) Are acquired, leased, or operated by the Contractor as borrow pits or spoil tips for the Permanent Works, including all access roads.

1.20.2 Use of the Site

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

On occupation of the Site or other land the Contractor shall provide such fencing, as required.

The Contractor shall at any time remove any vehicle or vessel or any other obstruction under his control that may be required to be removed by the Engineer for any purpose. The Contractor shall move such obstruction promptly on instruction being given.

The Contractor shall maintain access for the inspection, operation and maintenance of any of the Employer's plant or works which lies within the Site or elsewhere.

The Contractor shall not use any portion of the Site for any purpose not connected with the Works unless the written permission of the Engineer has been obtained.

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

1.21 Possession of the Site

The Contractor shall restrict his activities to those areas of the Site adjacent to the works being executed and shall avoid any encroachment upon lands outside the areas for which possession has been given. Any trespass or damage or any claim arising from such encroachment shall be the Contractor's sole responsibility and he shall hold the Employer indemnified against all claims arising from such trespass or damage.

1.22 Interference with the Works

The Contractor shall not interfere in any way with any existing works, whether the property of the Employer or of a third party, whether or not the position of such works is indicated to the Contractor by the Engineer, except where such interference is specifically described as part of the Works, either in the Contract or in an instruction from the Engineer.

1.23 Material for the Works

All material shall comply with appropriate Standard Specifications unless otherwise required hereinafter.

The Contractor shall, before placing any order of materials, manufactured articles or machinery for incorporation in the Works, submit for the approval of the Engineer the names of the suppliers from whom he proposes to obtain such materials, manufactured articles or machinery, together with a list of the same, giving the origin, quality, weight, strength, description and other relevant details. No materials, manufactured articles or machinery shall be ordered or obtained from any suppliers which the Engineer has not approved in writing.

All materials shall be delivered to the Site a sufficient period of time before they are required for use in the Works, to enable the Engineer to take such samples as he may wish for testing and approval.

Notwithstanding the fact that approval has been given to the source of supply, the Engineer may forbid the use of any materials if, upon delivery, they are found to be defective, or he considers them unsuitable for incorporation in the Works. Such rejected materials shall be removed from the site forthwith.

The Contractor may propose alternative materials of equivalent quality to those specified, and subject to the approval, such materials may be used in the Works.

The Contractor shall have no claim against the Employer in respect of any financial loss which he may suffer as a result of the rejection of any such materials, and he shall also bear the cost of removing them from the Site.

The Engineer shall have the right to inspect materials and plant for the permanent works during the course of manufacture. The Contractor shall arrange for the right of access to manufacturing premises for the Engineer and his staff during normal working hours. The Engineer shall be given sufficient notice by the Contractor to allow him to observe the testing of any materials for the works at the place of manufacture. The Engineer shall also be given the opportunity to inspect any material or plant in their completed state prior to packing for transport to the site.

If requested by the Engineer, the Contractor shall provide to the Engineer copies of orders for the supply of goods or materials required in connection with the works.

1.24 Inspection and Testing during Manufacture

The performance of each item of Plant or Pipe shall be tested in accordance with the Specification to the requirements of the Engineer.

Test certificates in triplicate shall be submitted by the Contractor to the Engineer within 2 weeks of the date of the tests. Type tests are not acceptable. Test certificates shall be supplied for tests carried out on the actual Plant being supplied.

Plant shall not be dispatched from the manufacturer's works until it has passed the specified tests and approval been given by the Engineer.

The Engineer shall at his discretion witness tests of individual items of Plant at the manufacturer's works. The Engineer shall be given three weeks' notice in writing before such tests are to take place.

The acceptance by the Engineer of any item of Plant or equipment after testing at the manufacturer's works shall in no way relieve the Contractor of his responsibility for the correct performance.

1.25 Rejected Materials and Defective Work

Materials or work which, in the opinion of the Engineer, do not comply with the Specification, shall be classified as rejected materials or defective work, and shall be cut out and removed from the Works and replaced as directed by the Engineer.

1.26 Existing Works and Services

The Contractor shall acquaint himself with the positions of all existing works and services including water mains, storm water drains, cables, and service poles before any excavation are commenced.

The Contractor will be held responsible for any damage, however caused, in the course of the execution of the Works, to such existing works and services.

Such existing works and services, where exposed by the execution of the works, shall be properly shored, hung-up and supported to the satisfaction of the Engineer and of the authority concerned.

Poles supporting cables and the like adjacent to the Works shall be kept securely in place until the Works are completed and shall then be made as safe and permanent as before.

Notwithstanding the foregoing requirements and without lessening the Contractor's responsibility, the Contractor shall inform the Engineer immediately any existing works have been exposed and shall comply with any requirements of the authority concerned.

Only when and as directed by the Engineer shall the position of existing works or services be changed by the Contractor to meet the requirements of the proposed work.

The Contractor shall make adequate provision so that when carrying out his work, no interference, damage or pollution is caused to roads and footpaths, or to any mains, drains, and the like or other parts of the Works. Wherever loads have to be carried over ground in which pipes, valves, culverts, and the like are buried, the Contractor shall take all precautions including where necessary, the provision and use of sleeper roads, light gauge railways or other means to prevent damage occurring to such underground works. The Contractor shall not store any plant or materials or spoil heaps over existing water mains, or in such positions that interference with access to the mains, control gates and the like, is created. Approval by the Engineer to the means of protection employed shall not relieve the Contractor of any responsibility in respect of damage occasioned by his operations.

The laying of pipework, ducts, drains, and the like shall be arranged so as to cause as little interference as possible with the smooth operation of existing works.

When breaking out and making good existing structures, the Contractor shall disturb the existing structures as little as possible. All structures shall be made good with materials similar to those used in the existing works, or such materials which are considered by the Engineer to be of similar appearance and suitable in all other respects.

1.27 Existing Access

Existing access to lands, property and all other places shall be maintained by the Contractor during the continuance of the Works to the Engineer's satisfaction.

1.28 Liaison with Police and other Officials

The Contractor shall keep in close contact with the police and other officials in the areas concerned regarding their requirements for the control of workmen, movement of traffic, or other matters and shall provide all assistance and facilities which may be required by such officials in the execution of their duties.

1.29 Water and Power for Use on the Works

The Contractor shall be solely responsible for the location, procurement and maintenance of a water supply adequate in quality and quantity to meet his obligations under the Contract.

The Contractor shall be solely responsible for the location and continuity of the supply of water for use on the Works. Supplies may be derived from rivers and streams, but shall in all cases to be to the Engineer's approval, and the abstraction of water from any sources shall not interfere with any permanent water supply and be to the requirements and permitted by Water Resources Management Authority (WRMA). The Contractor shall be solely responsible for the transporting of water from its source to the point at which it is required for construction purposes, and in such quantities and quality as to enable the Works to proceed without hindrance due to the shortage of adequate water supplies.

The Contractor shall make his own arrangements for power supplies and shall be solely responsible for the location, procurement and maintenance of a power supply, adequate to meet his obligations under the Contract.

The Contractor shall make his own arrangements for the supply of adequate safe drinking water, electricity and other services to the Permanent Works, Temporary Works and plant and shall provide and maintain all pipes, cables and fittings which may be necessary to carry such services to his operations

1.30 Employer as a Supplier of Water and Power

The position of the Employer or his Agent as a supplier of water or power 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 or power 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.

1.31 Inspections by the Engineer during Defects Liability Period

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

1.32 Site Offices

The Contractor shall maintain offices for the sole use by staff for the duration of the Contract in a position to be designated by the Engineer.

The offices shall be fully weatherproof. The exterior and interior faces of walls and ceilings shall be of approved finish. The offices shall be made dust, insect and vermin proof as far as possible.

The Contractor shall arrange, provide and pay, all charges in connection with water, electricity and telephone supplies to the offices as per the contract or otherwise as directed by the Engineer.

1.33 Facilities for Survey and Inspection by the Engineer

The Contractor shall make available technicians and such labour, materials and safety equipment as the Engineer may require for inspections and survey work in connection with the Works. The Contractor shall provide all necessary tackle, test equipment, access, labour, staff and any other thing the Engineer may reasonably require in order that he may safely, conveniently and quickly carry out such inspections as he deems necessary at any time during the execution of the Works and during the Defects Liability Period.

1.34 Protective Clothing and Safety Equipment

The Contractor shall provide any necessary protective clothing and safety equipment for the use of by workmen, staff on site and authorized visitors to the site including the Employer and his representatives and those of any relevant authority who have reason to visit the Site.

1.35 Material Testing

The Contractor shall 60alvaniz for testing of all samples taken to a recognized laboratory approved by the Engineer. The Contractor shall allow for all the necessary labour and equipment necessary for the sampling and testing of the materials.

The existence of the laboratory shall in no way relieve the Contractor of the responsibility for carrying out his own tests in order to maintain the degree of control of quality hereinafter specified.

The Contractor is required to keep at the project site, the following minimum equipment at all times during the Contract period:

(a) Two (2) complete set of sieves of 200 mm or 300 mm diameter including cover, pan and brush;

(b) Two (2) pan type weighing scale complete with weights, to weigh up to ten kilograms (10kg) with sensitivity one gramme (1 g);

I Two (2) galvanized steel slump test cone apparatus complete with standard tamping rod and base plate;

(d) Six (6) steel 15cm cube moulds, complete with two (2) tamping rods, base plates and trowels;

I One (1) chemical balance to weigh up to two hundred and fifty grammes (250 g) with weight box and sensitivity of one tenth of a gramme (0.1 g);

All mechanical equipment's to be used for measurement or weighing shall be calibrated as required and calibration certification issued by the calibrating body.

1.36 Training of Operator

The Contractor shall make provision for the on-site training of the Operator's technical team especially on the operation of the borehole and water reticulation system.

1.37 Project Management

1.37.1 Project Control

The Contractor shall provide within his site organization a project management capability to advice and be directly responsible to the Site Agent. (Contractor's chief site representative) The duties of the section shall include the following:

a) Planning and programme preparation particularly in relation to the requirements of the Employer and the public authorities, and the requirements to maintain water supply and waste water disposal services where careful detailed arrangements have to be made and adhered to.
b) Planning the execution of the Works in a manner which minimizes disruption to the water supply system and will permit the efficient and effective commissioning of the water supply system and their respective components.
c) Ensuring adequate potable water supplies and wastewater disposal services are maintained to all consumers.
d) Continuous surveillance of progress and anticipation of factors likely to affect the timely performance of the Contract.
e) Making proposal for modification to forward planning and to the programme at an early stage in the light of factors resulting from (d) above.
f) Continuous appraisal of the Contractor's methods and routines particularly as to their effect on the community and property.
g) Forward planning for resource requirements taking due account of possible shortages and delays in the arrival on site of materials, equipment, plant and personnel and their mobilization for effective usage.
h) Acquisition and process of up-to-date information for progress meetings with the Engineer. The preparation of monthly progress reports including an update of the detailed programme and cash flow forecast which shall include progress photographs as directed by the Engineer.

The Contractor's project management staff shall be of adequate ability and experience. Programmes shall be based upon Critical Path Management (CPM) networks in precedence format and shall be prepared using a suitable PC-based project management software package approved by the Engineer.

1.37.2 Payment Certificates

Payment certificates shall be submitted and processed as prescribed in the conditions of Contract.

1.38 Sign Boards

Before the erection of any sign boards or posters by the Contractor, the Contractor shall obtain the approval of the Employer and the Engineer to the size, location and wording of such sign boards or posters.

The Contractor shall provide and erect sign boards at the Sites where works are being executed, giving information to the public on the Project and the Employer and further details as will be prescribed by the Employer. The location of the sign boards at the sites will be indicated by the Engineer. The Contractor shall maintain, alter, move or adapt the sign boards from time to time as may be instructed by the Engineer. The display of any named Sub-contractors or any other information associated with the Works shall be to the approval of the Engineer.

1.39 Language of Correspondence and Records

All communications from the Contractor to the Engineer shall be in the English language. All books, timesheets, records, notes, drawings, documents, specifications and manufacturers' literature shall be in the English language. If any of the aforementioned is in another language a certified translation in English shall be submitted to the Engineer.

1.40 Tracked Plant

The Contractor's tracked plant may not be run on any public or private road without the written permission of the owner or authority concerned.

1.41 Fuel Supplies

The Contractor shall arrange for obtaining, storing and distributing all fuel oils required for the completion of the Works. The storage of fuel on site shall comply with the Petroleum Act and Factories Act applicable in Kenya. Copies of this can be purchased by the Contractor at the Government Printers.

1.42 Telephone and Communications

The Contractor shall obtain suitable means of communications during the course of the Contract. The use of radio communications may be permitted but the Contractor shall be responsible for obtaining all the necessary permission and licences.

1.43 Preservation of Trees

No tree shall be removed without prior written permission of the Engineer who will limit the removal of trees to the minimum necessary to accommodate the Permanent Works.

If trees are removed or damaged by the Contractor or his employees, without approval, then the Contractor shall replace such trees.

Replacement of trees shall not be with seedlings less than two years of age, obtained from a reputable nursery and of a species approved by the Engineer. The Contractor shall plant, water and ensure that the replacement trees are properly established, all at his own costs.

1.44 Protection from Water

The Contractor shall keep the whole of the Works free from water and shall be deemed to have included in his Contract Sum all costs for pumping, shoring, temporary drains, sumps and other measures and provisions necessary for such purposes and for clearing away and making good to the satisfaction of the Engineer any damage caused thereby.

1.45 Protection against Fires

The Contractor is advised that, at all times, it is necessary to guard against fires starting within the Site or in the environs thereof, particularly as the result of the Works or from the actions of his employees. The Contractor shall have available, at all times, a trained fire-fighting team provided with adequate fire-fighting equipment and shall deal with all fires on the Site howsoever caused.

The Contractor shall be responsible for maintaining qualified firefighting crew on the Site at all times as well as maintaining an efficient fire alarm system. The Contractor shall also submit a fire prevention and firefighting program for the Engineer's approval.

The Contractor shall provide suitable and adequate firefighting equipment, to the satisfaction of the Engineer, for ready use at all the times in all the Engineer's site establishment including Contractor's residential quarters, labour camps and ancillary buildings. These shall be maintained until the completion of the construction and handing over of the works to the Employer.

The Contractor shall comply with laws and regulations such as Occupational Health and Safety Act 2007 legislation and any other legislations and regulations regarding fires and with respect to the prevention of fires. No fire may be lit in the dry season without written permission from the Engineer and/ or the relevant Authority.

1.46 Safety Precautions

The Contractor shall adhere to the current legislative requirements from Factories Inspectorate, Ministry of Labour, in respect of the appointment of Safety Supervisors on Building and Works of Engineering Construction. In accordance with these requirements, the Contractor shall appoint a Safety Supervisor who shall be qualified in safety and familiar with the works being performed. The Safety Officer shall ensure that adequate measures and rules for the protection of health and safeguarding against accidents are enforced.

The Contractor shall take all necessary precautions against risks of loss of life or of injury to any person employed on the Works or to employees of the Employer and to the Engineer or to visitors or to persons having good and sufficient reasons to be about the Works, and to this end he shall properly safeguard the Works to the satisfaction of the Engineer and in accordance with the Occupational Health and Safety Act 2007 legislation and any other legislations that govern safety at construction sites in Kenya.

The Contractor shall at all times comply with any accident prevention regulations and any safety regulations peculiar to the various trades employed on the Works, and any safety regulations published by the Government.

The Contractor shall report promptly to the Engineer all accidents involving the death of or serious injury to any person on the Site or resulting from the Contractor's operations.

The Contractor shall, at his own expense, educate all his employees on safety precautions based on good practice on site. This shall be done in both English and Kiswahili languages. Safety instructions shall deal with all safety measures including but not be limited to the following; protective clothing, helmets and footwear, use of lifting equipment, precautions against electrical shock, welding, routine procedures in case of accidents, fires, etc., watchmen, warning notices and barriers, use of drilling equipment and dust suppression and use and storage of explosive.

1.47 Explosives and Fuels

The Contractor shall make arrangements to transport, store and handle explosives and fuels in a safe manner for protecting the public in accordance with the laws and security regulations in force in the Republic of Kenya. In this regard, he shall submit a program to the Engineer for approval for the safe handling and storage of explosives and fuels. The programme shall be accompanied by material data sheets for each of the explosives and fuels. When approved, the Contractor shall issue a copy to each of his personnel involved with the handling of explosives and fuels.

The Contractor shall obtain all necessary licenses and shall pay all fees and charges in respect of the same as may be necessary for the purpose of moving explosives and fuels from place to place

and storing the same, and shall make all applications and obtain approvals from the relevant authorities of the Government of Kenya.

The Contractor shall construct his explosives magazines at locations and in a manner complying with the relevant regulations of Kenya and approved by the Engineer. Detonators and fuse shall be stored in a separate magazine away from explosives. In no case shall they be transported in the same vehicle with explosives.

The Contractor shall provide adequate protective facilities to safely store and to prevent the loss or theft of explosives. Overnight storage of explosives and detonators outside of the magazines will not be permitted. Magazines shall be securely locked when not in use.

The Contractor shall maintain an inventory record of storage and withdrawal of all explosives including detonators. This record shall be available to the Engineer, and the Engineer shall be promptly notified of any loss or theft of explosives.

The Contractor shall supply and install sirens and loudspeakers systems, so that adequate warning may be given to all persons who may be endangered when explosives charges are to be fired. The Contractor shall ensure, prior to discharging explosives, that the area to be blasted is clear of all workmen, residents, pedestrians etc. in addition he shall post flagmen on each of the roads entering the said area so as to stop and prevent any traffic from entering into the area until "all clear" notification is given.

During thunderstorms and other electrical disturbances, no charging and firing will be permitted.

1.48 Above Ground Fuel Storage Tanks

The fuel storage tank shall comply with BS 21, 1387, 799, 2594 and 5410 and shall have internal working pressure up to and including 0.4 bar, measured at the top of the tank, and a maximum internal vacuum of 10 mbar. Unless otherwise shown on the drawings, the tank shall have a manhole whose centre shall be 450 mm from one end. Filling point shall be fitted to the highest point in the tank shell and vent and dip point shall be fitted preferably at the centre of the manhole lid. The Contractor shall supply the dip stick.

The drain point shall be fitted at the lowest point in the tank and flush with the inside of the shell. This shall be at a minimum of 150 mm from the ground level. The draw off shall be welded near the base of the tank on the vertical centre-line and at the opposite end to the drain.

The tank shall be suspended from the ground by saddle supports and the bond between the tank and the supports shall be broken by application of bituminous paint on the tank and the saddles. The tank shall be fitted with lifting tugs /hooks of sufficient strength at locations shown on the drawings. The location of the tank shall be firm ground with reinforced concrete slab with a provision of catch pits and sumps of sufficient capacities and to the satisfaction of the Engineer. A bund wall shall be provided round the hard standing concrete slab.

The tank shall be earthed in accordance with BS 7430 AND 6651. The earth system shall terminate with copper earth rod in earth test pit.

1.49 Watching, Fencing and Lighting

The Contractor shall employ competent watchmen to guard the Works both by day and night.

Any excavations, material dumps, spoil dumps or other obstructions likely to cause injury to any person or thing shall be suitably fenced off and at night marked by red warning lights.

Fences shall consist of at least three 15 millimetres diameter hemp ropes or 4mm diameter wires, or more if required, stretched tightly between poles, and standards securely planted in solid ground, well clear of the excavation. The poles, and standards shall not be more than 15 metres apart, and where circumstances require, they shall be placed closer. Ropes or wires shall be stretched tight approximately 0.4 metres, 0.8 metres and 1.2 metres respectively above the ground. Banks of spoil may be accepted by the Engineer in lieu of fencing if of suitable height and form.

Fences and spoil banks shall be clearly marked at the ends, all corners, and along the length at intervals of not more than 15 metres by means of white limewashed boards, discs, stones or oil drums during the daytime and by red lamps burning at night. Markers shall be freshly limewashed at regular intervals to ensure that they are white and clean.

If a road is closed, or partly closed to traffic, temporary traffic and barricades shall be erected by the Contractor to the satisfaction of the Engineer and the police, or other relevant authority, to give proper warning to traffic and the public. Lettering on road signs shall be black on a yellow background and shall incorporate reflective material. The signs shall be adequately illuminated at night.

1.50 Soil Conservation

All precautions shall be taken by the Contractor to prevent the erosion of soil from any lands used or occupied by the Contractor for the purpose of the execution of the Temporary Works.

If in the opinion of the Engineer, the Contractor's operations in areas other than the permanent works caused soil erosion, the Contractor shall undertake soil conservation measures in these areas as directed by the Engineer. The details of the proposed soil conservation measures shall be submitted by the Contractor for the Engineer's approval prior to the execution of the said works.

All soil conservation measures shall be carried out at the earliest possible time, as approved by the Engineer, to ensure that the required protection is established most effectively during the progress of Works.

No separate payment will be made for the soil conservation measures and such costs shall be deemed to be included in the respective unit rates and the Contract Sum

1.51 Dust Abatement

During the performance of the work the Contractor shall carry out proper and efficient measures wherever and as often as necessary to reduce the dust nuisance resulting from his operations. Measures shall include, but not be limited, to installation of dust suppression units on his rock drilling equipment, watering down of excavated material during loading operations, and use of water tankers to sprinkle access roads, disposal areas, etc.

The Contractor shall be held liable for any damage to crops, cultivated fields and dwellings of persons in the neighbourhood of the Works resulting from his operations.

In addition, the Contractor shall provide his employees, visitors or any other individual on site with personal protective equipment against dust at all times so that they are not exposed to the dust hazard.

No separate payment will be made for the dust abatement measures and the costs thereof shall be deemed to be included in the respective unit rates and the Contract Sum

1.52 Noise Control

All work shall be carried out without unreasonable noise. Compressors used on site shall be silenced either by using only full silenced models or fitted with effective exhaust silencers and properly lined and scaled acoustic covers all to the design of the manufacturers of the compressor or by the use of effective acoustic screens to enclose the noise source. Pneumatic percussion tools used on Site shall be fitted with silencers of a type recommended by the manufacturers of the tools. Compressors, silencers or other equipment shall be maintained in good and efficient working order.

Additionally, where noise from the equipment cannot be 66alvanizi using silencers and other equipment related measures, the Contractor shall at all times provide the correct Personal protective equipment for the employees, visitors and any other person on site working within the noise range.

No separate payment will be made for noise suppression measures and the costs thereof shall be included in the unit rates and the Contract Sum.

1.53 Sanitation

The Contractor shall provide adequate sanitation and refuse collection and disposal facilities complying with state laws and local by-laws for all houses, offices, workshops, and the like, erected on the site, all to the satisfaction of the Engineer.

The toilet facilities provided at the site by the Contractor shall be made available, free of charge, to the employees of the Contractor and any of his subcontractors.

The Contractor shall warn his employees and sub-contractors that any employee found fouling the site shall be removed from the site immediately in accordance with the Conditions of Contract.

The Contractor shall remove all rubbish and to this end shall provide adequate number of covered garbage bins/containers placed at convenient points around the site establishments. The Contractor shall institute and maintain a regular garbage collection and disposal system. Garbage shall be disposed of by burning, by burial or by other means approved by the Engineer.

No separate payment will be made for such sanitary arrangements and all such costs will be deemed to be included in the unit rates and Contract Sum.

1.54 First Aid and Medical Services

The Contractor shall provide and maintain all equipment necessary to render first aid in case of accidents, snake bites or other emergencies according to Occupational Health and Safety Act 2007 legislations regarding workplace health and safety and any other relevant legislation. This equipment shall be kept in readiness at the sites of the works, at camps and wherever the Contractor's staff may regularly live and work. The Contractor shall ensure that there are persons available to all such places with knowledge of simple first aid procedures and able to administer snake bite treatment.

In addition, the Contractor shall provide at his own cost, training to the relevant employees on ways and means of preventing snake bites.

In general, the contractor shall be guided by the following,

- Where the number of workers exceeds 25 - provide a stretcher and a vehicle that can carry a person on a stretcher
- Where the number of workers exceeds 250 - provide first aid room with a qualified nurse to be on duty during all shifts.

Notwithstanding the minimum requirements prescribed above, the Contractor shall be responsible for the adequacy of all the arrangements made.

1.55 HIV/AIDS Awareness

The Contractor shall implement an HIV/AIDS awareness programme for his Personnel.

1.56 Pollution

During the execution of the Works, the Contractor shall ensure that no pollution of existing watercourses is allowed to take place as a result of his operations. The Contractor shall take all reasonable steps to protect the environment on and off the site and to avoid damage or nuisance to persons or to property of the republic or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

1.57 Maintenance of Irrigation Water Supplies

The Contractor shall be responsible for maintaining perennial irrigation water supplies so that the supply may be used in any part of the command area at all times unless otherwise agreed in advance with the Irrigators' Association and approved by the Engineer.

1.58 Restoration of Drains, Streams, Canals etc.

Subject to any requirement of the Works whereby a permanent change is to be effected, all drains, canals, pipes, channels, water-courses or streams temporarily cut through or disturbed by the excavation of the Works are to be restored so that the water flowing in them may continue to flow in as full and free manner as it did before the disturbance.

1.59 Site Clearance

On completion of the Works, the Contractor shall clear the site and remove all temporary buildings, equipment and debris. The Contractor shall level off and grade all areas used for haul roads and all building, store and workshop areas. The whole of the site shall be left in a clean and tidy condition.

1.60 Weather Records

The Contractor shall erect two rain gauges ("Nylex 600" or similar approved) and a double bulb, minimum/maximum thermometer (0.1°C accuracy) at sites agreed with the Engineer. The Contractor shall be responsible for the daily measurement of rainfall and minimum and maximum temperature to be taken at 8:00am each day.

1.61 Units and Abbreviations

The International System of (metric) Units as set out in ASTM E380 shall be used throughout the Contract except where otherwise provided.

2 EARTHWORKS, BACKFILLING AND RESTORATION

2.1 Conditions of Site

Before carrying out work on any Site, the Site shall be inspected by the Contractor in conjunction with the Engineer to establish its general condition which shall be agreed and recorded in writing and by means of digital photography.

Details recorded shall include the location of all boundary and survey beacons, the condition of buildings, surface, terracing (if any), ditches, roads, tracks, fences and other information relating to the Site and elsewhere which may be affected by the works.

In the event of any boundary or survey mark established for the purpose of land title being disturbed or displaced the Contractor shall forthwith replace the beacon. Where necessary the Contactor shall employ the services of an approved licensed surveyor for the purpose of setting out boundaries.

2.2 Site Clearance and Topsoil Removal

Site clearance shall be carried out over the areas to be occupied by the Permanent Works before beginning excavation or filling or other work, and shall include the clearance of all trees, stumps, bushes and other vegetation and the removal of all boulders between 0.01 and 0.2 m^3 volumes.

Before beginning clearance in any area, the Contractor shall give seven (7) days written notice of his intention to the Engineer who will determine the extent and limits of such clearance.

Topsoil shall mean the surface layer of soil which by its humus content supports vegetation and is unsuitable, as a formation to roads and concrete structures or as a backfill or bedding material. The extent and depth of topsoil that needs removal shall be agreed with the Engineer. Topsoil shall be set aside for re-use or disposal as directed by the Engineer.

Trees to be removed shall be uprooted or cut down as near to the ground level as possible. Bushes, undergrowth, small trees stumps and tree roots shall, where directed by the Engineer, be grubbed out. All holes left by the stumps or roots shall be backfilled with suitable material in a manner approved by the Engineer.

The Engineer may require that individual trees, shrubs and hedges are preserved; the Contractor shall take all necessary precautions to prevent their damage.

In the case of wayleaves for pipelines and the like, the Contractor shall preserve as far as practicable all grass and other vegetation outside the limits of trenches and permanent works and shall not necessarily destroy crops or any vegetation whose removal would not be essential to his operations.

2.3 Erosion

The Contractor shall take care at all times to prevent erosion on every site and elsewhere on land which may be affected by his operations and the Engineer may impose such reasonable limitations and restrictions upon the method of clearance and upon the timing and season of the year when clearance is carried out as the circumstances warrant.

2.4 Ground Levels

Before commencement of any earthworks or demolition the sites shall be surveyed, as necessary, in conjunction with the Engineer to establish existing ground levels. These agreed ground levels shall form the basis for the calculation of any subsequent excavation and filling.

2.5 Trial Holes

The Contractor shall excavate refill and restore in advance of his programme such trial holes as he may require for determining the nature of the subsoil and the location of existing underground services and obstructions.

2.6 Excavation Generally

Excavations shall be made in open cutting unless 69alvanizi or heading is specified or approved by the Engineer and shall be taken out as nearly as possible to exact dimensions and levels so that minimum of infilling will afterwards be necessary. The Contractor shall ensure the stability and safety of excavations and shall take all measures necessary to ensure that no collapse or subsidence occurs.

Except where described in the Contract or permitted under the Contract excavation shall not be battered. The sides of all excavations shall be kept true and shall where necessary be adequately supported by means of timber, steel or other type struts, walling, poling boards, sheeting, bracing and the like.

Excavations shall be kept free from water and it shall be the Contractor's responsibility to construct and maintain temporary diversion and drainage works and to carry out pumping and to take all measures necessary to comply with this requirement.

The Contractor shall not deposit excavated materials on public or private land except where directed by the Engineer or with the consent in writing of the relevant authority or of the owner or responsible representative of the owner of such land and only then in those places and under such conditions as the relevant authority, owner or responsible representative may prescribe.

2.6.1 Definition and Classification of Excavated Materials

The following definitions of earthworks materials shall apply to this and other Clauses of the Specification in which reference is made to the defined materials:

(a) "Top soil" shall mean the top layer of soil that can support vegetation

(b) "Suitable material" shall comprise all material which arises from excavations within the Site and which is approved by the Engineer as acceptable for use in the Works

(c) "Unsuitable material" shall mean material other than suitable material and shall comprise:

- Material from swamps, marshes and bogs
- Logs, stumps and perishable materials
- Material susceptible to spontaneous combustion
- Clay of liquid limit exceeding ninety (90) and/or plasticity index exceeding sixty-five (65)

(d) "Rock" or "hard material

Rock or hard material shall be material which cannot be ripped to an average depth of greater than 300 mm by a track type crawler tractor complying with the following:

- In good order complete with all equipment and accessories as supplied;
- Rated 300 BHP flywheel power or over;
- With an operating weight of not less than 37.2 tonnes;
- Equipped with a hydraulically operated single tine ripper compatible with the tractor used; and
- Operated by a qualified operator in accordance with the manufacturer's recommendations and to the satisfaction of the Engineer.

Where it is impractical to prove hard material by the above method then the quantity of hard material, if any, shall be determined by the Engineer.

Where excavation contains individual boulders of hard material greater than 0.3 m^3 each in volume then such boulders shall be classified as hard material.

(e) "Soft material" material shall mean all material other than that defined as "rock" or "hard material".

2.7 Excavation in Excess

If any part of any excavation is in error excavated deeper and/or wider than is required the extra depth and/or width shall be filled with Grade C15P concrete or compacted granular or other approved fill to the original formation level and/or dimensions as the Engineer directs.

In pipe trenches where the pipe is not bedded on or surrounded with concrete, excess excavation shall be filled with compacted granular material. Excess excavation in rock trenches shall be filled with concrete (15N/mm2 compressive strength) up to 150mm below the pipe invert.

2.8 Mechanical Excavation

Mechanical excavation shall be employed only if the subsoil is suitable and only in such manner which will allow adequate support of the excavations. The Contractor shall ensure that there are no pipes, cables, mains or other services or property which may be disturbed or damaged by its use.

2.9 Excavation for Pipe laying

The width of trench excavation shall be the minimum required for efficient working after allowance has been made for any timbering and strutting, and shall not exceed the widths described in the Contract. At any one spread the maximum length of open trench shall not, without the prior approval of the Engineer, exceed 100 metres.

Trenches in rock for pipes up to 100mm bore shall be excavated to provide a minimum clearance of 100 mm around the outside of the pipe and joints. For pipes exceeding 100mm bore the minimum clearance shall be increased to 150mm.

Where the trench is in rock or rocky ground the Contractor shall excavate the pipe trench to a depth of 150mm below the invert of the pipe and refill with compacted granular fill.

The materials for re-use excavated from trenches shall be stockpiled at the sides of the trench except where this would obstruct any road or footpath and prevent the passage of traffic or pedestrians. In such cases the Contractor shall excavate the trench in such lengths and stockpile the excavated materials at such places as the Engineer may require.

Where excavation for pipe laying is carried out behind thrust blocks on existing pipelines the Contractor shall provide adequate support arrangements to transfer thrusts to the surrounding ground.

2.10 Headings

Excavation for pipes in heading shall be carried out to the approval of the Engineer and to dimensions which will permit a proper inspection to be made. The heading shall be properly and securely timbered. The pipe shall be laid on a minimum thickness of 150mm of concrete. After the pipe has been laid, jointed and tested the heading shall be filled in short lengths not exceeding 1 metre with Grade C15P concrete or as directed. The heading shall be completely filled with concrete and hard filling shall then be rammed into the concrete at the crown of the heading.

Special precautions shall be taken to prevent a slump in the concrete and to ensure that no slips or falls of the heading or in the ground above or in the shafts can take place.

2.11 Approval of Excavation

When excavations have been taken out accurately to the profiles or dimensions required for the work the Contractor shall inform the Engineer who shall carry out an inspection of the excavation. If, after his inspection the Engineer requires additional excavation to be carried out, the Contractor shall do so to such new profiles or dimensions as the Engineer may direct.

2.12 Excavation for Foundations of Structures

The Contractor shall give sufficient notice to the Engineer to enable him to inspect and approve foundations in advance of placement of the permanent works. The Engineer may withdraw his approval if work is not commenced within 48 hours or the formation is subsequently allowed to deteriorate.

If the Engineer directs a bottom layer of excavation of not less than 75mm thickness shall be left undisturbed and subsequently taken out by hand immediately before concrete or other work is placed.

Formations which are to receive concrete blinding or a drainage layer shall be covered with such blinding or layer immediately the excavation has been completed, inspected and approved by the Engineer.

Surfaces against which permanent works are to be placed shall be kept free of oil, water, mud or any material.

No concrete or other materials shall be placed until formations have been approved. Adequate notice shall be given to the Engineer to enable him to examine the formation.

2.13 Rock Surfaces under Concrete Structures

2.13.1 Concrete Placed Directly on Rock

Rock under concrete structures shall be prepared by picking, barring and wedging or other methods which will leave the rock in as sound a condition as may reasonably be expected according to the rock quality.

Rock surfaces shall be thoroughly cleaned by compressed air and water jet or such means as the Engineer my direct before concrete is placed.

2.14 Excavated Materials Suitable for Re-use

In so far as they are suitable and comply with the Specification, materials arising from excavations shall be re-used in the Works.

During excavation, the Contractor shall ensure that all material suitable for re-use are kept separate and set aside and protected as necessary to prevent loss or deterioration.

During excavation of pipe trenches the Contractor shall ensure that all granular or other approved material suitable for filling around and over pipes shall be kept separate and re-used for this purpose.

2.15 Backfilling of Excavations

Backfilling shall be thoroughly compacted in layers not exceeding 150mm compacted thickness and by means which will not damage the Works.

Backfilling of reinforced concrete structures shall be with suitable material approved by the Engineer.

"Granular material" as backfill is defined as unconsolidated quarry dust, gravel, sand or similar in which the clay or silt content is not predominant. The use of angular crushed stone shall not be permitted.

2.16 Pipe Beddings

Unless otherwise specified granular material for beddings shall consist of aggregate to BS EN 12620 and shall conform to the following grading.

Pipe Nominal Diameter (mm)	Max Size (mm)	Grading (mm)
<50	sand	N/A
50	10	10 single-size
80	10	10 single-size

Granular bedding material where specified shall have a Compaction Fraction not greater than 0.3 as ascertained by the test method described below.

Aggregates for flexible pipes shall consist of sub-rounded or rounded material which will not cause damage to or penetrate the pipe material.

Sand bedding material shall consist of approved local sand which material shall have a Compaction Fraction ascertained by the test method described below of not greater than 0.3.

Class A bedding shall consist of Grade C15P concrete bed and surround.

Class A1 bedding shall comprise 120 degrees cradle of Grade C15P insitu un-reinforced concrete under the pipe with selected backfill material to a depth of 300mm above the crown of the pipe.

Class B bedding shall comprise a 180 degrees bed of single-size granular material in accordance with the above table, with selected backfill material to a depth of 300mm above the crown of the pipe.

Class S bedding shall comprise a complete surround of granular material in accordance with the above table to a depth of 150mm above the crown of the pipe.

Class D bedding shall comprise a hand-trimmed natural bottom to the trench with selected backfill material placed around and over the pipe to a depth of 300mm above the crown of the pipe.

Granular bedding and selected backfill material, placed around and to a thickness of 300mm above the crown of the pipes shall be placed simultaneously on both sides of the pipe in layers not exceeding 150mm thickness and compacted by the use of hand rammers taking particular care to compact the material under barrel of the pipe and around joints.

In trenches where there is a continuous accumulation of groundwater, the trench shall after obtaining the approval of the Engineer, be over-excavated by 150mm and shall be backfilled using compacted granular material in accordance with the above table.

If the quantity of suitable material which can be obtained from the excavations is insufficient, the Contractor shall either screen the excavated material or transport suitable material from other excavated or borrow pits on the Site. In cases where insufficient material exists on the Site, the Contractor shall import suitable material after obtaining the written approval of the Engineer.

2.17 Compaction Fraction Test

2.17.1 Apparatus required:

1) Open-ended cylinder 250 mm long and 150mm ± 5mm internal diameter (150mm diameter pipe is suitable);

2) Metal hammer with striking face 38 mm diameter and weighing 1 kg.

3) Ruler.

2.17.2 Method

Obtain a representative sample, more than sufficient to fill the cylinder (viz. about 10kg). It is important that the moisture content of the sample should not differ from that of the main body of material at the time of its use in the trench.

Place the cylinder on a firm flat surface and gently pour the sample material into it, loosely and without tamping. Strike off the top surface level with the top of the cylinder and remove all surplus material. Lift the cylinder up clear of its contents and place on a fresh area of flat surface. Place about one quarter of the material back in the cylinder and tamp vigorously until no further compaction can be obtained. Repeat with the second quarter, tamping as before, and so on for the third and fourth quarters, tamping the final surface as level as possible.

Measure down from the top of the cylinder to the surface of the compacted material. This distance in millimetres divided by the height of the cylinder (250mm) is the Compaction Fraction of the material under test.

To obtain a representative sample about 50kg of the proposed material should be heaped on a clear surface and divided with the spade down the middle into two halves. One of these should then be similarly divided, and so on until the required weight sample is left.

2.18 Selected Backfill Material

Backfill in contact with the pipes shall be selected material and shall not contain larges stones, rocks, tree roots or similar objects which through impact or by concentrating imposed loads might damage the pipes. The material shall be capable of being compacted without the use of heavy rammers and should be free of clay lumps or other material larger than 745mm or stones larger than the maximum particle size specified for pipe bedding.

2.19 Backfilling of Pipe Trenches

The trench above pipe bedding level (300mm above the crown of the pipe) shall be filled with the approved back fill material obtained from the trench excavations, free from clay limps, boulders and rock fragments larger than 150mm.

If the quantity of material which can be obtained from the pipe trench excavation is insufficient, the Contractor shall either screen the excavated material or transport suitable material from other excavations or borrow pits on the Site. In cases where insufficient material exists on the Site, the Contractor shall import suitable material after obtaining the written approval of the Engineer.

The material shall be placed in layers not exceeding 150mm thickness and compacted by the use of rammers to achieve a density of not less than 95% maximum density at optimum moisture content +5% to -2% as determined by the BS Heavy Compaction Test to BS 1377.

For trenches in fields and open areas where agreed by the Engineer the trench backfill shall be compacted to obtain a density of not less than 85% maximum dry density at optimum moisture content +5% to -2% as determined by the BS Heavy Compaction Test to BS 1377.

The density of the compacted fill shall be determined by the Contractor using the "sand replacement" method as directed by the Engineer.

Before backfilling trenches the Contractor shall obtain approval from the Engineer of the methods he proposes to use and shall demonstrate by means of tests that the specified compaction can be achieved. The method of compaction shall at all times be to the approval of the Engineer.

Where ground water conditions are such that the bedding material would be likely to act as a carrier for ground water from higher of lower ground, the Engineer may instruct flow barriers of suitable selected earth or concrete to be inserted in lieu of bedding material. Such barriers to be erected at reasonable intervals close to flexible joints in the pipe.

2.20 Making Good Subsidence after Backfilling

Backfilling, whether in foundations or in pipe trenches, shall be thoroughly compacted by ramming and any subsidence due to consolidation shall be made up with extra compacted material.

Should subsidence occur after any surface reinstatement has been completed the surface reinstatement shall first be removed, the hollows made up, and then the surface reinstatement re-laid.

Any subsidence that occurs adjacent to the Site of the Works which is attributable to the Contractor's activities shall be reinstated to the full satisfaction of the Engineer.

2.21 220 Removal of Timbering from Excavations

Timbering shall be removed from the excavations before or during the process of backfilling except in so far as this removal of timber would be likely to cause damage to adjacent property, structures

or structure foundations in which event the Contractor shall leave in the excavation such timbering as he considers necessary or as may be ordered by the Engineer.

2.22 221 Reinstatement of Surfaces

All surfaces whether public or private that are affected by the Works shall be reinstated temporarily in the first instance and when the ground has consolidated fully the Contractor shall reinstate the surfaces permanently.

Temporary reinstatement and permanent reinstatement of all surfaces, affected by the operations of the Contractor shall be carried out and maintained to the satisfaction of the Engineer and the responsible authority or owner.

Temporary reinstatement shall be carried out immediately the trenches are backfilled. Permanent reinstatement shall not be carried out until the ground has consolidated completely. The Contractor shall inform the Engineer before carrying out this work. In the event of further settlement occurring after completion of the permanent reinstatement the Contractor shall forthwith make good the reinstatement to the approval of the Engineer or responsible authority.

For the purpose of temporary and permanent reinstatement in bitumen and surfaced roads the surface width of trenches shall be increased by 150mm on each side of the trench for a depth of 75mm to provide a solid abutment for the surfacing material.

Reinstatement of surfaced roads shall be carried out to the approval of the relevant authority.

The responsible authority shall have the right to carry out permanent reinstatement at the Contractor's expense.

Trenches in open ground shall be reinstated to the condition in which the ground was before excavation was commenced. The final surface of the trench shall be flush with the surrounding ground.

Should the Contractor not remedy the defect to the Engineer's satisfaction forthwith any remedial work considered necessary may be undertaken by the Employer and/or the responsible authority at the Contractor's expense.

The trenches shall be refilled and rammed solid as specified in the Contract and shall not be topped up above the original surface level to allow settlement.

2.23 Safety of Excavations in Roads

The Contractor shall ensure that trenches and reinstatement are maintained in a safe condition and shall take immediate action to remedy any deterioration which renders the works unsafe. If in the opinion of the Engineer any excavation or reinstatement is in a dangerous condition the Contractor shall immediately remedy the defect. Should the Contractor fail to carry out the reinstatement promptly the work any be carried out by others at the Contractor's expense.

2.24 Forming Banks and Filled Areas

The filling to be used in the embankments and filled areas shall be material selected from that arising from surplus excavation (unless otherwise defined in the Particular Specification), the material being placed according to its nature as shall be directed by the Engineer. The fill shall be placed in layers not exceeding 150mm thick, each layer being thoroughly compacted by an approved roller to the satisfaction of the Engineer.

2.25 Top soiling and Grassing

Surfaces required to be grassed shall be planted with approved local grass at a spacing of 200mm x 200mm. The grassed area shall be replanted if the first or subsequent operation is unfruitful or if for any reason the grass is destroyed. Grassed areas shall be watered and attended until the grass has become well established.

The soiling and planting of the grass in slopes shall be carried out immediately the slope is formed and the grass shall be kept weeded and cut until the work is accepted at the time of the Certificate of Completion.

2.26 Free Draining Fill

Free draining fill for use as backing to wall shall consist of sound hard stone or broken rock or concrete derived from demolition of structures. The particles shall be roughly cubiform and shall be between 75mm and 25mm in size. All smaller particles, Dust, rubbish and organic matter shall be excluded.

2.27 HARD-CORE

Hard-core shall consist of sound hard stone or broken rock or concrete derived from excavations or demolition of structures and shall be graded from 150mm to 50mm in size, except that sufficient but not excessive blinding materials of smaller sizes may be permitted at the discretion of the Engineer.

3 CONCRETE WORKS

3.1 Concrete General

Concrete shall consist of cement, graded aggregate (coarse and fine) and water carefully proportioned, thoroughly mixed, placed and compacted as specified.

The Contractor shall obtain formal approval from the Engineer before pouring any concrete for the permanent works. The Engineer shall allow concreting after ascertaining the required lines and levels, suitability of formwork, availability of required plant and labour, proper fabrication and spacing of the steel bars and quality and quantity of cement and aggregates.

3.2 302.1 Classes and Composition

This Specification includes 4 grades of concrete

- Grade CI5
- Grade C20
- Grade C25
- Grade C30

The grade refers to the 28-day characteristic strength in N/mm^2

The concrete composition shall generally conform to the requirements of the prescribed mix design, as set out in BS 5328 Tables I and 2. Small quantities of concrete may with the approval of the Project Manager be batched in accordance with the Table 3.1 of Nominal Mixes

Table 3.1 Nominal Mixes

Grade of concrete	Approx. volume of Aggregate m^3 per m^3 concrete		Approx. cement per m^3 finished concrete in bags (each 50 kg)	Remarks
	Fine	Coarse		
Cl5	0.450	0. 900	5	Aggregate max. size to be 20 mm. Fine aggregate to Zone M of BS 882 Water not to exceed 28 litres per 50kg of Cement
C20	0.400	0.875	6	
C25	0.375	0.825	8	
C30	0.350	0.725	11	

3.3 Cement

Cement for use in the permanent works shall be Ordinary Portland Cement from approved manufacture and shall comply with BS 12. Where sulphate-resisting cement is specified, it shall comply with BS.4027.

All cements shall be certified by the manufacturers as complying with the requirements of the specification. Before orders are placed the Contractor shall submit details of the proposed supplier(s) together with such information on the proposed methods of transport, storage and certification so that the Engineer may satisfy himself that the quantity and quality required can be supplied and maintained throughout the construction period. Where necessary the Engineer may require representative samples of the proposed cement to be taken and forwarded to a nominated laboratory for analysis and testing before the source is approved.

No cement shall be used in the Works until deemed satisfactory by the Engineer.

3.4 Supply of Cement

Cement shall be obtained from one manufacturer unless otherwise 78alvanizin by the Engineer. Should the use of cement from different manufacturers be 78alvanizin, the different supplies of cement shall be stored separately and shall not be mixed.

The Contractor shall supply to the Engineer copies of the manufacturer's test certificates certifying that each consignment of cement has been tested and analysed in accordance with Clause 3.5 of the specifications, and that the results comply in all respects with the above standards. Each certificate shall state clearly the date of 78alvaniz and the number of bags despatched in each consignment.

Bagged cement shall be delivered in sealed 50 kilogramme sacks. Each bag shall be marked with the parcel number of the cement contained. Bagged cement shall be transported so that at no time is it exposed to damp and so that moisture cannot be absorbed from the atmosphere. Cement in bulk shall be transported in totally enclosed water tight and sealed containers.

If cement is obtained from an intermediate agent, such agent's arrangements for transporting and storing cement shall be to the approval of the Engineer.

3.5 Storage of Cement

The Contractor shall provide sufficient storage capacity on Site to ensure that his anticipated programme of work is not interrupted due to lack of cement. Factors outside the Contractor's control such as transport, weather conditions, holidays and breakdowns shall be taken into account.

Cement delivered to the Site in bulk shall be stored in dry, well ventilated weather proof silos or bins which shall be self clearing. Cement delivered to the Site in bags shall be stored in dry, weather-proof sheds which shall have floors of damp proof construction raised at least 150 millimetres above the surrounding ground.

Cement of different consignments shall be stored separately and consignments shall be used in the same order as they are delivered to the site. No cement shall be stored on the site for longer than three months from the date of 78alvaniz by the manufacturer. If not used within that period, the cement shall be removed from the site.

Any bag of cement which is damaged or found to contain cement which has set or partly set, shall be discarded and not used in the permanent works.

3.6 Testing of Cement

Cement shall be tested by the manufacturer. If the manufacturer's test certificate is not made available, representative samples shall be taken from different bags or containers of each consignment. They shall be suitably packed and sent to an approved laboratory for testing to prove the cement's compliance with the specified standards.

The Engineer may require cement to be tested after its delivery to the site. Any cement which has been in store at the site for longer than one month shall be re-tested.

The Engineer may take samples of cement from cement bins or bagged cement, from a parcel of cement after its delivery to the site, or from a parcel of cement which has been stored at the site for longer than one month.

In addition to the manufacturer's tests the Engineer may require the following tests to be carried out:

(a) Comprehensive strength on mortar cubes in accordance with Method 1 of Clause 6A of BS.12

(b) Soundness in accordance with Clause 9 of BS.12.

Any cement which fails to meet the specified requirements shall not be used in the Permanent Works.

3.7 Aggregate for Concrete

3.7.1 General

Aggregates for concrete shall comply with BS 822, and shall be obtained from a source or sources approved by the Engineer and shall be transported and stored in such a manner as will prevent:

(a) Contamination of the aggregates from the ground, rubbish, vegetation, dust or any other foreign material.

(b) Segregation.

(c) Intermixing of aggregates of differing characteristics.

Before aggregates from each source are approved for use in the Permanent Works, tests shall be carried out at an approved testing laboratory on representative samples submitted by the Contractor to check that the aggregates comply with the requirements of the Specification.

During concreting operations, tests shall be carried out to check that aggregates delivered for use in the Permanent Works comply with the requirements of the Specification.

Sampling and testing of aggregates for concrete shall be carried out in accordance with the requirements of BS 812 except where described otherwise.

Moisture contents of aggregates shall be determined as the moisture content of the aggregate compared with that of the aggregate in the saturated surface-dry condition. Specific gravities of aggregate shall be determined on aggregate in the saturated surface-dry condition.

Aggregates shall be stored on a clean, free draining surface. The various types and sizes of aggregates shall be kept separate from each other and each stockpile shall be kept as large as possible to maintain a reasonably uniform content in the aggregate.

3.7.2 Fine Aggregates

Fine aggregates shall be clean and durable and shall be natural sand, crushed gravel sand or crushed rock sand complying with BS 882. All the material shall pass through a 5 millimetre BS sieve and the grading shall be in accordance with Zones 1, 2 or 3 of BS 882. In order to achieve an acceptable grading, it may be necessary to blend materials from more than one source.

As an alternative, fine aggregate for mortar only shall comply with BS 1199 and 1200.

The fine aggregate shall not contain iron pyrites or iron oxides. It shall not contain mica, shale, coal or other laminar, soft or porous materials unless the Contractor can show by tests on finished concrete as set out in BS 1881 that the presence of such materials does not adversely affect the properties of the concrete.

The proportion of clay, silt and other impurities passing a 75 microns BS sieve shall not exceed three per cent for natural or crushed gravel sand or 15 per cent for crushed rock sand. The shell content shall not exceed 15 per cent by weight.

Chlorides soluble in a 10 per cent solution by weight of nitric acid shall not exceed 0.05 per cent by weight expressed as chloride ion when tested as set out in BS 812, subject to the further restriction given in the note on total chloride content in sub-clause 3.5.5.

Soundness: After five cycles of the test set out in ASTM C88-76, the aggregate shall not show a weight loss of more than 10 per cent.

Samples taken from the fine aggregate shall pass the colour test for organic impurities described in sub-clause 3.6.4.

Tests on fine aggregates shall be carried out daily or as required by the Engineer on site during concreting operations as follows:

(a) Sieve analysis

(b) Moisture content. An approved "rapid" test may be used for this test.

(c) Percentage of material passing a 75 microns BS sieve by the Field Settling Test, checked when necessary by the Decantation Method.

(d) Test for organic impurities as described in sub-clause 3.5.4.

The Contractor shall arrange to carry out the following tests when requested by the Engineer:

(e) Specific gravity and water absorption.

(f) Bulk density.

(g) Other tests described in BS 812.

3.7.3 Coarse Aggregates

Coarse aggregates shall be clean, hard and durable crushed rock, crushed gravel or natural gravel complying with the requirements of BS 882. The material shall be frost resistant and shall not contain any iron pyrites, iron oxides, flaky or laminated material, hollow shells, coals or other soft or porous material, or organic matter. The pieces shall be predominantly angular, rounded or irregular as defined in BS 812.

Coarse aggregate shall be supplied in the nominal sizes called for in the Contract and shall be graded in accordance with BS 882 for each nominal size.

The proportions of clay, silt and other impurities passing a 75 microns BS sieve shall be not more than one per cent by weight.

The content of hollow and flat shells shall not be such as will adversely affect the concrete quality when tested as set out in BS 1881. The total shell content shall not be more than the following:

- 40mm nominal size and above 2 per cent of dry weight
- 20mm nominal size 5 per cent of dry weight
- 10mm nominal size 15 per cent of dry weight

Chlorides soluble in a 10 percent solution by weight of nitric acid shall not exceed 0.03 per cent by weight, expressed as chloride ion when tested as set out in BS 812 but subject also to the further restriction on total chloride content given in sub-clause 3.5.5.

When tested in accordance with ASTM C289, the aggregate shall be non-reactive.

Soundness: After 5 cycles of the test set out in ASTM C88-76, the aggregate shall not show a weight loss of more than 12 per cent.

Flakiness Index: When tested in accordance with BS 812 shall be as set out hereunder:

- 40mm nominal size and above Not more than 40
- 20mm nominal size and below Not more than 34

If the flakiness index of the coarse aggregate varies more than five units from the average value of the aggregate used in the approved trial mix, a new set of trial mixes shall be carried out in the workability of the mixes have been adversely affected by such variation.

Impact Value: Not more than 45 per cent when tested in accordance with BS 812.

Ten per cent fines value: Not less than 50 kilonewtons when tested in accordance with BS 812.

Shrinkage: When mixed with other ingredients in the approved proportions for concrete and tested as set out in BS 1881, the shrinkage factor shall not exceed 0.05 per cent.

Water absorption: The aggregate shall not have a water absorption of more than 2.5 per cent when tested as described in BS 812.

Tests on coarse aggregate shall be carried out daily or as required by the Engineer on site during concreting operations as follows:

(a) Sieve analysis

(b) Moisture content: An approved "rapid" test may be used for this test.

(c) Percentage of materials passing a 75 microns BS sieve by the Field Settling Test, checked when necessary by the Decantation Method.

The Contractor shall arrange to carry out the following tests when requested by the Engineer:

(d) Determination of flakiness index.

(e) Specific gravity and water absorption.

(f) Determination of "ten per cent fines" and of Los Angeles Abrasion.

(g) Other tests described in BS 812.

3.7.4 Test for Organic Impurities

Aggregates shall be tested for organic impurities by means of discoloration of a sodium hydroxide solution as follows:

A 340 millilitres graduated prescribed bottle shall be filled to the 123 millilitres mark with a sample of the aggregate to be tested. A 3 per cent solution of sodium hydroxide in water shall be added until the volume of the aggregate and liquid after shaking gives a total volume of 194 millilitres. The bottle shall be stoppered, shaken thoroughly and allowed to stand for 24 hours. Should the liquid then be darker than the standard colour solution the aggregate shall not be used for making concrete.

The standard colour solution shall be prepared in a 340 millilitres prescription bottle as follows:

0.g millilitres of a 2 per cent solution of tannic acid in 10 per cent alcohol shall be added to 97.5 millilitres of a 3 per cent solution of sodium hydroxide in water. The mixture shall be shaken and allowed to stand for 24 hours.

A glass of the standard colour may be used in place of the standard solution.

3.7.5 Total Chloride and Sulphate Contents

The total chloride content arising from all ingredients in a mix, expressed as chloride ions as a percentage of the weight of cement in a mix, shall not exceed 0.5 per cent in any one sample nor 0.3 per cent in 95 per cent of the samples tested. For pre-stressed concrete, steam cured concrete or concrete containing sulphate resisting cement or super sulphated cement, the total chloride content shall not exceed 0.5 per cent of the weight of cement in the mix.

The total sulphate content arising from all ingredients in a mix shall not exceed 0.4 per cent by weight of the aggregates or 4 per cent of the weight of cement in the mix, whichever is less. For this purpose the sulphate contents shall be expressed as SO_3 and shall be calculated form the sulphate contents of the cement, aggregates and any admixtures. Where applicable, sulphate contents shall be determined in accordance with tests described in BS 1047 and 3892.

Pulverised fuel ash shall not be used in conjunction with a cement complying with the requirements of BS 4027 in concrete required to be resistant to sulphates.

3.8 Admixtures

Admixtures for improving workability, accelerating or retarding setting of concrete, or for any other purpose, shall only be used with the Engineer's written approval. Calcium chloride or admixture containing chlorides will, however, not be approved.

The Contractor shall submit samples of the admixtures he proposes to use to the Engineer for testing. If an admixture is approved for use it shall be obtained from an approved supplier and the Contractor's arrangement for measuring, mixing and adding the admixture to the concrete batch shall be strictly in accordance with the manufacturer's instructions or recommendations and subject to the approval of the Engineer.

The proportions of the concrete mixes and water/cement ratio shall be adjusted to the satisfaction of the Engineer so that the strength of the concrete with admixture is at least equal to the strength of the equivalent concrete without admixture.

3.9 Water for Concrete

Clean fresh water is to be used for the mixing of all concrete and mortar, and is to be from a source approved by the Engineer. If required by the Engineer, samples shall be taken from the proposed source of supply and submitted to a nominated laboratory for testing in accordance with BS 3148, "Methods of test for water for making concrete" and on the results of these tests the Engineer will decide whether the source is acceptable.

3.10 Concrete Mixes

The design of concrete mixes shall be the sole responsibility of the Contractor, but may be undertaken in conjunction with the Engineer. Concrete mixes shall be designed mixes in accordance with the requirements of BS 5328 having the characteristics specified in Table 3.1 of this Specification. Concrete for use in water retaining structures shall comply with BS 8007.

Evidence shall be submitted to the Engineer, for all classes of concrete to be used, showing that at the intended workability the proposed mix proportions and production methods will produce concrete of the required quality.

The following information shall be provided before any designed mix is supplied:

(a) Nature and source of each material.

(b) Full details of tests on trial mixes including workability.

(c) Proposed quantities of each ingredient for one cubic metre of fully compacted concrete.

No change in the approved mix design will be permitted, unless the Contractor carries out trials on the proposed mix design to show that compliance with this Specification can be maintained.

Mix design shall in all cases be subject to the approval of the Engineer, but such approval shall in no way relieve the Contractor of his responsibility for the design and production of concrete in compliance with this Specification.

3.11 Trial Mixes

At least six (6) weeks before commencing the placing of any concrete in the works, trial mixes shall be prepared for each class of concrete to be used on the works. Three (3) batches of each class of concrete shall be made using materials typical of the proposed supply and under full scale production conditions.

The workability of each of the trial batches shall be determined and three (3) cubes made from each batch for testing at 28 days. A further three (3) cubes made from each batch may be made for tests at an earlier age if required.

The trial mix proportions shall be approved if the average compressive strength of the nine (9) cubes tested at 28 days exceeds the specified characteristic strength by 3 Newtons per square 83alvanizin, or if nine tests at an earlier age indicate that it is likely to be exceeded by this amount.

To demonstrate that the maximum free water/cement ratio is not exceeded, two batches of concrete shall be made in a laboratory with cement and surface-dry aggregate known from past records of the supplier of the material to be typical. The proposed mix proportions will not be accepted unless both batches have the cement content specified and free water/cement ratio below the maximum specified in Table 3.2.

Table 3.2 — Classes of Concrete

Class	Characteristic Compressive Strength N/mm^2	Maximum Free Water/cement Ratio	Minimum Cement Content Kg/m^3	Maximum Cement Content Kg/m^3	Maximum Aggregate Size mm
C25/10/A	25	0.55	360	400	10
C25/20/A	25	0.55	360	400	20
C25/20/B	25	0.55	290	400	20
C25/20/C	25	-	240	540	20
C20/20/B	20	0.55	290	400	20
C20/40/B	20	0.55	260	400	40
C20/40/C	20	-	220	540	40
C15/40/C	15	-	180	540	40
C15/20/C	15	-	180	540	20
C10/40/C	10	-	150	540	40

A, B and C denote exposure conditions for the finished concrete as defined in BS 8007.

3.12 Testing of Concrete

3.12.1 General

All concrete shall be sampled and tested in accordance with the requirements of BS 1881 unless otherwise stated in this Specification or instructed by the Engineer.

The Contractor shall allow for all the necessary labour, materials, plant and equipment necessary for the regular sampling and testing of concrete to be placed in the Works.

3.12.2 Cement Content

Tests shall be carried out as required by the Engineer to determine the cement content of the mix. The cement content of any batch of concrete shall not be less than the specified minimum value minus 5 per cent of that value nor more than the specified maximum value plus 5 per cent of that value.

3.12.3 Workability

The workability of the concrete shall be measured as required by the Engineer by slump tests or compaction factor tests and shall be within the following limits:

Slump	±	25mm or ± one third of required value whichever is greater.
Compacting Factor	±	0.03 where required value is 0.90 or more
	±	0.04 where required value is 0.90 to 0.80
	±	0.05 where required value is 0.80 or less

The required value shall be that which has been accepted under Clause 3.8 of this Specification.

3.12.4 Water/Cement Ratio

The water/cement ratio shall be determined as required by the Engineer and shall not exceed the specified maximum value by more than 5 per cent of that value.

3.12.5 Compressive Strength

Samples of concrete shall be taken for compressive strength at a rate of one sample per 15 cubic metres of concrete placed or 15 batches of concrete placed whichever is the lesser volume. A greater frequency of sampling may be instructed by the Engineer until compliance with specified strength requirements has been confirmed for each class of concrete used in the Works.

Two test specimens shall be prepared from each sample and shall be cured for 28 days, or by any other method approved by the Engineer that enables the prediction of 28-day strength at an earlier time.

On completion of curing, the two test specimens shall be tested. Provided the difference between the two results does not exceed 14 per cent of the mean of the two results, the mean shall be taken as the test result. Where the difference between the two results exceeds 14 per cent of their mean, the lower of the two results shall be taken as the test result.

Compliance with the specified strength may be assumed if the conditions given in both (a) and (b) below are satisfied.

(a) The average compressive strength determined from any one group of four consecutive 28-day test results exceeds the specified characteristic strength by not less than 3 Newtons per

square millimeter for classes of concrete C20, C25 and C30 and not less than 2 Newtons per square millimeter for class C15 concrete.

(b) Each individual 28-day test results is greater than the specified characteristic strength minus 3 Newtons per square 85alvanizin for classes of concrete C20, C25 and C30 or 2 Newtons per square 85alvanizin for class C15 concrete.

If only one tests result fails to meet the second requirement then that result may be considered to represent only the particular batch of concrete from which that sample was taken provided the average strength of the group satisfies the first requirement.

If more than one result in a group fails to meet the second requirement or if the average strength of any group of four consecutive test results fails to meet the first requirement, then all the concrete in all the batches represented by all such results shall be deemed not to comply with the strength requirements. For the purposes of this Clause, the batches of concrete represented by a group of four consecutive test results shall include the batches from which samples were taken to make the first and the last tests in the group of four, together with all the intervening batches.

3.13 Failure to Comply with Specified Requirements

Failure of concrete to comply with the specified requirements will result in it being classified as defective work. Immediately on notification by the Engineer that concrete work is defective, the Contractor shall take all measures necessary to improve concrete quality before further concrete is placed in the Works. If required by the Engineer, the rate of sampling of concrete shall be increased until adequate control is again established. Tests shall be carried out on the defective concrete or test cores taken from it to establish its in-situ strength. If the results of these tests satisfy the Engineer that the defective concrete will fulfil its design function then it may be accepted. If not, the Contractor shall propose strengthening or remedial work where possible or shall remove the defective concrete from the Works.

3.14 Concrete Returns and Records

The Contractor shall send weekly to the Engineer a return showing the quantities of cement and the number of mixings of each class of concrete used in each section of the Works.

Records shall be kept by the Contractor of the positions in the Works of all batches of concrete, of their class and of all test cubes or other specimens taken from them. Copies of these records shall be supplied to the Engineer.

3.15 Plant, Equipment and Construction Procedure

The design, layout, installation and operation of plant and equipment for processing, handling, transporting, storing and proportioning concrete ingredients and for mixing, transporting and placing concrete shall be to the satisfaction of the Engineer. Before the plant and equipment is ordered or delivered to site, the Contractor shall submit to the Engineer drawings showing the proposed arrangements of the plant together with detailed descriptions of the equipment proposed

3.16 Batching

The aggregates and cement shall be proportioned by means of efficient weigh batching machines except when the Engineer has approved the use of volume batching. The machines shall be carefully maintained and cleaned and they shall be provided with simple and convenient means of checking the accuracy of the weighing mechanism, and they shall be checked when required by the Engineer.

For volume batching suitable gauge boxes shall be used.

3.17 Mixing Concrete by Machine

Where the concrete is to be mixed in machines, these shall be of the batch mixing or other approved type. The machines shall ensure that all the concreting materials including the water are thoroughly mixed together before any portion of the mixture is discharged. The mixing time shall not be less than thirty seconds per cubic foot (30sec/cft) of concrete, with a minimum of three minutes (3min) mixing time per batch. The machines must be capable of discharging their contents while running.

3.18 Mixing Concrete by Hand

Where it is not possible to employ machine mixing and approval has been obtained from the Engineer, concrete shall be mixed by hand as near as practicable to the site where it is to be deposited. Clean mixing bankers or platforms of sufficient area for the proper execution of the work shall be provided. These platforms if constructed of timber shall consist of planks closely jointed so as to avoid the loss of any grout or liquid from the wet concrete. The whole of the aggregate and cement shall be turned over on the banker in a dry state at least twice. The water shall then be added gradually through a rose head, after which the materials shall again be entirely turned over in a wet state at least three times.

3.19 Preparation of Surface to Receive Concrete

Foundations which are to receive concrete shall be properly drained and dewatered so that no water runs over or stands on a surface on which concrete is being placed. If required by the Engineer drains provided through or beneath concrete for the temporary conveyance of water shall afterwards be completely sealed to the Engineer's approval.

Before deposition of concrete against rock, the rock surface shall be thoroughly wetted and cleaned by the application of water, or of water and air, under pressure. No concrete shall be deposited until the surface has been cleaned and passed as satisfactory by the Engineer.

Faults or seams in the rock shall be cleaned to a depth satisfactory to the Engineer and if necessary stemmed with cement mortar of an approved mix.

Before any steel reinforcement is embedded in the concrete any loose mill scale, loose rust and any oil, grease or other deleterious matter shall be removed. Partially set concrete which may adhere to the exposed bars during concreting operations shall likewise be removed.

3.20 Authority to Commence Placing of Concrete

The Contractor shall give the Engineer at least 24 hours' notice of his intention to place concrete in a particular section of the Works. Before concrete is placed the Contractor shall apply to the Engineer for approval of the cleanliness, alignment and suitability of surfaces against which the new concrete is to be placed and of the fixing of formwork, reinforcement, embedded parts and the like and he shall obtain written permission from the Engineer to proceed with concreting.

The Contractor shall carefully plan his concreting operation to ensure, where possible, that these operations are completed within the normal working day.

3.21 Dimension of Concrete Pours and Programme of Placing

Unless otherwise approved by the Engineer concrete shall be cast in one operation between external faces of concrete and joints shown on the Drawings or between construction joints or both.

The Contractor shall submit and obtain the Engineer's approval to a detailed concreting programme and his proposals for the location of construction joints.

3.22 Transport and Deposition of Concrete

Concrete shall be transported and deposited in such manner as to prevent segregation, loss of materials or contamination with foreign matter. The means of transport of concrete shall be subject to the approval of the Engineer. The containers for conveying the concrete shall be thoroughly cleaned immediately after use and sides dampened before work is started or restarted to prevent cement and fine material in the first batch adhering to the sides. Adequate precautions shall be taken to protect the concrete against wetting or drying out through exposure to the weather and to prevent segregation and consolidation of the mix due to prolonged jolting of the concrete. Concrete shall be placed in its final position and fully compacted before the onset of initial set. Wherever possible, concrete shall be deposited vertically in the final position required and shall not be dropped through a greater height than 1.5 m. Where necessary, bins, drop chutes, down pipes or baffles shall be provided to prevent segregation of the material. Drying out of fresh concrete before deposition shall be prevented by the provision where necessary of suitable covers. Loss of slump during transport and deposition of the concrete shall not exceed 25 millimeters.

Concrete shall not be placed in standing or running water unless so specified. Where concrete has to be placed under water, the Contractor shall submit to the Engineer his proposals indicating the methods and equipment to be employed. The concrete shall be deposited by bottom discharging watertight containers or through funnel shaped tremies which are kept continuously full with concrete up to a level above the water and which shall have the discharging bottoms immersed in the concrete in order to reduce to a minimum the contact of the concrete with the water. Special care shall be taken to avoid segregation and additional cement of about 25% must be added.

3.23 Distribution and Spreading of Concrete

Concrete shall be placed in layers not exceeding 500 millimeters in depth approximately parallel to the horizontal or inclined construction joint planes. These layers shall be deposited from one face to the other until the full height of the lift is reached. Each layer shall be deposited on the previous one before the latter has taken its initial set and the exposed area of fresh concrete shall be maintained to the practical minimum. In order to accomplish this timing a new layer may be started before the previous layer is completed.

The face from which placing of concrete is to commence shall be selected so that if an emergency should occur which prevents the layer being completed the vertical construction joint will be formed in a structurally acceptable position.

Concrete shall not be placed during rain sufficiently heavy or prolonged to wash mortar form coarse aggregate on the exposed sloping faces of fresh concrete unless adequate shelter is provided.

Concrete shall not be placed against any surface (including formwork, reinforcement, embedded steelwork, adjacent concrete or rock) which during hot weather is not adequately dampened to prevent excessive absorption of water from the fresh concrete.

Once commenced, concreting shall be carried on as continuous operation between pre-arranged construction, expansion or contraction joints save only if an emergency occurs and interruption is unavoidable. The Contractor shall have readily available suitable prefabricated formwork for stop ends to form emergency vertical construction joints and, in the event of such an interruption

occurring, the concrete already placed shall be properly finished up to the stop end and to a horizontal or inclined surface as directed by the Engineer. In water retaining structures the Contractor shall propose methods of making the joint watertight.

Concrete shall be placed carefully so as not to displace the formwork or reinforcement.

3.24 Compaction of Concrete

The Contractor shall thoroughly compact all concrete immediately after it has been placed in position. Unless otherwise 88alvanizin by the Engineer, compaction shall be accomplished with the aid of immersion vibrators as specified below, together, if necessary, with rods, shovels and the like. Particular care shall be taken to fill all voids and to work the concrete against rock and existing concrete surfaces, round any reinforcement and embedded fixtures and into the corners of the formwork.

If the Contractor does not wish to use immersion vibrators for any portion of the works he shall submit his proposals for alternative vibrators or compaction equipment and shall receive the Engineer's approval to the equipment before commencing to concrete the portion concerned.

Vibrators shall be of a type and size adequate for the portion placed. Vibrators shall operate at a frequency of between 7000 and 10000 impulses per minute. The Contractor shall ensure that vibrators are operated at pressures and voltages not less than those recommended by the manufacturer in order to ensure that the compactive effort is not reduced.

A sufficient number of vibrators shall be operated to enable the entire quantity of concrete being placed to be vibrated for the necessary period and in addition stand-by vibrators shall be available for instant use at each concreting place. The length and diameter of the vibrating element of immersion vibrators shall be sufficient to penetrate through the layer of concrete being placed and re-vibrate the upper portion of the underlying layer of concrete.

Only men experienced in the use of vibrators shall be employed on this type of work.

Vibration shall be continued at each point until the concrete ceases to contract, a thin layer of mortar has appeared on the surface and air bubbles have ceased to appear. The period of vibration necessary shall be determined by trial in the presence of the Engineer. Vibration shall then be continued for this period at each point before any further concrete is superimposed.

Immersion vibrators shall be inserted vertically to penetrate into the layer underneath at regular intervals, which shall not exceed the distance from the element over which vibration is visibly effective and in any case shall not exceed 700 millimetres. Vibrators shall not be used to move concrete laterally and shall be withdrawn slowly to prevent the formation of voids. Vibrators shall not be applied to reinforcement or other embedded items.

3.25 Protection of Concrete

Freshly placed concrete shall be protected from rainfall and from water running over the surface until it is sufficiently hard to resist damage from this cause.

No traffic shall be allowed on any concrete surface until such time as it is hard enough to resist damage by such traffic.

Concrete placed in the Permanent Works shall not be subjected to any structural loading until it has attained at least its nominal strength.

If the Contractor desires to impose structural loads on newly placed concrete, he shall make at least three test cubes and cure them in the same conditions as the concrete they represent. These cubes shall be tested singly at suitable intervals in order to estimate the time at which the nominal strength is reached.

3.26 No Partially Set Concrete shall be used

All concrete must be placed and compacted in its final position within thirty minutes (30min) of discharge from the mixer unless otherwise approved. No partially set material shall be used in this work.

3.27 Plum Concrete

Plums shall be hard clean natural stones embedded in mass concrete during the placing of the concrete. Unless otherwise shown on the drawings, the plums shall not be larger than one third of the cross section of the concrete and should not be placed closer than 150 mm to each other vertically and 100mm horizontally. The volume of plums shall unless otherwise specified, not exceed forty per cent (40%) of the mass concrete volume and care shall be taken to ensure that the minimum cover over any plums is 100mm.

3.28 Concrete canal lining

3.28.1 Earth filling

The canal shall be properly formed to the required shape, grade and alignment. Earth filling and compaction for the sub-grade on canal base and banks shall be carried out to ensure a firm foundation in accordance with the provisions of this Specification covering Earthworks (embankment to be thoroughly compacted by hand-tamping, rolling or water soaking. New embankments should be in compacted in 150mm layers). The sub- grade shall be wetted several hours before the lining to ensure that the sub-grade is saturated at the commencement of lining.

3.28.2 Concrete works

Concrete works in lining shall be carried out in accordance with the provisions of this Specification covering Concrete Works. Special attention shall be paid to the concrete mix to ensure that it is properly controlled to avoid it creeping downward from the sides.

The thickness of the concrete lining shall be 75mm or as directed by the Engineer. Where a completed section has a thickness less than that specified, it will be removed and replaced. Plastering or other methods of building up the lining thickness will not be allowed.

Concrete canal linings will be placed in-situ and in panels of 2 — 3 m lengths and be constructed in alternate bays, so that at least 24 hours elapse between the completion of one panel and the start of lining of an adjacent panel. This will be in order to maintain uniform spacing for the joints. Screed guides shall be used to maintain the desired grade and thickness of the lining during laying of the concrete. Any other method of constructing the lining will require the approval of the Engineer. In forming the concrete (screeding operation) at least three passes with a wooden plank, or any other method chosen by the contractor and approved by the Engineer, are necessary in order to maintain the shape and the inside of the canal. After completing the required number of passes, the concrete will be immediately floated (smoothening of the surface with a wooden plank) and troweled to produce the specified finish. Striking off, or removal of any concrete from the consolidated surface by means other than those used in the construction, will not be permitted.

Curing of concrete shall be carried out in accordance with the provisions of this Specification covering Concrete Works (proper curing by keeping the concrete damp by sprinkling or by covering with wet gunny bags).

3.28.3 Expansion and shrinkage joints

Expansion and shrinkage joints shall be formed at 2 — 3m intervals in the position and manner shown on the Drawings or as directed by the Engineer. Grooves shall be formed on the joints as shown in the drawings. The minimum Width:Depth (W/D) ratio of the sealant material shall be 2:1. The remaining thickness shall be filled with joint filler material as shown in the drawings. The edges of the previously laid concrete shall first be painted with a suitable sealing compound preferably Sika Primer 3 or equivalent to prevent bonding. After the curing period, the grooves shall be filled with the hot sealing compound (Sikaflex-11FC or equivalent) at the rate of about 0.25 litres per square metre over a primer coat.

After the sealant has been applied to the joint, it can be smoothed using a spatula lubricated with diluted washing-up liquid (10:1 dilution).

3.29 Concreting in Adverse Weather

No concreting will be allowed to take place in the open during storms or heavy rains. Where strong winds are likely to be experienced additional precautions to ensure protection from driving rain and dust shall also be taken.

The Engineer may withhold approval of commencement of concreting until he is satisfied that full and adequate arrangements have been made.

3.30 Concreting at Night or in the Dark

In general, concrete works will not be permitted to be carried out at night.

Where approval has been given to carry out concreting operations at night or in places where daylight is excluded, the Contractor is to provide adequate lighting at all points where mixing, transportation and placing of concrete are in progress.

3.31 Concreting in High or Low Ambient Temperature

Where the ambient temperature exceeds thirty-two degrees Celsius (32°C), the Contractor shall take special measures in the mixing, placing and curing of concrete. The temperature of the concrete when deposited shall not exceed thirty degrees Celsius (30°C). The Contractor shall carry out all necessary special measures to ensure that the maximum concrete temperature after placing shall not exceed fifty degrees Celsius (50°C) or thirty degrees Celsius (30°C) above the concrete temperature at the time of placing, whichever is lower.

During placing suitable means shall be provided to prevent premature stiffening of the concrete placed in contact with hot surfaces.

The Contractor shall not mix and place concrete when the ambient temperature falls below three degrees Celsius (3°C).

3.32 Curing and Protection

Concrete shall be protected during the first stage of hardening from the harmful effects of sunshine, drying winds, cold, rain or running water. The Contractor shall pay particular attention to the need to protect concrete immediately after the finishing operation and prior to its final set and shall

submit their proposals to achieve this protection for the Engineer's approval. Protection of concrete which has achieved its final set shall consist of one or more of the following:

(a) A layer of sacking, canvas, hessian, straw mats or similar absorbent material or a layer of sand, kept constantly moist by spraying with water as necessary for fourteen (14) days or such periods as may be directed by the Engineer.

(b) After thoroughly wetting, a layer of approved waterproof paper or plastic membrane kept in contact with the concrete for fourteen (14) days or such period as may be directed by the Engineer.

The use of saline water for curing purposes will not be permitted.

3.33 Steel Reinforcement

3.33.1 Materials

Unless otherwise directed or otherwise shown on the Drawings, hot rolled high yield reinforcement shall be used throughout the works.

Where required, mild steel reinforcement, medium tensile steel reinforcement and high tensile steel reinforcement shall comply with BS 4449. Cold twisted steel wire for the reinforcement of concrete shall comply with BS 4482.

All reinforcement shall be sourced from an approved manufacturer and, if required by the Engineer, the Contractor shall submit a test certificate of the rollings. The Contractor shall, when requested by the Engineer, provide sample pieces 1.0 metre long for testing.

Tying wire shall be 1.6 mm diameter soft annealed iron wire.

Before any steel reinforcement is embedded in the concrete any loose mill scale, loose rust and any oil, grease or other deleterious matter shall be removed. Partially set concrete which may adhere to the exposed bars during concreting operations shall likewise be removed.

3.33.2 Fabricating Reinforcement

Bar reinforcements shall be bent to the shapes shown on the Drawings and bending schedules. All bars shall be bent cold, unless otherwise permitted by the Engineer. All hooks, bends, and the like, unless otherwise shown on the Drawings, shall be to BS 8666. The Contractor shall satisfy himself as to the accuracy of any bar bending schedules supplied and shall provide all reinforcement in accordance with the Drawing. Bar reinforcement shall be bundled and each bundle of steel shall be tagged with identifying tags, showing the size and mark of the bar. The bundles shall be stacked clear of the ground in easily accessible positions that do not in any way hinder the progress of work and shall be kept clean.

3.33.3 Fixing Reinforcement

When placed in the work reinforcement shall be free from coatings or dirt, detrimental scale, paint, oil or other foreign substances. When steel has on its surface rust, loose scale and dust which is easily removable, it may be cleaned by a method approved by the Engineer.

All reinforcing bars, ties, links and fabric shall be fixed in the positions shown on the Drawings within the tolerances specified in BS 8666. In no case shall the cover specified on the Drawings be increased by more than 5 millimetres.

Displacement of reinforcement beyond the specified tolerance shall be prevented by supporting the bars sufficiently and securely fixing them together at intersections where necessary.

The ends of all tying wires shall be turned into the body of the concrete and not allowed to project towards the surfaces of the concrete.

Spacers shall be used to maintain the cover to all steel and shall be made of dense cement mortar of one part cement and two parts sand.

Spacers shall be triangular in section and only one acute edge shall bear against the formwork, the flat side shall bear against the steel. Wire cast into the blocks to fix them to the reinforcement shall be 1.6 millimetres diameter soft annealed iron. Spacers shall not be used on the wet face of water retaining or water excluding structures. Chairs, stools, etc. shall be used to maintain clearance between two or more layers of reinforcement.

Nothing shall be allowed to interfere with the specified position of reinforcement. The fixing of reinforcement shall be checked before and during concreting, and particular attention shall be given to the position of top steel in cantilever sections. During concrete placing a competent steel fixer shall be in attendance to adjust and correct the position of any reinforcement which may be displaced.

3.33.4 Splicing and Lapping

All reinforcement shall be provided in full lengths as indicated on the Drawings or bending schedules. Splicing of bars, except where shown on the Drawings, shall not be permitted without the written approval of the Engineer. Splices shall be staggered as far as possible. Bar reinforcement shall not be welded without the Engineer's written permission.

In lapped splices, the bars shall be placed in contact and wired together in such manner as to maintain a clearance between bars of not less than 50 millimetres.

Mesh or bar reinforcement shall overlap sufficiently to maintain a uniform strength and shall be securely fastened at ends and edges. The edge lap shall not be less than 40 diameters of the mesh reinforcement bar or two mesh widths whichever is greater.

3.34 Cover to reinforcement

The concrete cover to reinforcement shall be 50 mm unless otherwise shown on the Drawings.

The Contractor shall provide any necessary concrete pads for ensuring the cover is attained and in no case shall timber packing be used.

3.35 Formwork

3.35.1 Definitions

Forms, formwork or shuttering shall mean all temporary moulds forming the concrete to the required shape together with any special lining that may be required to produce the concrete finish specified.

False work or centering shall mean the furnishing, placing and removal of all temporary construction such as framing, props and struts required for the support of forms.

3.35.2 Materials

The formwork may of seasoned, planed, tongued and grooved timber, plywood, block board, tempered hardboard, steel or as specified on the Drawings.

All timber used for formwork shall be sound wood, well-seasoned and free from loose knots, shakes, large checks, warping and other defects. Before use on the work, it shall be properly stacked and protected from injury from any source. Any timber which becomes badly warped or cracked, prior to the placing of concrete shall be rejected. All formwork for outside surfaces before final ground level shall be either tongued and grooved or provided with a suitable lining to produce a smooth surface finish.

3.35.3 Forms

All forms shall be of wood or metal and shall be built grout-tight and of sufficient rigidity to prevent distortion due to the pressure of the concrete and other loads incidental to the construction operations. Forms shall be constructed and maintained so as to prevent warping and the openings of joints due to shrinkage of the timber.

The forms shall be substantial and unyielding and shall be so designed that the finished concrete will conform to the proper dimensions and contours. The design of the forms shall take into account the effect of vibration of concrete as it is placed.

All formwork shall, unless otherwise directed, be provided with 25 millimetres by 25 millimetres angle fillets (chamfers) so as to form splays on internal and external angles.

A grout check formed from 25 millimetres square hardwood timber shall be incorporated in the formwork to provide a clean, level, horizontal joint on exposed concrete surfaces at the top of each lift.

All joints in the formwork shall be either horizontal or vertical. End formwork shall be square across the mass of concrete.

Where concrete is to be deposited to a slope steeper than 20 degrees to the horizontal, top formwork shall be used to enable the concrete to be properly compacted unless the Engineer agrees otherwise.

Openings for the inspection and cleaning of the inside of formwork for walls, piers and columns shall be formed in such a way that they can be closed conveniently before commencing to place concrete.

Form clamps, tie bolts and anchors shall be used to fasten forms. The use of wire ties to hold forms in position during placing of concrete will not be permitted. Tie bolts and clamps shall be positive in action and of sufficient strength and number to prevent spreading or springing of the forms. They shall be of such type that no metal part shall be left within the specified concrete cover. For water retaining sections, methods of fixing the forms which result in holes through the concrete section when the formwork is removed shall not be used and built-in wall ties shall be fitted with water baffles.

All forms for outside surfaces shall be constructed with stiff wales at right angles to the studs and all form clamps shall extend through and fasten such wales.

The shape, strength, rigidity, grout tightness and surface smoothness of forms which are re-used shall be maintained at all times. Any warped, bulged or otherwise damaged timber shall be

replaced. Forms which are unsatisfactory shall not be re-used. If the surface finish on the formed concrete deteriorates as a result of deterioration of the faces of the forms, the Engineer shall instruct that forms be resurfaced, or discarded.

All forms shall be treated with approved mould or similar oil or be soaked with water immediately before placing concrete to prevent adherence of concrete. Any materials which adhere to or discolour concrete shall not be used.

All forms shall be set and maintained true to the line designated until the concrete is sufficiently hardened. Forms shall remain in place for periods which shall be as specified in Clause 3.34. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the Engineer shall order the work stopped until the defects have been corrected.

All formwork shall be approved by the Engineer before concrete is placed within it. The Contractor shall, if required by the Engineer, provide copies of calculations of the strength and stability of the formwork and false work. Notwithstanding the Engineer's approval of these calculations, the Contractor shall be held responsible for the safety and adequacy of formwork.

3.35.4 False work and Centering

Detailed plans for a false work or centering shall be supplied by the contractor to the Engineer at least 14 days in advance of the time the Contractor begins construction of the false work. Notwithstanding the approval of the Engineer of any designs for false work submitted by the Contractor, the Contractor shall be solely responsible for the strength, safety and adequacy of the false work or centering.

All false work shall be designed and constructed to provide the necessary rigidity and to support the loads from the weight of green concrete and shuttering and incidental construction loads.

False work or centering shall be founded upon a solid footing safe against undermining and protected from softening. False work which cannot be founded on satisfactory footings shall be supported on piling which shall be spaced, driven and removed in a manner approved by the Engineer. The Engineer may require the Contractor to employ screw jacks, or hard wood wedges to take up any settlement in the formwork either before or during the placing of concrete.

False work shall be set to give the finished structure the required grade and camber shown on the Drawings.

3.35.5 Forms for Joints

Where permanent or temporary joints are to be made in horizontal or inclined members, stout stopping off boards shall be securely fixed across the mould to form a water-tight joint. The form of the permanent joint shall be as shown on the Drawings.

Where reinforcement or water stops pass through the face of a joint the stopping off board shall be drilled so that the bars or water stop can pass through, or the board shall be made in sections with a half round indentation in the joint faces for each bar so that when placed the board is neat and accurate fit and no grout leaks from the concrete through the bar holes, joints or around the water stop.

3.35.6 Release Agents

Only approved chemical release agents, mould creams (emulsions of water in oil) or oils containing a proportion of surfactant not exceeding 2 percent will be permitted. Water soluble emulsions and oils without surfactant shall not be used. Oil based release agents shall be applied at a rate of 7 square metres per litre one day in advance of concreting, preferably by spray or roller. Chemical release agents shall be applied in accordance with the manufacturer's recommendations.

New timber face work shall be given three coats of release agent before use on the work to ensure uniformity of porosity on the surface.

On no account shall the release agent come into contact with the reinforcement.

3.36 Removal of Formwork

Formwork shall be carefully removed without shock or disturbance to the concrete. No formwork shall be removed until the concrete has gained sufficient strength to withstand safely any stresses to which it may thereby be subjected.

The minimum periods which shall elapse between completion of placing concrete and removal of forms are given in the following Table 3.2, and apply to ambient temperatures higher than 10°C. At lower temperatures or if cements other than ordinary Portland are involved, the Engineer may instruct longer periods.

Compliance with these requirements shall not relieve the Contractor of his obligation to delay removal of formwork until such removal can be completed without damage to the concrete.

Table 3.3 – Formwork striking time

Position of formwork	**Striking Time**
Beam sides, walls and columns	1 to 2 day
Slab soffits — props remain undisturbed	4 days
Beam soffits — props remain undisturbed	7 days
Removal of slab props	14 days
Removal of beam props	21 days

3.37 Surface Finishes

3.37.1 General

After removal of the formwork no treatment of any kind other than that required for curing the concrete shall be applied to the concrete faces until after inspection by the Engineer. All honeycombed areas, deformed surfaces or other defective surfaces shall then be repaired at the direction of the Engineer. Immediately following the Engineer's inspection of surface finish, all tie bolt cavities shall be filled with sand cement mortar and the surface left smooth, sound, even and uniform in colour.

Should the finishes surface either as-stuck or after repair exhibit a non-uniform colour or texture, the Engineer shall have the right to order that the surface be given a skim coat and then painted.

3.37.2 Formed Surfaces

All joints between panels shall be vertical and horizontal unless otherwise directed. Suitable joints shall be provided between sheets to maintain accurate alignment in the plane of the sheets.

For warped surfaces, facings shall be built up of laminated splines cut to make a tight surface which shall then be dressed and sanded to the required curvature.

Type F1: This finish is for surfaces against which backfill or further concrete will be placed. Formwork shall consist of sawn boards, sheet metal or any other suitable material which will prevent the loss of grout when the concrete is being placed.

Type F2: This finish is for surfaces which are permanently exposed to view but where the highest standard of finish is not required. Forms to provide a Type F2 finish shall be faced with wrought thicknesses tongued and grooved boards with square edges arranged in a uniform pattern and close jointed or with suitable sheet material. The thickness of boards or sheets shall be such that there shall be no visible deflection under the pressure exerted by the concrete placed against them. Joints between boards or panels shall be horizontal and vertical unless otherwise directed. This finish shall be such as to require no general filling of surface pitting, but fins, surface discoloration and other minor defects shall be remedied by methods agreed by the Engineer.

Type F3: This finish is for surfaces which will be in contact with water flowing at high velocity and for surfaces permanently exposed to view where good appearance and alignment are of importance. To achieve this finish, which shall be free of board marks, the formwork shall be faced with plywood complying with BS 1088 or equivalent material in large sheets. The sheets shall be arranged in an approved, uniform pattern. Wherever possible, joints between sheets shall be arranged to coincide with architectural features or changes in direction of the surface. Suitable joints shall be provided between sheets to maintain accurate alignment in the place of the sheets. Unfaced wrought boarding or standard steel panels will not be permitted for Type F3 finish. The Contractor shall ensure that the surface is protected from rust marks, spillages and stains of all kinds.

Type F4: This finish is similar to that required for type F3 but is used in places where a first class alignment and a dense surface free from air holes and other defects is required, suitable for the application of decorative finishes, in very high velocity water channels and in other similar circumstances.

3.37.3 Unformed Surfaces

Type U1: This is screed finish for surfaces of roads of foundations, beds, slabs, and structural members to be covered by backfill, subsequent stages of construction, bonded concrete topping or cement mortar beds to receive pavings, and on exposed surfaces of paving where a superior finish is not required. It is also the first stage of Type U2 and U3 finishes. The finishing operations shall consist of levelling and screeding the concrete to produce a uniform, plane or ridged surface, surplus concrete being struck off by a straight edge immediately after compaction.

Type U2: This is a floated finish for exposed surfaces where a hard-smooth steel 96alvaniz surface is not required. Floating shall be done only after the concrete has hardened

sufficiently, and may be by hand or machine. Care should be taken that the concrete is worked no more than is necessary to produce a uniform surface free from float marks.

Type U3: This is a hard-smooth steel 97alvaniz finish for surfaces exposed to water flowing at high velocity. Trowelling shall not commence until the moisture film has disappeared and the concrete has hardened sufficiently to prevent excess laitance from being worked to the surface. The surface shall be 97alvaniz under firm pressure and left free from trowel marks.

Type U4: This finish is similar to Type U3 finish but the permissible tolerances are smaller.

3.37.4 Surface Tolerances

All parts of concrete surfaces shall be in the positions shown on the Drawings within the tolerances set out in Table 3.4 or Table 3.5.

In cases where the Drawings call for tolerances other than those given in Table 3.4 or Table 3.5, the Drawings shall rule.

Where precast units have been set to a specified tolerance, further adjustments shall be made as necessary to provide a satisfactory straight or curved line. When the Engineer has approved the alignment, the Contractor shall fix the units so that there is no possibility of further movement.

Table 3.4 — Surface Tolerances for Formed Surfaces

Type of Finish	**Tolerance in Millimetres (See Note 1)**		
	A	**B**	**C**
FI	10	10	+25 to -10
F2	5	10	+15 to -15
F3	2	5	+10 to -10
F4	See Note 2	2	+5 to -5

Note 1:

The tolerances, A, B and C given in the table are defined as follows:

A is an abrupt irregularity in the surface due to misaligned formwork or defects in the face of the formwork.

B is a gradual deviation from a plane surface as indicated by a straight edge 3 metres long. In the case of curved surfaces, the straight edge shall be replaced by a correctly shaped template.

C is the amount by which the whole or part of a concrete face is displaced from the correct position shown on the Drawings.

Note 2:

Abrupt irregularities are not permitted in a Type F4 finish. Any residual irregularities which remain after removal of formwork shall be removed by grinding to achieve a transition of 1 in 50 between the surfaces adjacent to the irregularity.

Table 3.5 — Surface Tolerances for Unformed Surfaces

Type of Finish	Tolerance in Millimetres (See Note 1)		
	D	**E**	**F**
U1	-	10	+20 to -10
U2	Nil	10	+20 to -10
U3	Nil	5	+12.5 to -7.5
U4	Nil	2	+6 to -4

Notes:

D is the maximum allowable value of any sudden change of level in the surface.

E is the maximum allowable value of any gradual irregularity of the surface, as indicated by the gap between the surface and a 3 metres long straight edge or correctly shaped template placed on the surface.

F is the maximum allowable value of the difference in level or position between a straight edge or correctly shaped template placed on the surface and the specified level or position of that surface.

3.38 Conduits, Box-outs and Apertures

The layout of conduits, box-outs, grooves, apertures and the like shall be as shown on the Drawings or as directed by the Engineer, and shall be subject to inspection and approval by the Engineer before commencing concreting.

Conduits shall be placed as near the centres of members as possible and sufficient space shall be provided between adjacent conduits to prevent difficulties in the placing of concrete.

Box-outs, holes grooves, apertures and the like shall be accurately set out in the formwork prior to placing the concrete. Fixing blocks, ends of brackets, bolts and, where possible, built in parts shall be cast into the concrete at the time of placing. No part of the concrete works shall be cut out for any such item, or for any other reason, without the Engineer's permission.

The Contractor shall ensure that all sub-contractors are informed of his programme for the structural works at the commencement of the Contract and that such sub-contractor's requirements relating to concrete members are approved well in advance. The Contractor shall obtain from all such sub-contractors complete information of their requirements regarding conduits, pipes, fixing blocks, ducts, holes and any other items to be cast into or formed in the concrete members. Failure of a sub-contractor to sub-contractor to supply such information shall not be allowed to delay the progress of the Works.

3.39 Construction joints

Concreting shall be carried out continuously up to construction joints, the position and arrangement of which shall be as indicated on the Drawings or as previously approved by the Engineer. The Contractor is to allow for working beyond the ordinary working hours where necessary in order

that each section of concrete may be completed without any lapse while the work is in hand. All construction joints are to be formed square to the work.

Where vertical construction joints are required, the joint face of the first stage concrete shall be finished against a stopping-off board, or vertical end shutter, suitably notched to pass the reinforcement. When the concrete is hard and the shutter is removed, the whole joint surface shall be thoroughly hacked and roughened or scabbled with suitable tools so that no smooth skin of concrete is visible and that all aggregates and solid matrix around them is exposed.

For horizontal or slightly inclined construction joints, the surfaces shall preferably be prepared when the concrete has set but not hardened by jetting with a fine spray of water and brushing with a stiff brush to remove the smooth skin and expose the aggregate without disturbing it. Where this treatment is impractical and work is resumed after the concrete surface has hardened, a similar procedure shall be adopted as on vertical joints.

If, in the opinion of the Engineer, any deleterious material has come into contact with the concrete of the construction joint or if the concrete is honeycombed or unsound for any reason, the concrete shall be cut back to such a depth as the Engineer shall order and the roughened surfaces shall be thoroughly cleaned by compressed air and water jets or other approved means.

Immediately before concreting is resumed, the roughened joint surface shall be thoroughly cleaned with compressed air and water jets and slightly wetted and cement grout placed The Contractor shall take precaution to avoid segregation of the concrete along the joint plane and to obtain thorough compaction.

3.40 Movement joints

Movement joints shall be formed in the position and manner shown on the Contract Drawings or instructed by the Engineer. In the case of water retaining structures, joints shall be made water-tight by the provision of a continuous water stop, with suitable water resistant filler material and sealant. The materials and workmanship 99alvaniz in movement joints shall comply with the following:

(a) Compressible filler shall be self-expanding cork filler consisting of cork granules bonded together with an insoluble, synthetic resin. When subject to wet or moist conditions the filler shall be capable of swelling to occupy a larger volume than that of the material supplied. The expansion properties of the filler shall not be less than one hundred and forty per cent (140%) when immersed in boiling water for one hour (1hr). The filler shall be supplied and stored in sealed moisture resistant wrappings. Compressible filler shall be secured to the first cast concrete surface using an approved adhesive.

(b) Water stops, either centrally or externally placed, shall be Polyvinyl Chloride (PVC) of the dimensions and type shown on the Drawings. PVC water stops shall have an elongation of at least 300% at rupture with a tensile strength of more than 12.3 N/mm^2. Gluing temperature shall be about 150^oC. The PVC water stop shall accommodate a transverse movement of at least 50 mm. For expansion joints the water stops shall incorporate a centre bulb or box to allow movement to be accommodated. Centrally placed water stops shall have reinforced eyelets on the outer flange to facilitate the positioning of the water stops by wiring to the surrounded steelwork. Externally placed

water stops shall include a wide reinforced nailing flange for positive fixing to formwork or adjacent concrete faces.

Water stop shall be firmly supported by split stop-end shuttering where appropriate, and in no case shall the water stops be pierced to assist in fixing. Special care should be taken to ensure that the concrete is well worked against the embedded part of the water stops and is free from honeycombing. Precautions shall be taken to protect any projecting portions of the water stops from damage during the progress of the work and from sunlight and heat. Where water stops are required to be jointed, this shall be undertaken using approved heat welding equipment. The water stops shall be installed in accordance with the manufacturer's instructions and to the approval of the Engineer.

I Joint sealant shall be bitumen-rubber sealing compounds and shall be pourable and in accordance with BS 2499 for horizontal joints and shall be an approved solvent type gun grade applied by suitable for vertical joints.

(d) Miscellaneous materials necessary for the installation of movement joints such as adhesives for securing filler materials, bond breaking tapes, bituminous paints for creating a discontinuity between concrete surfaces and primers shall be compatible with the compressible filler, water stops and sealant specified previously.

Contraction joints where specified shall be formed in the position and manner shown on the Drawings. The reinforcement shall be discontinuous across the joint. Dowel bars, water stops and sealant shall be provided as shown. The face of the first stage concrete shall be finished fair faced and after curing painted with two coats of bituminous paint. Casting of water stops and sealing of joints is to be carried out in accordance with the manufacturer's instructions. Dowel bars shall be round mild steel of the dimensions shown on the Drawings. The bars shall be cast into the first stage concrete and the protruding part shall be painted with two coats of bituminous paint.

Expansion joints where specified shall be formed in the position and manner shown on the Drawings. The reinforcement shall be discontinuous across the joint. Dowel bars, water stops, compressible filler and sealant shall be provided as shown. The face of the first stage concrete shall be finished fair faced and after curing the compressible filler shall be fixed in position in a manner to the approval of the Engineer. Casting in of water stops and sealing of joints is to be carried out in accordance with the manufacturer's instructions. Dowel bars shall be round mild steel of the dimensions shown on the drawings. The bars shall be cast into the first stage concrete and the protruding part shall be painted with two coats of bituminous paint. An end cap shall be fixed to the end of each bar prior to pouring the second stage concrete, in order to create a void at the end of the bar to accommodate any movement.

3.41 Pre-cast Concrete Units

Pre-cast concrete units shall be provided by an approved specialist supplier or may, subject to the Engineer's written approval, be manufactured by the Contractor. The Engineer may require the Contractor to supply samples of pre-cast concrete units for testing prior to the approval of the proposed supply for each type of unit and such samples shall be supplied and tested as directed by the Engineer.

Pre-cast concrete units shall be made in accordance with the provisions of this Specification covering concrete work. Pre-cast concrete units shall be manufactured under shed roofs and protected from the weather. The units shall remain in the moulds for seven days and shall remain protected for a further seven days, during which periods the concrete shall be shielded by sacking or other approved material which shall be kept wet. The units shall then be moved from the sheds and stacked in the open for at least a further seven days to season before being set in position.

Pre-cast concrete work shall be tested as directed by the Engineer and work failing to meet the requirements of the Specification shall be rejected. Pre-cast units that become damaged during handling shall likewise be rejected.

The Contractor shall, when required, make arrangements with his supplier for access to the supplier's work for the Engineer to inspect and carry out tests on pre-cast concrete units.

All pre-cast units shall be marked with individual identification. Lifting hooks are to be attached only to those positions shown on the Drawings or detailed by the Engineer. The Contractor shall be deemed to have included in their rates for all measures required to handle and stack units safely and without undue stressing.

3.42 Breaking out Existing Concrete or Block work

Well in advance of the commencement of the work the Contractor shall seek the approval of the Engineer regarding the proposed method of breaking out existing concrete or block work in the positions shown on the Drawings or as directed by the Engineer.

3.43 Cement Grout

Cement grout for general purposes shall consist of Portland cement and water mixed in the proportion of one (1) part by volume of cement and one and a half (1.5) parts by volume of water. The grout shall be used within one hour (1hr) of mixing.

3.44 Cement Mortar

Cement mortar shall be machine mixed and unless otherwise specified, consist of three (3) parts of sand to one (1) part of Ordinary Portland cement mixed and thoroughly incorporated together. Just enough water will be added to give a workability appropriate to its use. The above proportions are by volume. Mortar shall be used whilst freshly mixed and no softening or re-tempering will be allowed.

3.45 Concrete Block and Bricks Masonry

Concrete blocks and bricks shall comply with BS 6073: Part 1 and shall have a minimum 28 days compressive strength of 3.5 N/mm^2 and 7 N/mm^2 respectively. The concrete blocks and bricks shall be laid in a staggered pattern such that the vertical joints between two consecutive layers are offset by half a block length. Joints on the inside faces shall be rendered in which case the joints shall be raked out at a depth of 5 mm. Rendering shall consist of 1:2 mortar applied to a thickness so as to ensure professional finish

The mix used to manufacture concrete blocks shall not be leaner than 1:9 by volume and the maximum size of aggregate shall be 10mm. The standard size of the concrete block shall be 400 mm x 200 x 200 mm and 300 x 100 x 100 for bricks. However blocks and bricks of other sizes may be used if approved by the Engineer for proper bonding at corners and openings

The concrete blocks and bricks shall be wetted before laying and shall be set in mortar, which complies with the specifications given in Clause 3.42. Unless otherwise stated, the maximum joint thickness shall be 12 mm and the horizontal and vertical joints shall be filled with mortar. Joints shall be finished flush with the face of the blocks and bricks. The Concrete block and brick masonry shall be cured for a period of seven days by covering the work with two layers of Hessian, which is kept permanently saturated. Provision shall be made to clean all exposed faces both as the work proceeds and on completion so that they are left in a neat, tidy and clean condition.

Building masonry will not be permitted in heavy rain without the approval of the Engineer. In such instances the Contractor shall make provision to protect materials and the newly placed mortar from the rain.

Concrete blocks shall either be obtained from an approved manufacture or made on site in approved block making machines. When casting of the concrete blocks is done at site, these shall be removed from the casting machine and deposited on edge on covered racks and left for 3 days, during which time they shall be kept constantly wet. Afterwards they may be placed on racks in the open provided they are protected by Hessian cloth or similar and kept wet for a further 5 days. Thereafter they shall not be moved or used in the works until they are 28 days old.

Chambers shall be constructed after pipes have been laid, except the bases may be constructed earlier to avoid deterioration of the formation.

Backfilling around completed chambers shall be with suitable material deposited equally all round and compacted in accordance with the Specifications.

Where any pipes are built into concrete or block work the pipe shall be surrounded in two layers of polythene sheeting unless a puddle flange has been shown on the Drawings.

3.46 Rendering Work

3.46.1 Material

Cement, water and fine aggregate shall conform to the requirements specified in the concrete works. Mesh reinforcement shall be plain diamond expanded steel lathing to BS 1369 where specified. Lime shall be to BS 980 and shall be mixed with water and allowed to stand prior to use according to the manufacturer's recommendations.

The mix proportion of the cement mortar by volume shall be as follows:

For rendering coat, Cement: Sand = 1:5

For finishing coat, Cement: Sand = 1:3

Lime putty may be mixed in mortar for finishing coat at 10% of sand by volume.

3.46.2 Waterproof cement mortar

Waterproof mortar shall be made by mixing a waterproof agent into ordinary cement mortar. The Contractor shall be responsible for selection and quality of the waterproof agent and this shall be approved by the Engineer before use. The mixing and application shall be in accordance with the manufacturer's instructions.

3.46.3 Application

The surfaces which are to receive a rendering coat shall be free from all laitance, scum, loose carbonate scale, loose aggregate dirt and other foreign matters. Concrete block, brick or stone surfaces shall be sufficiently and uniformly damped immediately before application of mortar. Concrete surfaces shall be kept thoroughly wet for 24 hours prior to the application of mortar.

Where shown on the drawings or directed by the Engineer, steel wire lath shall be fixed to the brick, concrete block or concrete walls before applying cement mortar plaster.

Cement mortar shall be used within 30 minutes from the time of mixing. Re-tempering shall not be permitted.

The total thickness of rendering plus finishing coat shall be 30 mm for the floors and 20 mm for wall. Cement mortar finish shall be trowel finished unless otherwise specified. When the finishing coat is applied, the entire surface of floor or wall shall be finished in one operation in order to 103alvaniz joint marks.

When expansion and control joints exist in the base structure, provision shall be made to prevent cracking of the mortar by inserting metal expansion beads within the coating thickness in a manner approved by the Engineer.

The finished surface shall be perfectly plumb or level as the case may be except where otherwise specified without any bulging, runs, bruises or stains.

After application of the finishing coat, the surfaces shall be kept continuously damp for not less than 48 hours and then allowed to become thoroughly dry. Moistening shall be started as soon as the surface has hardened sufficiently not to cause displacement or damage.

3.47 In Situ Concrete Chambers

In situ concrete chambers shall be constructed generally in accordance with Section 3 of this Specification.

3.48 Chamber Covers and Slabs

Covers and slabs shall be the type, size and weight shown in the drawings. Care shall be taken to see that slabs are even so that the cover can seat without rocking.

Covers and frames shall be provided as shown on the drawings. The tops of the covers shall be flush at all points with the surrounding surface of paved areas or as directed in unpaved areas. Any slight adjustment of the slab level which may be necessary to accomplish this shall be effected by topping the side walls with concrete.

4 STONEWORK

4.1 Stones

Stone for all purposes shall be the best of its kind, sound and durable, free from flaws and from soft, weathered or decomposed parts. The stone and the quarry from which it is obtained shall be subject to the approval of the Engineer, samples shall be submitted by the Contractor of the stone he proposes to use in the Works and the Engineer's approval shall be obtained before such stone is used or any order is placed. The stone used shall be clean and must be washed if deemed necessary in the opinion of the Engineer.

Stones for face work shall be as far as possible quarry split and not bullnosed or hammer dressed. A moderate amount of dressing to trim off large projections will however be permitted. Exposed faces of stones for masonry shall be free from tool marks except such as are inherent in the nature of any dressing that may be specified. In rock-faced work the roughness on the surface shall not project more than 40 mm for stone less than 0.3 m^2 face area and not more than 60 mm for large stones.

4.2 Stone Masonry

Masonry shall be built to the lines and levels shown on the Drawings.

For face work the stones shall show a face of not less than 0.025 m^2 and not more than 0.1 m^2 in area and none shall be less than 100 mm in depth; they shall be laid to give a uniformly random appearance and shall be selected in laying so as to present an even distribution of large and small stones on the face.

For the arises, stones shall be roughly squared, quarry split and of a size to give out bands varying from 300 mm to 500 mm in length and in bands from 150 mm to 250 mm. The alignment of arises shall be set true to the required lines.

The stones shall be set in mortar with their natural bedding plane (if any) as near normal as possible to the face or normal to the line of thrust in the case of load bearing structures. Particular care must be given to obtaining a sound bond both longitudinally and transversely and there shall be at least one bonder, or length not less than two-thirds of the wall thickness, in each square yard of wall face.

The mortar, unless otherwise specified, shall be machine mixed cement and sand in the proportion of one part to three (1:3) parts generally as described in the specification. Mortar shall completely fill all interstices between the stones.

The face joints in rubble masonry may vary in thickness from 10 mm to 20 mm. They shall be finished as a neat weathered joint with mortar while the work proceeds where the masonry is specified to be "un-pointed". Where pointing is specified, the joints in each day's work shall be raked out to a depth of not less than 25 mm before the mortar has set. Subsequently the joint shall be filled with mortar and finished in accordance with Clause 4.6. The face of the masonry is to be kept wet while the pointing is proceeding. Provision shall be made to clean all exposed faces both as work proceeds and on completion so that they are left in a neat, tidy and clean condition.

Building of masonry will not be allowed in heavy rain without the written consent of the Engineer. Building shall only proceed when suitable precautions to the satisfaction of the Engineer shall be taken against the action of rain on newly placed mortar. If for any reason of urgency the consent

of the Engineer should be desired to a departure from these provisions, the Contractor shall submit to the Engineer for approval their proposals for protecting the materials and work from the weather.

4.3 Types of Masonry

The arrangement of the stones on the exposed face or faces of the masonry shall be as described below according to which type is called for on the Drawings.

(a) Random rubble un-coursed masonry shall be built with stones of irregular shapes taken generally as they come from the quarry, preparation being limited to the removal of inconvenient corners and excrescences. They shall be selected as the work proceeds to give a uniformly random appearance and no attempt shall be made to form courses.

(b) Random rubble masonry brought to courses shall be generally as the preceding type except that it shall be levelled up to courses between 300 mm to 400 mm in depth and coinciding with the quoin stones.

(c) Squared rubble coursed masonry shall be built in courses between 100 mm to 250 mm in depth of stones squared to rectangular shapes and selected so that all stones in one course are of approximately the same height.

4.4 Bedding of Stone Masonry

Unless otherwise directed by the Engineer, all masonry stones, when incorporated in the Works shall be laid on its natural bed, except in the case of arches where the natural bed shall be radial.

4.5 Special Stonework

Special stonework shall consist of approved stones dressed to the shapes and dimensions and with the faces tooled, all as shown on the Drawings. All stones shall be laid true to line and centre with mortar joints as shown on the Drawings.

4.6 Pointing of Joints in Masonry

Unless otherwise shown on the Drawings, pointing to masonry joints shall be flush and shall be formed by raking the joint clean and then filling it with pointing consistency mortar which shall be given a flush face with a steel trowel.

4.7 Hand Placed Rubble Filling

Hand placed rubble filling shall consist of stones individually selected and placed by hand firmly in place in bearing contact with each other or with the sides of the space to be filled; the voids shall be carefully filled with small rocks and spalls wedged together to form a compact mass. The sides of stones shall be roughly trimmed if necessary with a spalling hammer to obtain a reasonably close fit. On the exposed face the stones shall be placed with their flattened sides uppermost and in the plane of the face.

4.8 Tipped Rock / Pitching

Rock protection on embankment slopes and around structures shall be to the lines and levels shown on the contract Drawings. The terms “tipped rock” and “pitching” refer to the manner in which the rock is placed.

The different classes of rock are specified on the Drawings according to nominal size and the maximum and minimum size of the individual particles. Within the size limits of each class, the rock fragments shall be well graded with not more than forty per cent (40%) of the rocks being smaller than the stated nominal size. The shape of the rock shall be roughly uniform with no

dimension less than sixty percent (60%) of the largest dimension. The individual rock pieces shall be dense, durable and abrasion resistant.

The Contractor shall submit bulk samples of not less than 2 m^3 of each class of rock for approval by the Engineer prior to placing. These samples shall be retained for comparison with material being placed in order to ensure a reasonable degree of uniformity within each class.

The base on which rock protection is to be placed shall be compacted and trimmed to the lines and levels shown on the drawings. Where two or more classes of rock are specified, the lower layers shall be completed to the Engineer's approval before the placing of subsequent layers.

Tipped Rock shall be tipped directly into place and roughly trimmed to the required profile. The thickness, lines and levels of each class of tipped rock is shown on the Drawings.

Pitching will be used where a finished horizontal or inclined surface is required. It shall consist of hand placed stones, with spalls wedged into the interstices to produce an even surface, without projection above the neat lines shown on the Drawings. Care shall be taken to ensure that the stones are well bedded and the percentage of spalls shall not exceed forty percent (40%) of the total rock volume. Pitching on slopes shall be built upwards from the toe, unless otherwise directed by the Engineer. A coping consisting of large flat stones shall be laid along the top of stone pitching on slopes to produce a firm edge.

Tipped Rock and Stone Pitching shall consist of selected hard durable rock free from weathered or decomposed parts to the approval of the Engineer, containing no flaky stone and being well graded within the limits shown below. The class and the thickness of the layer shall be as shown on the drawings.

Class	Size of stone d (mm)	Percentage by weight smaller than stone sized
A	300	100
	125	40-55
	45	0
B	150	100
	63	40-55
	31.5	0
C	63	100
	22	60-85
	8	20-40
	4	0

Class	Size of stone d (mm)	Percentage by weight smaller than stone sized
D	31.5	100
	16	50-80
	8	20-50
	4	0
E	350	100
	200	0
F	225	100
	90	35-55
45		0
G	850	100
	500	30-60

300 0

Tipped rock / stone pitching shall be placed in an approved manner in order to produce a uniform well knit un-segregated layer in which all sized are held in position.

4.9 Gabions

Gabions shall be of the types and sizes shown on the Drawings. The cages shall be constructed from mild steel wire complying with BS 1052, "Specification for mild steel wire for general engineering purposes", 107alvanizin in accordance with BS 443, "Specification for testing zinc coatings on steel wire and for quality requirements". The wire shall be 3mm diameter formed into a fabric having a mesh of 75 mm x 100 mm for baskets and 60 mm x 80 mm for mattresses.

Stone filling for gabions shall consist of hard durable rock, free from weathered or decomposed parts. The minimum dimensions of each stone shall not be less than half its maximum dimension. For mattresses the stone shall be 200 mm to 150 mm for baskets the stone shall be 300 mm to 200 mm. The stone shall be obtained from a source approved by the Engineer. No stone shall be smaller than the size of the gabion mesh. In carrying out the filling, selected pieces of stone of elongated shape shall be placed with their flatter and elongated faces in contact with the mesh wherever possible.

The empty gabions shall be placed to line and level as shown on the Drawings or as directed by the Engineer and then stretched so that the gabions regain their shape on being filled. Diaphragms shall be provided at not more than 1m intervals for baskets and not more than 0.6 m intervals for mattresses. A gabion shall not be completely filled until the adjacent basket or mattress has been half filled, unless otherwise directed, in order not to cause displacements from bulging during filling.

For baskets at least two horizontal connection wires shall be tied between front and back of the gabion in each 1m compartment, at a height of 300 mm and 600 mm from the bottom as the stone fill reaches these levels. Additional tie wires shall be provided if necessary and in no case shall the gabion basket bulge by more than 40 mm. Where a continuous line of gabions is required, adjacent gabions shall be securely tied together at the top and bottom of the gabions with tying wire.

The gabions shall be filled to a level just sufficient to require the lid to be forced into place with a bar. The lid and all joints between baskets and between diaphragms and baskets shall each be tied down with a continuous running wire.

Where gabions are to be shaped, the shape shall be formed by folding the mesh internally and tying it with a continuous running wire.

All tying wire shall be 107alvanizin and of same gauge as specified for the cages above.

The surface upon which gabions are to be laid shall be compacted to a minimum dry density of 95% of the maximum dry density (AASHTO T99).

4.10 Geotextile Filter Cloth

Geotextile filter cloth shall be made of non-woven polyester material with a minimum weight of 270 g/m^2 and minimum thickness of 2.3mm.

The material shall be placed carefully on suitably cleared surfaces, such that tearing or piercing is avoided at all times.

Continuity at horizontal and vertical joins shall be achieved with a minimum overlap of 0.6m. Overlaps may be physically sealed using spot welds with an open flame and subject to approval of the Engineer. On a horizontal join, the new layer shall be placed on the outside and backfilling shall proceed carefully to ensure that full contact of the join overlap is maintained. On a vertical join, the new layer shall be placed on the inside, and backfilling shall proceed such that contact is first on the outside layer, thereby sealing the inside layer to prevent soil migration between the overlap.

4.11 Graded Filters

The filter shall consist of well graded natural or manufactured aggregate having the following gradation. In the following ratios, FM represents the filter material and BM the base material.

For graded filters of sub-rounded particles:

$$R_{50} = \frac{\text{50\% size FM}}{\text{50\% size BM}} = 12 \text{ to } 58$$

and

$$R_{15} = \frac{\text{15\% size FM}}{\text{15\% size BM}} = 12 \text{ to } 40$$

For graded filters of angular particles:

$$R_{50} = \frac{\text{50\% size FM}}{\text{50\% size BM}} = 9 \text{ to } 30$$

and

$$R_{15} = \frac{\text{15\% size FM}}{\text{15\% size BM}} = 6 \text{ to } 18$$

The filter material should pass a 75mm for 108alvanizin particle segregation and bridging during placement. Also the filter must not have more than five per cent (5%) of material finer than that passing a 60 micron sieve to prevent movement of fines within the filter.

The graded filters shall consist of stone graded to meet the requirements indicated below.

Class	Size of particles d (mm)	Percentage smaller than particle size
A	63	100
	31	70-100
	8	10-80
	2	0-25
	1.4	0

B	16	100
	4	64-100
	1	15-64
	0.25	0-15
	0.09	0

The filter shall be placed in layers and tamped into place in such a manner that mixing between layers or between the filter material and the formation to be protected, shall not occur.

Care shall be taken to ensure that segregation of sizes does not occur. The minimum thickness of each filter layer shall be 250 mm unless otherwise shown on the Drawings. Where the term "gravel backing" is used on the drawings or Bills of Quantities, this shall be taken to mean graded filter Class A material.

4.12 Hardcore

Hardcore shall consist of broken rock, concrete or other approved hard material, clean and free from extraneous matter, having a maximum particle size of 100 mm. It shall be spread and levelled, watered and compacted, and then blinded with a layer of fine material of grading 3 mm to dust, watered and compacted all to the Engineer's approval.

5 PIPELINE MATERIALS AND WORKS

5.1 GENERAL

This section relates to materials, handling, storage and construction of pipeline works. It covers supply and construction of Ductile Iron (DI), Steel, Upvc, HDPE, Galvanised Pipes and concrete pipelines, sluice gates, penstocks, valves, surface boxes, chambers and other associated works. This specification applies in particular to water supply pipework. Pipes, valves and fittings shall comply with the relevant Standard Specifications as stated hereinafter

All materials shall comply with those standards and specifications laid down by internationally recognized institutions for the water industry. Preference will be given to manufacturers who are quality certified to ISO 9001.

All materials supplied to the site shall be subject to acceptance tests carried out by an approved Authority and shall be subject to the Engineer's approval.

Pipe fittings and valves shall be suitable for buried installation unless otherwise stated. All tapers (reducers) required at tees and other locations to meet the specified diameters may be furnished in the manufacture's standard lengths and diameters.

5.2 MATERIALS REQUIREMENTS

5.2.1 General Requirements

All pipes shall be supplied in accordance with the relevant Standard specified or other Standard approved by the Engineer. All pipes and fittings of any one kind shall be supplied to the same Standard except as otherwise allowed by the Engineer. The Standard, method of manufacture, and specification shall not be changed at any time from that agreed between the Contractor and the Engineer except with the prior written approval of the Engineer.

All Pipeline Materials shall be supplied to the dimensions stated in the standards unless otherwise shown on the drawings. The Contractor may supply material to other dimensions subject to the approval of the Engineer, however, the Contractor will be responsible for any redesign or extra design work and construction resulting from the use of material to other dimensions.

5.2.2 Materials & Standards

All materials shall be KS, ISO, EN, BS or equivalent standard and shall be supplied from approved manufacturers. The Contractor is required to submit a list of suppliers that he intends to deal with together with his Tender bid. The Contractor shall also submit for the approval of the Engineer, before ordering:

a) Type of materials to be used, dimensions, thickness, lengths, shape, weight, class, tolerance limits and quality.
b) Standards to which the item is manufactured.
c) Details of specials, adaptors, fittings and joint design.
d) Coating and lining methods.

All pipe and coating materials shall be certified for potable water use and shall contain no ingredients that may migrate into water in amounts that are considered to be toxic or otherwise dangerous for health. All pipes shall be certified as safe for transporting potable water by an independent testing laboratory.

5.2.3 Authorization and Certificates

The Contractor shall submit with his Tender a Certificate of Manufacturers Authorization certifying that the Contractor has obtained the Manufacturer's Authority and his quotations for pipes, valves, meters and fittings are from the proposed Manufacturer who agrees to supply the materials in case of award of the Tender to the Contractor. No change of the source of pipeline materials will be accepted without prior approval of the Engineer.

The original and one copy of such manufacturer's certificate shall be delivered to the Engineer not later than 14 days prior to the intended date of delivery of the Pipeline Materials to Site.

5.2.4 Manufacture

The Contractor shall submit a certificate from the manufacturer certifying that all the items have been mill tested (at the factory), and that they have successfully passed the relative tests prescribed by the relative standards specifications.

Each pipe, fitting or accessory shall bear the mark of manufacturer and its country of origin, together with the nominal diameter and pressure rating. In addition, where pipes or fittings are of different pressure classes a referencing system shall be agreed with and employed by the manufacturer denoting the pipeline for which the pipe or fitting is intended.

5.2.5 Third Party Inspection

The Contractor shall at his own expense provide the services of an accredited, internationally recognized by Kenya, independent third party control agency to ensure that the pipes, fittings, valves, hydrants etc. are all manufactured in accordance with the specific standards and who, among other duties and obligations, shall testify that they have witnessed all mill tests prescribed by the relative standards and the materials manufactured fulfil in every respect the requirement of the Contract and who shall check the materials in respect of proper packing and certify the Bill of Lading.

Further details of testing requirements are included in the Technical Specifications.

Detailed inspection of pipes and fittings by an internationally 111alvanizin firm with a local representative shall be required and the Tenderer shall include in his Tender the cost of such inspection which shall include for but not necessarily be limited to:

a) Certification of country of origin of iron ore or Upvc Resin.
b) Inspection and Certification of country of origin, manufacture and quality or standard or foundry materials for use in the manufacture of ferrous pipes and fittings.
c) Inspection and certification of manufacture and testing in accordance with the appropriate standards at the manufacturers works.
d) Inspection and certification of the pipes and fittings upon the arrival at the site and storage in accordance with Clauses 142.5 and 142.6 hereof.

The manufacturer shall be responsible for ensuring the certification and inspection as indicated under (a) and (b) above takes place at the appropriate time and the certificates are duly delivered to the Engineer by recorded or receipted delivery. When the foundry materials and/or Upvc resin are received or about to be received by the manufacturer at his works he shall further inform the Engineer in writing of the date of commencement of manufacture and the appropriate duration of the manufacture period at least 14 days prior to commencement date.

All certified records of inspection of the manufacturer shall be made available for examination by the Engineer or his agent at the manufacturer's works during the period of manufacture and shall be forwarded to the Engineer upon completion of manufacture.

Prior to delivery of the manufactured goods to the site of storage the Contractor shall obtain from the Engineer in writing the name or names of those persons responsible for final site acceptance.

5.2.6 Inspection and Testing

Before delivery to site the Contractor shall allow for inspection of all Pipeline Materials by an inspector appointed by the Engineer. The inspection will include attendance at all pressure and material tests, execution of dimensional checks and inspection of the workmanship and standard of manufacture with scrutiny of evidence of the materials used in the fabrication of the Pipeline Materials.

The Contractor shall arrange for such testing as may be required to be carried out at the place of manufacture according to this Specification. If there are no facilities at the place of manufacture for making the prescribed tests the Contractor shall bear the cost of carrying out the tests elsewhere.

The Contractor shall supply test certificates and shall furnish and prepare the necessary test pieces and samples and shall supply and provide all test rigs, equipment appliances, labour and any other facility required for inspection and testing.

The Engineer and his inspector shall be allowed full access to all areas at the place of manufacture or elsewhere where testing, furnishing or preparation of materials for the performance and testing of work under this Specification is taking place.

The Contractor shall furnish the Engineer with reasonable facilities and space (without charge) for the inspection, testing and obtaining of such information as he desires respecting the character of material in use and the progress and manner of the work.

5.2.7 Packing and Protection

The Contractor shall supply all necessary materials and equipment for making good, where approved by the Engineer, any damage to coatings of pipes, fittings and valves.

5.2.8 Handling of Pipeline Materials

The Contractor shall comply with the following requirements:

(a) Pipes shall not be stacked higher than recommended by the pipe manufacturer.

(b) Pipes, fittings and valves shall not be dropped, or allowed to land on sharp or other objects which will cause bends, dents or damage to the coating.

I When lifting pipes and fittings special lifting hooks with curved saddles to fit the curvatures of the pipe or fitting shall be used. Alternative types of lifting hooks, clamps, or slings, may be used subject to the Engineer’s approval.

(d) Suitable pillows shall be used to protect pipes and fittings under securing chains or other lashings when loads are being transported.

5.2.9 Storage of Materials

The Contractor shall store pipes, fittings and other materials only at places approved by the Engineer and shall at all times provide adequate supervision and, when no activity is in progress at such areas, a watchman to prevent theft or damage. Any damage incurred shall be the Contractor’s responsibility.

Fittings and valves shall not be stacked more than one tier high and they shall be supported off the ground by suitable timbers.

Air valves, rubber joint rings, gaskets, bolts and similar fittings and materials shall be kept in approved locked premises and such fittings and materials shall not be distributed to the trench side until immediately prior to laying, fitting, jointing or assembly thereof. All bolts, nuts, washers,

rubber joint rings and gaskets must be stored in a cool location within an approved building. All other fittings and materials shall at all times be stored in the shade under cover and protected from the weather damage and contamination to the satisfaction of the Engineer.

The Contractor shall take any necessary precaution to prevent fire in the storage areas and shall provide and maintain fire breaks and other precautions. He shall also ensure surfacing and drainage of the pipe and valve stockpiling areas so that delivery and handling vehicles can always operate and flood water does not enter the materials.

5.2.10 Acceptance of Pipeline Materials on Site

Pipeline Materials will be finally accepted within the Site only when the following conditions have been observed:

a) All damaged coatings and other repairs have been made good.
b) All pipes have been stored in accordance with the specifications, manufacturer's recommendations and to the satisfaction of the Engineer.
c) All pipes are stacked to the satisfaction of the Engineer, laid on suitable timbers on level ground and properly cocked.
d) All fittings and boxes are laid out.
e) The Engineer, or his delegated representative, has carried out a satisfactory inspection.

The Contractor shall be responsible for and shall undertake any work required by the Third-Party Inspector or by the Engineer or his Representative as appropriate or where necessary, replace defective pipes and fittings deemed. All expenses in connection with such remedial works or replacements shall be deemed covered by the Tender.

5.3 PIPE MATERIALS

5.3.1 Flange Joints

Where specifically called for or deemed appropriate, flanged joints shall be 113alvaniz.

All flanges shall be faced and drilled to conform to the dimensions specified in BS 4504 for a nominal pressure of 16 bar. All flange and coupling assemblies shall consist of the required number of bolts, nuts, washers and gaskets (2 washers per bolt). Bolts and nuts shall not be inferior to BS 4504 Clause 5 and no bolt shall project more than two full threads beyond its nut after tightening. In no circumstances shall the shortening of excessively long bolts by cutting be allowed.

Gaskets shall be made of reinforced elastomer rubber in accordance with BS 2494 Type W and of minimum thickness of 3mm, or other specification to the approval of the Engineer. They shall be stored in accordance with ISO 2230.

Bolts, nuts and washers shall be protected to BS 3382 Part 1-4 for above ground installation and to BS 3382 Part 5&6 for below ground installation and in chambers.

5.3.2 Flexible joints

Ductile Iron pipes and fittings between sizes 80 mm diameter and 800 mm diameter shall have sockets suitable for joints to BS EN545. Rubber rings for flexible joints to Ductile Iron pipes shall comply with BS2494.

Steel pipes up to DN 500 may be plain ended suitable for jointing with flexible couplings and flange adapters or socket and spigot with rubber gaskets as described herein. Steel pipes from DN

550 upwards shall be plain ended suitable for jointing with flexible couplings and flange adaptors. Steel pipes within chambers shall be suitable for jointing as shown on Tender Drawings.

5.3.3 Mechanical Couplings

All plain ends of fittings shall be suitable for jointing to couplings, and to flexible socket joints. Each plain end of pipe or fitting shall be supplied with one coupling complete with bolts, nuts, joint rings etc.

Nuts, bolts and washers shall be supplied with all mechanical couplings and flange adaptors. All couplings will be coated in fusion-bonded epoxy coating or similar protection to the approval of the Engineer.

5.3.4 Materials for The Assembly of Flexible Joints

The Contractor shall supply all the lubricants necessary for assembling spigot and socket joints. The lubricant shall be of a kind not conducive to the growth of bacteria and shall be to the approval of the Engineer. The quantity supplied shall be sufficient for the number of joints of each size, together with an allowance of 10% excess over the net quantity to allow for waste.

5.3.5 Ductile Iron Pipes and Fittings

Socketed Pipes

DI pipes shall be centrifugally cast, standard length 6 m, with socket and spigot, EPDM rubber gaskets, according to EN 545, or DIN 28600 till DIN 28646 or equivalent ISO 2531, 4179, 6600. All pipes and welding work shall either be class K9 and C30 and C40.

The minimum tensile strength shall be 420 N/mm^2 and the minimum 0.2% proof stress shall be 300 N/mm^2. The quality of metal used for the manufacture of the pipes shall be of good quality grey cast iron and subject to the various quality control tests as specified in the relevant Standards. The minimum elongation after fracture shall be 10% for nominal diameters DN 60 to 1,000.

The joints of ductile iron (DI) pipes and fittings of class C30 and C40 shall be standard joints of the TYTON type according to the above mentioned standards and as indicated on the Drawings and in the Bill of Quantities.

Dimensions shall be according to DIN 28610, Part 1 as follows or according to equivalent standards as indicated on the Drawings or in the Particular Specifications:

Centrifugally cast ductile iron pipes shall be individually subjected to a works hydrostatic test of not less than 10 seconds duration.

For class K9 pipes whose thickness shall be in accordance with BS EN 545, these shall be:

DN	Minimum Works Hydrostatic Test Pressure for K9 (bar)
60 – 300	50

All pipes supplied shall conform to class K9 unless specifically indicated otherwise on drawings or in the bills of quantities.

Socketed Joints

Socketed joints shall be of the push-on type to BSEN 545 unless otherwise specified on drawings or in bills of quantities. The material used for the rubber gaskets shall be either natural rubber or synthetic elastomer to BS 2494, and they shall be stored in accordance with ISO 2230: 1973.

Flanged Pipes

Ductile Iron Flanged Pipes shall be centrifugally cast to BSEN 545. They shall be joined using a rubber gasket of minimum thickness of 3 mm which shall be reinforced unless otherwise indicated on drawings or in bills of quantities. The material used shall be either natural rubber or synthetic elastomer in accordance with BS 2494, which shall be stored in accordance with ISO 2230: 1973. Pipe thickness shall conform to BSEN 545 class K9 unless otherwise indicated on drawings or in the bills of quantities.

Protections to Pipes

Inside protection lining shall be of sulphate resisting blast furnace cement mortar according to DIN 2614, ISO 4179 – 1985. The thickness of the cement mortar shall be as specified in BSEN 545.

Ductile Iron Pipes and fittings shall be externally protected with a minimum of either: -

(a) Sprayed metallic zinc layer of nominal coating of 400 g/m² metallic zinc + aluminium (85%+15%) with bituminous varnish layer of minimum average thickness of 100 microns as per DIN 30674 Part 3. The pipe manufacturer shall provide a polythene sleeve for site protection purposes. The sleeve shall conform to DIN 30674 Part 5 and be of minimum thickness of 200 microns.

(b) Factory applied heat fused extruded polyethylene coating as specified in BSEN 545, DIN 30674 Part 1.

(c) 350 microns fusion bonded epoxy coating to AWWA C213 standards or equivalent.

Tenderers shall indicate in their tenders the particular external protection proposed which shall be applied to all pipe materials.

Fittings

Ductile Iron Fittings shall be sand cast in accordance with BS EN 545. The minimum tensile strength shall be 400 N/mm^2 and the minimum 0.2% proof stress shall be 300 N/mm^2. The minimum elongation after fracture shall be 5%. All fittings shall be subjected to a works leak-tightness test using water to a pressure as given in BS EN 545.

Fittings shall be to thickness class K12 except for tees that shall be to thickness class K14 unless otherwise indicated in drawings or in bills of quantities.

Joints to Fittings

Socketed fittings, except collars, shall be supplied with push-on joints unless otherwise called for on drawings or in bills of quantities. Collars shall be supplied with mechanical joint. Flange fittings shall be fixed by rubber gaskets as indicated in I above for flanged pipes.

Protection to Fittings

Unless otherwise indicated in drawings or in bills of quantities, fittings shall be internally a cement mortar, centrifugally applied and conforming to DIN 30674. Fittings and specials dimensions and deviations shall be in accordance with ISO2531 and shall be externally protected with a minimum thickness of metallic zinc layer of nominal coating of 400 g/m² metallic zinc + aluminium (85%+15%) with bituminous varnish layer of minimum average thickness of 100 microns as per DIN30674 Part 3. The pipe manufacturer shall provide a polythene sleeve for site protection purposes. The sleeve shall conform to DIN 30674 Part 5 and be of minimum thickness of 200 microns.

5.3.6 Steel Pipes and Fittings

Standard Pipes and Fittings

Steel pipes shall dimensionally conform to BS 534, and in terms of materials, properties and tests to BS 3600, except that for ND not exceeding 80 mm dimensions to DIN 2441 or 2442 are acceptable. Pipes from DN 150 mm and above shall be manufactured with a spiral weld seam or with a spiral seam or longitudinal weld seam. Automatic submerged-arc fusion welding of both sides shall be used.

Pipes shall be delivered in 12m length from 323.9 mm and above and 6 m lengths for below 323.9 mm. Tolerances on length will be +/- 51 mm. All pipes shall be hydrostatically tested. Works Test Pressures shall be carried to induce hoop stress of 75 % of the minimum yield stress of steel. The results of all hydrostatic tests shall be recorded on a pressure-recording chart. All test pressures must be held for a minimum of 10 seconds.

All fittings shall be manufactured from pipes that have previously successfully tested. All new welds made during fabrication of the fittings shall be subjected to non-destructive testing using wither radiological, ultrasonic or dye penetrants or a combination of these depending on the geometry of the weld.

Flanges will be to BS4504. Flexible joints shall be by the use of flexible couplings to AWWA C219 and of approved pattern, or for nominal diameters not exceeding 500 mm may be socket and spigot joints with rubber gaskets subject to the specification herein provided.

Fitting ends for use with flexible couplings shall be true ended with the ends appropriately prepared for the type of coupling provided.

Joints for site welding shall comprise a socket and special spigot (bell joint with air chamber) such that the internal coating of the spigot shall be undamaged during the welding.

Internal and External Works Protection

The factory applied external protection of all steel pipes and fittings and flexible couplings shall be provided by a coating of fusion bonded epoxy to AWWA C213 to a thickness of 300-400 microns. Pipes shall be electro-statically sprayed and fittings will be coated using a combination of electrostatic sprays and 116alvanizi bends. Protection to site welded joints shall be by a solvent free epoxy coating to AWWA C210. During production external epoxy coatings shall be tested by the pipe-coating contractor according to AWWA C213 Clause 5.3.3.

Lining thickness shall be in accordance with AWWA C205 Table 1. Lining thickness shall be measured on each pipe using a graduated steel point for wet linings or with an electromagnetic or magnetic measuring instrument for dry linings. The average of the thickness readings taken from 4 points spaced at 90º along any cross-section plane at least 50 mm from the pipe ends shall be calculated and this average shall fall within the tolerances specified in AWWA C205.

- Compression Tests on Mortar Lining Test Cylinders shall be done weekly in accordance with AWWA C205 Section 4.8. Compressive strength shall reach 18 Mpa in 7 days and 31 Mpa in 28 days.
- Curing shall be done in accordance with Section 4.7 of AWWA C205. Curing will take place under an ambient temperature of more than 5 deg C and pipes shall be kept shaded for the first 24 hours after lining to prevent cracking. Pipe ends shall be sealed with plastic end caps not latter than 30 minutes after lining and the internals kept wet during the curing period. Linings have to be cured for a minimum of 4 days before shipment.
- Cracks in linings shall not exceed 1.6 mm. Cracks wider than 1.6 mm shall be repaired unless it can be demonstrated to the satisfaction of the Engineer that cracks will heal autogenously under constant soaking of water.

- Linings shall not contain any defects such as sand pockets, voids, over-sanded areas, blisters, and cracks as a result of impacts.

5.3.7 Upvc PRESSURE PIPES AND FITTINGS

Upvc pipes and fittings shall both conform to BS 3505 and BS 4346 or ISO standards. The use of rework material during manufacture is however strictly forbidden and the supplier shall provide certification to this effect. The classes referred to on the Drawings and in the Bills of Quantities are for the following working heads and pressures and pipes are specified by their Outside diameter

Class	Working Head in Metres	Working Pressure in Kg/cm^2
C	90	9
D	120	12
E	160	16

Pressure pipes in Upvc shall comply with BS 3505 Class C (9 bar maximum sustained working pressure) and shall have push-fit joints to BS 4346: Part 2. The maximum sustained working pressures to which the pipes and fittings will be subjected is based on water at a temperature of 30 degrees centigrade.

Outside diameters conforming to ISO 161/1 may be adopted, but in other respects pipes shall comply with the foregoing. The Supplier shall submit full details of the pipes he intends to supply.

The thickness for Upvc pipes to conform to ISO 4065:1996 as summarized in the following tables:

Nominal outside diameter, d_n	Pipe series S						
	Nominal (minimum) wall thickness						
	S 20 (SDR 41)	S 16 (SDR 33)	S 12,5 (SDR 26)	S 10 (SDR 21)	S 8 (SDR 17)	S 6,3 (SDR 13,6)	S 5 (SDR 11)
	Nominal pressure PN based on service (design) coefficient C = 2,5						
		PN 6	PN 8	PN 10	PN 12,5	PN 16	PN 20
12		—	—	—	—	—	1,5
16		—	—	—	—	—	1,5
20		—	—	—	—	1,5	1,9
25		—	—	—	1,5	1,9	2,3
32		—	1,5	1,6	1,9	2,4	2,9
40		1,5	1,6	1,9	2,4	3,0	3,7
50		1,6	2,0	2,4	3,0	3,7	4,6
63		2,0	2,5	3,0	3,8	4,7	5,8
75		2,3	2,9	3,6	4,5	5,6	6,8

The pipes up to and including 40mm diameter can be of a solvent weld type. The pipe shall be supplied with interchangeable sockets preformed at the factory and of such internal diameter that it takes the plain end of the pipe with the same nominal diameter. The joint shall sustain the end thrust to which the pipe shall be subjected. The Supplier shall supply sufficient quantity of the cleaner and adhesive, which shall be required to make the joints with the pipes.

Pipes and fittings shall be marked at not greater than one-meter intervals showing their class and diameter. Fittings for use with pressure pipes of DN 100 and greater shall be steel fittings complying with the requirements for such fittings, stated elsewhere in this Specification.

5.3.8 High Density Polyethylene (HDPE) Pipes and Fittings

HDPE pipes shall be according to DIN 8074 / 8075, with working pressure 20°C, resistant against UV radiation and frost. They may be delivered in coils, on reels or in rigid tubing up to a diameter of 125 mm. The inner diameter of pipe coils depends on the outside diameter of the pipes and has to conform to the requirements defined by the manufacturer.

HDPE pipes shall be in black colour with blue stripes and must be marked with producer, type, pressure and production date as well as length of each coil (if applicable) printed on each pipe.

Diameters and minimum wall thickness of HD-PE pipes are specified below (in mm):

High Density Polyethylene Pipes — Dimensions

Nominal Diameter (mm)	External Diameter (mm)	Wall Thickness (mm)	
		PN10	PN16
15	20.0	2.0	2.3
20	25.0	2.3	2.8
25	32.0	3.0	3.6
40	50.0	4.6	5.6
50	63.0	5.8	7.1

(A more elaborate specification is provided in annex 6 and forms part of the technical specifications)

HDPE pipes and fittings shall meet the requirements of BS 3284 and 5114 respectively. They shall be transported, laid, jointed and backfilled in accordance with the manufacturers written instructions.

Standard Length of rolls of HDPE pipes shall be as follows:

HDPE DN [mm]	Pipe length on roll [m]
20 = ISO 25	100
25 = ISO 32	100
32 = ISO 40	50
40 = ISO 50	50
50 = ISO 63	50

Installation – including fusion jointing work on HDPE pipelines – must be directed and supervised by suitably qualified and experienced persons and the Contractor shall have demonstrated his ability to provide this in his Tender.

Pipes supplied in coils and of up to 63 mm diameter may be unrolled with the coil in the vertical position. For larger diameters an unwinding device shall be used. A turn style can be used with the coil laid in a horizontal position on it or with the coil mounted vertically on a slow-moving lorry. The pipe shall never be removed from a coil in a spiral manner as this may cause kinking. Should kinking nevertheless occur the Contractor shall cut the pipe on either side of the kink, prepare the ends, and then use an approved joint after laying. All costs of dealing with kinking shall be to the Contractors expense. A minimum bending radius of 20 x the diameter shall be observed.

All HDPE pipes and fittings should conform to the standards as stipulated in elaborate specifications included in the annexes **(annex 6)** and forms part of the specifications.

5.3.9 Galvanised Pipes and Specials

Galvanized milled seamless steel pipes shall be medium duty and comply with DIN 2441, ISO 65 or BS 1387, standard length 6 m, with threaded ends. The threaded end shall be protected against damage.

Supply and installation shall include for all cutting, threading, jointing and for all fittings and accessories necessary for laying and installation as shown in the Drawings.

Dimensions shall be according to DIN 2441 as follows or according to equivalent standards as indicated on the Drawings or in the Particular Specifications:

Table 2-7: GMS Pipes — Dimensions

Nominal Diameter (mm)	External Diameter (mm)	Wall Thickness (mm)
15	21.3	3.2
20	26.9	3.2
25	33.7	4.0
50	60.3	4.5

The galvanization shall be by hot dip zinc process according to DIN 1706 and shall satisfy the copper sulphate test procedure according to DIN 50952, also prescribed in Appendix C of BS 1387 latest addition.

All piping shall conform to BS 21 or BS 5493 for Medium Piping. The pipes shall be screwed, socketed or flanged. All specials shall be of such dimensions as will mate with the piping supplied. Screw-down stop valves shall conform to BS 1010. Barrel Nipples shall conform to BS 21 and all other specials shall conform to BS 1256.

5.4 VALVES, METERS AND PENSTOCKS

5.4.1 Valves in General

Valves up to and including DN 300 shall be sluice valves and valves larger than DN 300 shall be butterfly valves except where otherwise specified on drawings or in bills of quantities.

All valves shall bear an identification mark on the upper body that shall include: -

- the name of the manufacturer and/or his trade mark
- the nominal diameter (DN)
- the nominal pressure (PN)

The manufacturer's full technical leaflets shall be supplied to the Engineer by the Contractor for approval prior to confirmation of any order for valves.

All Valves shall, unless otherwise stated in the Bill of Quantities, be PN 16 and supplied with galvanized Bolts, Nuts and Washers and Gaskets. Corrosion protection shall be EKB (Epoxy Coated) with dry film thickness of not less than 280 µm. All valves shall close when the stem rotation is in a clockwise direction unless otherwise specified.

5.4.2 Sluice or Gate Valves

Resilient Seated Gate Valves with smooth straight-through bore for use with water pipelines shall be made of ductile cast iron EN-GJS-400-18 according to EN 1563 (GGG 400 – DIN 1693) and

EN 558-1 GR 14-short, (DIN 3202 F 4), smooth straight-through bore, wedge gate encapsulated with vulcanized EPDM, inside and outside epoxy powder coated according to DIN 30677-T2 in accordance with DIN 3476 and all quality and test requirements of RAL quality mark 662, suitable for under-ground installation, suitable for nominal working pressure of 16 bars or higher pressure class (e.g. PN25, PN40) as specified, according to Drawings, Specifications and Bill of Quantities.

Resilient Seated Gate Valves shall be provided with suitable non-rising stainless-steel spindles (St 1.4021 / X20Cr13).

Sluice valves shall be flanged to DIN 28605, drilled to EN 1092-2 PN16 and DIN 2501 – PN 25 and PN 40

Minimum life cycle shall be 250 cycles according to DIN 1074.

Hand wheels shall be suitable for particular valves, epoxy powder coated and have closing and opening indicators.

5.4.3 Butterfly Valves

Butterfly valves shall be according to DIN and EN 593, double eccentric type with face to face dimensions to EN 558-1 GR 14-short (DIN 3202-F4), flange dimensions and drilling to EN 1092-2 PN 16 (DIN 28605 / DIN 2501) and shall be suitable for a nominal working pressure of 16 bar or higher pressure class (e.g. PN25, PN40) as specified, according to Drawings, Specifications and Bill of Quantities.

All butterfly valves shall be equipped, if not otherwise requested in the bill of quantity, with gear box and hand wheel.

- body test at a minimum pressure of 1.5 times the maximum permissible pressure
- seal test at a minimum pressure of 1.1 times the maximum permissible pressure.

5.4.4 Air Valves

Automatic air relief and vacuum break valves (air valves) shall be of the anti-shock anti-surge type designed to meet the following requirements.

The required valves shall provide all of the functions described below.

- Pipeline filling
- Uninterrupted high-volume air discharge through the large orifice.
- Pipeline draining or Column Separation
- Uninterrupted high-volume air intake through the large orifice.
- Pipeline full and operating
- Discharge of dis-entrained pressurized air through the small orifice.
- Rapid Filling / Column Separation

The valve must incorporate an integral surge alleviation mechanism that will automatically dampen surge pressures due to rapid air discharge or the subsequent re-joining of separated water columns.

Unless otherwise specified all air, valves shall be provided with an integral flanged inlet with studs appropriate to BS 4504 NP 16 or as the installation demands and complying with the appropriate nominal pressure.

Air valves shall be of approved manufacture.

5.4.5 Check Valves/Non-Return Valves

Non return Valves shall be with face to face dimension to EN 558-1 GR 48 (DIN 3202 part 1 — F6), flange dimensions and drilling to EN 1092-2 PN 16 (DIN 28605 / DIN 2501) and shall be suitable for a nominal working pressure of 16 bar or higher pressure class (e.g. PN25, PN40) as specified, according to Drawings, Specifications and Bill of Quantities.

Working pressures of non-return valves is minimum 16 bar or higher if specified, according to Drawings, Specifications and Bill of Quantities.

5.4.6 Flow and Pressure Control Valves

The Contractor shall supply and install a number of modulated flow and pressure control valves as indicated on the drawings.

With his tender, a Tenderer shall have supplied full technical details of the valves and controllers he proposes to supply and install. If the Engineer deems the valves and controllers proposed to be appropriate he will accept the offer. If however the Engineer considers the offer to be inappropriate he will reject the offer from the Tenderer and instruct him instead as to the acceptable manufacturer(s) of these items. Should a financial offer from a Tenderer in this regard be obviously under-priced then the cost of supplying an appropriate valve and controller shall be fully to the account of the Contractor.

5.4.7 Water Meters

The meters considered herein are:

- Single jet and Multi-jet Meters (Velocity Meters),
- Volumetric Meters (Displacement Meter) and
- Ultrasonic meters, UFM

The single-jet meters are applicable for small flow rates (diameters typically range from 15 to 50 mm). The multi-jet water meters are suitable for small and medium flow rates (diameters typically range from 15 to 150 mm). Displacement meters (Volumetric Meters) are sensitive to turbid water hence shall be accompanied by a strainer upstream. UFMs are mainly recommended for measurement of bulk flows (diameters typically range from 15 to 1,800 mm) and commonly used as 'clamp-on' meters to calibrate large diameter velocity meters.

All meters shall comply with applicable specifications (either according to EN ISO 4064:2014, or OIML R49: 2013). They shall be certified by Laboratories. In Kenya for all meters KEBS certificate will be mandatory.

All meters of size 15 to 40mm diameter shall be supplied complete with a set of copper alloy connectors

A water meter shall be of such design, composition, and construction that it does not facilitate the perpetration of fraud. A visible indicator showing any form of tampering is a requirement.

The meter shall have inbuilt Non – Return Valve to reduce the risk of water meter reversal fraud.

The meter shall be delivered calibrated.

The indicated volume of water shall be expressed in cubic metres and its multiples

The nominal diameter is required to be marked on the meter

A water meter shall be clearly and indelibly marked with the following information, either grouped or distributed, on the casing, the indicating device dial, an identification plate or the meter cover, if it is not detachable. These markings shall be visible without dismantling the water meter after the instrument has been placed on the market or put into use.

- Unit of measurement.
- Accuracy class, where it differs from accuracy class 2.

- Numerical value of Q_3 and the ratio Q_3/Q
- Type approval sign according to national regulations.
- Name or trademark of the manufacturer.
- Year of manufacture
- Serial number, Marking of approving laboratory with approval number
- Direction of flow
- Maximum admissible pressure (MAP)

A water meter shall be designated as accuracy class 2. This requires the Maximum Permissible Error (MPE) to be *±2 %* (for temperatures from *0.1 °C* to *30 °C* and *±3 %* for temperatures greater than *30 °C*) for the upper flow rate zone.

The water meter manufacturer must guarantee that the meter will perform at its optimum accuracy throughout its lifespan with only the removal of silt.

A water meter shall be manufactured from materials of adequate strength and durability for the purpose for which it is to be used.

Testing: Before acceptance upon delivery 5% of the meters will be sampled at random. A batch will be considered as failed if one or more meters do not comply with the established technical specifications or have failed the tests. Under these circumstances, the specific batch of meters has to be rejected. Testing shall be coordinated by the Engineer and the cost thereof borne by the Contractor.

Meters will be supplied with installation instructions and maintenance manual. The installation instructions shall be guided by the ISO 4064-5:2014 best practice recommendations

All meters should conform to the standards as stipulated in elaborate specifications included in the annexes **(annex 5)** and forms part of the specifications.

The WASPA guidelines for water meters generally acceptable for appliances in Kenya and are recommended under this project.

Meter Boxes

The meter boxes for domestic type water meters boxes shall be

- Meter size < 30mm; 300 mm by 400 mm by 400 mm deep precast concrete or approved UV treated PVC boxes.
- Meter size < 50mm; 450 mm by 600 mm by 500 mm deep precast concrete or approved UV treated PVC boxes.

The meter box covers shall be 2mm thick haunched 122alvanizin steel plate lockable covers

Bulk water meters

Unless otherwise directed, bulk water meters shall be in-line helical vane water meters. The meters shall comply with Class B measuring requirements of BS 5728. The meters shall comply dimensionally with ISO 4064, and shall have flanges drilled to BS EN 1092: 1997.or Compatible with the supplied flange fittings

Meter chambers will be purpose constructed to standard details.

5.4.8 Strainers

Strainers shall be made of GG-250, epoxy powder coated, with flange connection as specified on the Drawings and in the Bill of Quantities. The screen of the strainer shall be stainless steel.

The flanges of the strainers shall be drilled to DIN 2501 — PN 16, or higher-pressure class (e.g. PN 25, PN 40) as specified, according to Drawings, Specifications and Bill of Quantities.

5.4.9 Screens

Screens for Reservoir outlets shall be made of GG-250, epoxy powder coated, with flange connection, without non-return valve, as specified on the Drawings and in the Bill of Quantities. The screen of the strainer shall be stainless steel.

The flanges of the screens shall be drilled to DIN 2501 — PN 16, or higher-pressure class (e.g. PN 25, PN 40) as specified, according to Drawings, Specifications and Bill of Quantities.

5.4.10 Surface Boxes

These shall be of cast iron, (hinged and locked) and from an approved manufacturer to BS 5834. They shall be sized to suit the purpose required and as otherwise shown on the relevant drawings.

The number of keys required (if any) is indicated in the Bills of Quantities.

5.4.11 Valve Keys

These shall be of mild steel with ends to suit either valves to BS 5163, valves to BS 5155 or valves to BS 1592 fitted with valve caps, dimensioned to the appropriate Tender Drawing.

5.4.12 Hand wheels and Valve Caps and Valves

Where hand-wheels are specified, they shall have cast into them the words ‘open’ or ‘closed’, together with an arrow indicating the direction for such opening or closing.

5.4.13 Pipe Saddles

Pipe saddles for under pressure drilling shall be of the Universal Type with flexible strap for DI, DI, Steel and AC pipes PN 16, for PE and PVC pipes the pipe saddles shall be of the HAKU Type or similar, and shall be suitable and approved for the use with potable water at a nominal working pressure of 16 bar.

The outlet of the saddle shall be female thread and specially protected to avoid corrosion and incrustation.

The body of the pipe saddle shall be of ductile iron EN*-GJS-400-18 acc. To EN 1563 (GGG 400 DIN 1693), inside and outside epoxy powder coated complying in general with DIN 30677 part 2, coating thickness shall be minimum 250 µm, freedom from imperfections shall be tested by high-voltage method.

Saddle strap and bolts/nuts/washers shall be made of stainless steel 304 (minimum 1.4021) or 316 (minimum 1.4462). Strap shall be rubber lined to avoid direct contact between the stainless-steel strap and the pipe.

Gaskets shall be of EPDM or NBR suitable and approved for potable water.

5.4.14 Service Valves

Service Valves shall be suitable for a direct mounting on the pipe saddle and shall allow a temporary shut-off of the house connection line in case of emergency.

Service valves shall be of the resilient seated gate valve type with a male thread inlet for connection to the pipe saddle and an integrated or adopted restraint push-on outlet for connection to HDPE pipes according to DIN 8074/8075 and female threads for GMS pipe connection, and shall be suitable and approved for underground installation and for the use with potable water.

Valve bodies shall be of GG 250, the bonnet of GGG 400, epoxy powder coated, and non-rising stainless-steel spindle (1.4021). The sealing of the restraint socket for connection to HDPE pipes

according to DIN 8074/8075 shall be done by an O-ring made from EPDM or NBR (suitable and approved for potable water), grip ring shall be of Poly-acetate.

The service valves shall be installed with an appropriate Extension Spindle made of steel with PE-protection tube to the street surface, additionally protected by a PVC pipe and a service valve surface box.

5.4.15 Stop Cocks Upstream and Downstream of Meters

The stop cocks shall have spherical taps with integrated passage and quarter turn opening.

Design characteristics:

Body:	brass
Tap:	anti-lime deposit material or metal with anti-lime lining
Seals:	Teflon or Perbunan
Stem:	brass
Handle:	butterfly type, stainless steel

They must be designed for 10 bar working pressure and 16 bar test pressure

5.5 PIPELAYING WORKS

5.5.1 Setting Out

The way-leaves, easements or other rights of way for pipelines will be defined by the Employer across any private land and by the Engineer across any land belonging to the Employer.

The Contractor shall, where required by the Engineer set out the boundaries of way-leaves and mark them as required.

Before commencement of trenching, the Contractor shall, in the presence of the Engineer set out the pipeline alignments in accordance with the drawings, making any changes the Engineer may deem necessary.

The Contractor shall then submit to the Engineer for approval, at an approved scale, a profile of ground levels after the initial clearing of the way-leave, easement or other right of way showing the proposed invert levels and the precise chainages of all pipeline features.

Following approval and before excavation of the particular pipeline commences, the Contractor shall supply to the Engineer two further copies of the approved profile, incorporating all amendments required by the Engineer. The approved drawings shall form the construction drawings for the pipeline and no trenching or pipe laying shall commence before approval of the drawings by the Engineer.

5.5.2 Trench Excavation and Earthworks

Pipe trenches excavation, bedding and backfilling shall be carried out in accordance with Section 2 — Specifications for Earthworks except for thrust boring as specified in Clause 148.

5.5.3 Limitation in Length of Open Trench

Unless otherwise directed by the Engineer no trench shall be opened up for more than 100 meters in towns or more than 300 meters elsewhere in advance of pipe-laying. If these lengths of open trench are exceeded or if in the opinion of the Engineer there is undue delay in:

- testing the pipelines;
- removing surplus material;
- general tidying-up of areas where pipes have been laid;
- partial restoration or maintenance of surfaces;

the Engineer may order that no further trenches shall be opened until the outstanding work has been carried out to his satisfaction, and the Contractor shall have no grounds for a claim against the Contracting Authority on this account.

5.5.4 Working Width

Where pipelines are within 20 metres of a motorable track, or through light bush or thicket a way-leave clearance of 2 metres plus nominal bore of pipe will be allowed. Where pipelines are through dense bush, thicket or forest a way-leave clearance of five metres plus nominal bore of pipe will be allowed. Payment for Site Clearance will be based upon this width except that the Engineer reserves the right to restrict this width due to the presence of obstructions, roads, houses and the like. Payments will then be according to the actual area cleared. No claims for additional space nor for inconvenience and the like caused by obstructions, will be allowed.

5.5.5 Handling and Transport of Pipes and Fittings

The loading, unloading and handling of pipes and fittings shall be carried out using ropes, cranes, lifting beams and slings of approved design, strictly in accordance with the recommendations of the manufacturer and to the approval of the Engineer. Particular care shall be taken at all times to avoid damage of any kind. The use of lifting hooks is not permitted.

In the event of any damage being caused, the Contractor shall be liable for the cost of all repairs or replacements and the costs of any delays. The Engineer shall determine whether the damage shall be repaired (and if it is to be repaired, the manner of such repair), or the damaged piece replaced.

5.5.6 Laying of Pipes

Immediately before any pipe is lowered into the trench the plug shall be removed from the end of the last pipe laid and the new pipe shall be carefully lowered into the trench in an approved manner.

Each pipe and fitting shall be laid true to alignment curve and gradient in accordance with the drawings or as directed by the Engineer. The minimum gradient shall not be less than 1 in 500 rising in the upstream direction or 1 in 300 falling. The minimum cover shall not be less than 900 mm.

Pipes shall be boned to gradient and sight rails shall be provided for this purpose at intervals not exceeding 50 m and at all changes in grade.

Pipes laid in trenches shall be laid and firmly bedded on an even and uniform bedding. Where pipes are not laid on a granular bed, the bottom of the trench shall be smooth and free from stones or other projections. Pipes shall not be dragged along the trench bottom. Joint holes shall be excavated below the pipe invert and shall be as small as possible and shall be filled in and compacted after the pipes are laid and before the refilling of the trench is commenced. Survey pegs in the trench bottom shall be removed.

Pipes shall be laid with the sockets facing up hill. Each type of joint shall be made in full compliance with the manufacturer's instructions. Special care shall be taken to ensure the absolute cleanliness of the pipe ends and joint components and only the recommended lubricants shall be used.

Pipe jointing shall be carried out only by experienced personnel and with close supervision by the Contractor. Further pipe jointing shall not proceed until the previous joint has been inspected by the Engineer. Inspection of the joint by the Engineer shall not relieve the Contractor of his testing responsibilities.

The Contractor shall take all steps necessary to ensure that no dirty water or other extraneous matter is allowed to enter the pipes during or after laying. In the event of dirty water or extraneous matter entering the pipes the Contractor shall immediately carry out the necessary cleaning as may be directed by the Engineer.

Except when necessary for jointing, the end of the last pipe laid shall be plugged to the satisfaction of the Engineer and the Contractor shall provide and use a sufficient number of proper plugs for this purpose.

Pipe trenches shall not be backfilled until permission to do so has been obtained from the Engineer. Subject to such permission being obtained trenches shall be backfilled without delay to at least the minimum extent required by the specification in readiness for pressure testing.

The pipes shall be laid on a bedding as shown on the drawings or as directed by the Engineer. Details of pipe beddings are shown on the drawings and are specified.

5.5.7 Cutting Pipes

DI pipes shall be cut with an approved mechanical pipe cutter and in conformity with the pipe manufacturer's recommendations. The edges of the cut shall be clean, true and square. The use of an oxyacetylene flame cutter will not be permitted in any circumstances. The edges of the cut together with those parts of the pipes from which the coating has been removed shall be given two coats of epoxy paint and the internal lining repaired, if damaged, to the approval of the Engineer. The cut pipe shall be 126alvani for 10 mm at 30° to the pipe axis to remove sharp or rough edges. Swarf shall then be removed and the end of the pipe given two coats of approved bituminous paint.

Upvc pipes shall be cut with an approved mechanical pipe cutter and 126alvani, all in conformity with pipe manufacturer's recommendations. The edges of the cut shall be clean true and square.

The Contractor shall be solely responsible for the provision of all equipment necessary for the cutting and preparing of pipes.

5.5.8 No Flotation of Pipeline

The Contractor shall be solely responsible for ensuring that flotation of the pipeline does not occur during construction. The extent of the backfill placed over each pipe after laying and before testing shall be such as will prevent flotation of the pipeline and the requirements of Section 2 "Earthworks".

Should any section of the pipeline float out of line or level the section of pipeline so affected shall be removed and re-laid in accordance with the Specification to the satisfaction of the Engineer and any damaged sections shall be discarded and replaced. The cost of replacing any pipe damaged and discarded through causes of flotation shall be borne by the Contractor.

5.5.9 Flexibility in Pipelines Adjacent to Structures

Pipelines entering or leaving structures shall incorporate two flexible joints outside the structure, one at 300 mm from the structure wall, and the other at a further distance from the wall of one diameter or 300 mm, whichever is greater.

The provision of the necessary short pipe lengths and additional flexible joints shall be included in the rates for pipelines.

5.5.10 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 10 % of all pipe work has been laid and at no time may there be more than 10 % untested.

Where old pipelines that are yet to be taken into service are involved, they shall be similarly tested, except that the Engineer may specify at what stage testing is required.

Testing of HDPE pipes shall be as per "HDPE (PE100) Pressure Pipeline Installation & Good Practices Guide" included in these specs as Annex 7.

Testing for all other pipelines should be as per BS EN 805:2000 — Water supply — Requirements for systems and components outside buildings

5.5.11 Flushing and Sterilisation

This shall be done in accordance with the recommendations set out in AWWA C651. All pipe work shall be flushed and cleaned and all treated water pipe work shall additionally be 127alvanizin. The rates inserted are to be for the flushing and 127alvanizing, and where appropriate for cleaning shall be inclusive for, sampling, testing and inclusive of the reports on the bacteriological quality of water.

One (1) week before the Contractor intends to undertake disinfecting/flushing of all or part of the pipelines, the Contractor shall submit a detailed proposal for the work showing the quantity of water required. This quantity of water may be obtained by the Contractor from the nearest available source approved by the Engineer.

The chlorine dose shall be obtained from a sodium hypochlorite solution or other suitable solution to be approved by the Engineer. Chlorine Dioxide shall not be used. Samples taken from the pipeline during disinfection at locations directed by the Engineer shall be checked by a suitable comparator in order to ensure that the 127alvanizing liquid is present throughout the system and at sufficient concentration.

Sodium Hypochlorite shall not be added directly to the pipe and the free chlorine concentration shall not exceed 25 mg/l.

At the end of the 24 hour period at operating pressure the chlorine concentration shall be checked. If there is less than 1 mg/l of free available chlorine in the water, more sodium hypochlorite solution shall be introduced and left for a further 24 hour period after which the free available chlorine concentration shall be checked again. This procedure shall be repeated as necessary until the available free chlorine taken after 24 hours exceeds 1 mg/l for all samples taken from the length of pipeline under test. If the concentration of free available chlorine exceeds 5 mg/l at any point the after 48 hours the pipeline shall be flushed out until the concentration falls below this level.

After all testing and disinfection has been completed and the pipeline is ready for handing over in all other respects including the installation of connections where appropriate, the new pipeline shall be flushed out with potable water from the existing mains to which the new pipeline or network is or will be connected. Flushing entry and exit points shall be designed to allow a minimum of 1.0m/s water velocity in the main pipeline to remove any sand or other debris. The quantity of flushing water shall be calculated as the equivalent to 3 times the volume of the pipeline to be flushed unless directed otherwise.

It shall be a condition that the water in the existing network at the point of extraction shall register a minimum of 0.4 mg/l of free available chlorine when tested with a site comparator prior to any approval being given to commence flushing. If a reading of less than this is obtained the Engineer shall be informed and the Contractor instructed accordingly.

Once flushed, the water in the new pipelines shall be allowed to stand for a further 24 hours. Samples shall then be taken at locations instructed by the Engineer and immediately submitted for chemical and bacteriological testing at approved laboratories. If available, chemical and bacteriological tests shall normally be undertaken at the End Users laboratory and a charge may be made for testing. All charges for water sample testing shall be paid by the Contractor.

The pipeline shall not be considered acceptable until faecal coliforms are undetectable in a 100 ml sample, the bacterial count is within approved limits, the recorded total chlorine content is a minimum of 0.2 mg/l and the Ph is within acceptable limits i.e. between 7.0 and 9.0 unless otherwise instructed by the Engineer.

If the tests show that a satisfactory drinking water standard has not been achieved, the Contractor shall repeat the disinfection and flushing process, all at their own expense, until these requirements are met.

Flushing water shall be discharged via temporary discharge lines to the surrounding open areas, into the existing storm water system or in to water courses, as directed by the relevant authorities. Before being discharged the flushing, water shall pass through a baffled tank or similar equipment that shall be used to de-chlorinate the water.

5.6 PIPELINE PROTECTION, AUXILIARY WORKS AND STRUCTURES

5.6.1 Concrete Protection

Unless otherwise provided in the Special Specification or Bills of Quantities or directed by the Engineer, a 0.15 m concrete surround shall be provided to water mains in the following circumstances:-

(a) Water mains with less than 0.6 m or more than 6.0 m of soil cover over the pipes.

(b) Water mains under carriageways if depth of soil cover is less than 1.20 m

I In the places where shown on the Drawings or directed by the Engineer.

All concrete for beds and surrounds shall be class 20 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.

5.6.2 Valve Chambers

These shall be constructed in accordance with the drawings or as directed by the Engineer using materials approved by the Engineer. Notwithstanding the size and shape of the valve to be supplied the Contractor shall ensure that the minimum clearances as indicated on the drawings are provided within the chamber.

5.6.3 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 Engineer. Support blocks shall be constructed from Class 20 concrete.

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 proposed tie-in works described in Clause 148 will therefore be preceded by the required anchor/thrust block casting.

5.6.4 Surface Boxes and Chamber Covers

Unless otherwise stated, surface boxes and chamber covers shall be either cast iron or ductile iron and coated with a black bituminous solution. Surface boxes over gate valves shall be hinged and chained and shall generally comply with BS 5834.

Surface boxes for hydrant chambers shall have a 380 x 230 mm clear opening and shall comply with BS 750 and shall be suitable for heavy traffic loading.

Covers to air valve and other chambers shall be to the dimensions and loading requirements shown on the Drawings or as stated in the Bill of Quantities.

Covers shall be suitable for the following maximum safe centre static loads:-

Light duty	-	250 kg
Medium duty	-	1500 kg
Heavy duty	-	5000 kg

Lifting keys shall be provided for each type of surface box or cover supplied. These shall be of mild steel with ends to suit either valves to BS 5163, valves to BS 5155 or valves to BS 1952 fitted with valve caps, dimensioned to the appropriate Tender Drawing. One set of keys shall be provided for every ten surface boxes or covers subject to a minimum of ten sets of keys or the actual number of covers if less than ten.

5.6.5 Indicator Plates and Marker Posts

Pre-cast concrete indicator plates 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, indented in them. The plates 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 100 m spacing along the pipelines installed in open country or as directed by the Engineer. Marker posts shall be painted with at least two coats of all-weather plastic emulsion paint of approved colour.

5.6.6 Indicator Tapes

Indicator (marker) tapes where shown the drawings or indicated in the BOQ shall be laid in the trench above all plastic pipes (PVC, HDPE, GRP, etc.) in order to facilitate location with a metal pipe detector at a later stage. Indicator tapes shall be made of pigmented low-density polyethylene and metal foil in a bright colour or other approved material not less than 100 mm wide and 0.15 mm thick.

5.7 PLASTIC TANKS

The plastic tanks will be of a minimum wall thickness of 7 mm (made from polymer LLDPE of density 0.93g/cm3 ±0.5 which is designed for ESCR of over 1000 hours according to ASTM D16931 with Long term UV stabilizer, the tank is able to withstand UV exposure of >0.35W/m^2 or UV index 14 for over 8000 hours.

The approval certificates will be from KEBS.

The loading, unloading and handling of tanks and fittings shall be carried out using ropes, cranes, lifting beams and slings of approved design, strictly in accordance with the recommendations of

the manufacturer and to the approval of the Engineer. Particular care shall be taken at all times to avoid damage of any kind. The use of lifting hooks is not permitted.

In the event of any damage being caused, the Contractor shall be liable for the cost of all repairs or replacements and the costs of any delays. The Engineer shall determine whether the damage shall be repaired (and if it is to be repaired, the manner of such repair), or the damaged piece replaced.

6 STEELWORK

6.1 General

Except where otherwise specified, structural steel shall be Grade 43, complying with BS 7668, "Specification for weldable structural steels".

All structural rolled steel members shall comply in dimension, weight and tolerance with that shown on the drawings and with BS 4, "Structural steel sections" and BS EN 10056, 10067 and 10210.

6.2 Bolts, nuts and fastenings

Bolts, studs, nuts and washers etc, shall be of mild steel unless otherwise specified. The dimensions and tolerances of nuts and bolts shall comply with BS 4190, "Specification for ISO metric black hexagon bolts, screws and nuts" or where specified to BS 3692, "Specification for ISO metric precision hexagon bolts, screws and nuts" and the threads shall be to BS 3643, "ISO metric screw threads". The heads of the bolts shall be forged out of the solid bar and the ends shall be cleanly cut with standard threads and the nuts must fit the bolts accurately and tightly. Washers of the shape and type indicated on the drawings shall comply with BS 4320, "Specification for metal washers for engineering purposes".

Where nuts, bolts and washers are required to be galvanized, the galvanizing shall be to BS 3382, "Specification for electroplated coatings on threaded components".

6.3 Electrodes

Electrodes used in welding mild steel shall comply with the requirements of BS 639, "Specification for covered carbon and carbon manganese steel electrodes for manual metal-arc welding".

6.4 Contractor's Shop Drawings

Where the Contractor is required to undertake the detailed design of the steelwork components, he shall provide the Engineer with copies of detailed shop drawings for approval at least fourteen (14) days before commencing fabrication. The Contractor shall be responsible for the detailed design of all connections and these shall be fully detailed on the shop drawings together with all dimensions, clearances, welding details and procedures, machining, marking, etc. The Contractor shall not commence fabrication until he has received the Engineer's written approval of the shop drawings. Approval of such drawings shall in no way relieve the Contractor of his responsibility for accuracy or the correct operation of the component.

6.5 Fabrication and Erection of Steelwork

The standard of workmanship and engineering practices to be adopted for fabrication and erection shall conform to BS 449, "Specification for the use of structural steel in building" and BS 5531, "Code of practice for safety in erecting structural frames".

The Contractor shall supply samples of materials and standards of workmanship as required by the Engineer. All samples approved by the Engineer shall be retained and shall be considered as setting the standard for all subsequent work.

Inspection of work will be carried out by the Engineer and the Contractor shall give sufficient notice of the date when fabricated steelwork is ready for inspection. The Contractor shall provide particulars of places and dates of manufacture of all materials for the Permanent Works and the

names of the manufactures. Copies in duplicate of all orders for materials shall be sent to the Engineer at the time of placing such orders.

The Contractor shall ensure that all foundation bolts and supports including built-in bolts, etc upon which the steelwork is to be erected are in the correct position and that the steelwork fits correctly in required positions without forcing or straining in any way. Any check by the Engineer of the Contractor's measurements shall not relieve him of his responsibility for obtaining this fit unless any errors in position are clearly not attributable to him.

No permanent bolting or site welding shall be done until proper alignment has been obtained. The Contractor may use temporary jigs, anchors or supports during erection, but must allow for thermal movement to take place freely at all times.

If the Contractor wishes to drill holes in or fix attachments to the steelwork to carry temporary work such as shuttering, he shall obtain the Engineer's approval of the positions and details of all such holes or attachments and shall close such holes and remove the attachments to the satisfaction of the Engineer.

On completion of erection of any part of the steelwork on which the Contractor wishes to add further works, such as roofing, he shall first obtain the Engineer's approval of the steelwork and remedy any defects required by the Engineer. Any approval given shall in no way relieve the contractor of his responsibility for ensuring the subsequent correct positioning and 132alvaniz of the steel work of other parts of the structure.

6.6 Welding

All shop welds shall be carried out by qualified welders who shall be under competent supervision. All welding is to be carried out in accordance with BS 5135, "Specification for arc welding of carbon and carbon manganese steels". The Contractor's proposals for welding shall be submitted to the Engineer for approval before any work is undertaken.

The Engineer may call for a test of a welder's capabilities in accordance with BS 4872, "Specification for approval testing of welders when welding procedure is not required".

In the case of site welds, the welding procedure for making each type of joint shall be approved by the Engineer before the work is commenced and the Contractor shall make such trial welds as the Engineer may require to demonstrate the soundness of the proposed method and the competence of his workmen.

Where site welding is used all welded joints shall be subject to inspection by the Engineer. Any welds that are in the opinion of the Engineer defective shall be cut out and the welds remade to the satisfaction of the Engineer. The cost of such corrective measures including any resultant delays, shall be borne by the Contractor.

6.7 Painting General

The Contractor shall submit to the Engineer for his approval details of the types and manufacturers of paints he is proposing to use, together with the manufacturer's recommendations concerning preparation of surfaces, primers and undercoats, application methods, safety precautions and drying times for each type of paint. All paints used in the Works must be supplied ready-mixed in unbroken, sealed containers, which clearly show the type, colour and manufacturer of the paint and carry detailed "instructions for use".

All metal surfaces on which paint is to be applied shall be blast cleaned as laid down in BS 7079, "Preparation of steel substrates before application of paints and related products", or other mechanical means and fully prepared in accordance with the manufacturer's recommendations. Applications of paint coatings on external work shall not be carried out or continued in mist, rain or excessively damp conditions. The Contractor shall take all necessary precautions to prevent dust and dirt coming into contact with freshly applied paint before it has dried.

Paints shall be applied either by brushing or spraying in accordance with the manufacturer's instructions. The thinning of paints shall not be permitted without the approval of the Engineer. Unless otherwise recommended by the manufacturer, the minimum interval between the application of a first coat of paint and the second shall be twenty four hours (24hrs). Special care shall be taken to ensure complete coverage of all corners, arises and openings without causing an excessive build-up of paint and avoiding runs.

Steelwork to be painted shall be clean and free from all rust, grease, oil and mill scale.

The Contractor Shall provide all the relevant employees, visitors and any other persons who shall be exposed to the painting works, with personal protective equipment for the entire duration of their exposure to the paint works.

No separate payment will be made for the dust abatement measures and the costs thereof shall be deemed to be included in the respective unit rates and the Contract Sum

6.8 Painting Steelwork Immersed in Water

Steelwork subject to immersion in water shall be blast cleaned or thoroughly mechanically cleaned by an approved alternative process and immediately coated before leaving the factory with zinc phosphate or similar compatible metallic inhibitive primer with a minimum dry film thickness of 50 microns. Following drying of the primer, the steelwork shall be coated with one coat of non-toxic, non-tainting, high build bituminous paint to BS 3416, "Specification for bitumen-based coating for cold application, suitable for use in contact with potable water", having a minimum dry film thickness of 100 microns.

After erection, damaged areas of steelwork shall be mechanically cleaned and touched up with primer and bituminous paint to fully restore the factory applied coating system and thickness.

Finally, two overall finish coats of bituminous paint with a minimum dry film thickness per coat of 100 microns giving an overall minimum dry film thickness of the complete coating system of 350 microns.

6.9 Painting other steelwork

Where steelwork, which is not galvanized and not subject to immersion in water is required to be painted, it shall be thoroughly cleaned and painted prior to leaving the factory with:

(a) one coat of zinc phosphate or similar compatible metallic inhibitive primer with a minimum dry film thickness of 50 microns.

(b) one coat of red lead primer with a minimum dry film thickness of 50 microns.

(c) two coats of micaceous iron oxide undercoat paint with a minimum dry film thickness per coat of 50 microns.

After erection, damaged areas of steelwork shall be mechanically cleaned and touched up with primer and under coat to fully restore the factory applied coating system and thickness.

Finally, one overall finish coat of enamel gloss micaceous iron oxide paint with a minimum dry film thickness of 50 microns giving an overall minimum dry film thickness for the complete coating system of 250 microns.

6.10 Galvanising

All steel and ironwork of whatever kind required to be 134alvanizin is to be pickled in dilute hydrochloric acid and then washed, fluxed and stoved and coated with zinc by dipping in a bath of molten zinc. All components are to be immersed in the bath only for the time sufficient for them to attain the temperature of the bath, they are then to be withdrawn at such a speed that a coating of 80 microns thickness is achieved, or such other practical maximum thickness for the component as defined in BN EN ISO 1461:1999, "Specification for hot dip 134alvanizin coatings on iron and steel articles".

The 134alvanizing is to be carried out after all drilling, chipping, trimming, filing; fitting and bending operations are complete and shall cover all faces evenly.

After erection of 134alvanizin steel components, damaged or welded areas shall be painted immediately after cleaning with two coats of metallic zinc primer with each coat having a thickness of 50 microns. The paint shall be applied strictly on accordance with the manufacturer's instructions and shall be compatible with any subsequent paint systems to be applied.

6.11 Galvanised handrails

Handrail tubes shall be 38 mm nominal diameter steel tube to BS 1387, "Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads". The top and bottom rails shall be 900 mm and 450 mm respectively above floor level. The rails and vertical standards shall be connected using screwed steel pipe fittings to BS 1740, "Specification for wrought steel pipe fittings (screwed BS 21 R-series threads)", where practical with the final connections being welded in accordance with Clause 6.6.

The handrail assembly shall be securely mounted on base plates fabricated of mild steel and attached to the base or foundation slab in a manner to be approved by the Engineer.

All sharp edges and rough areas shall be carefully ground off and the entire handrail assembly cleaned and 134alvanizin in accordance with Clause 6.10.

6.12 Gates

Gates of the types and sizes shown on the drawings shall be supplied and installed where indicated on the drawings. The gate shall be drop-tight and shall be suitable in all respects for use in raw water. The gates shall have flush inverts.

Gates shall be supplied complete with all frames, cills, seals, spindles, hand wheels and headstocks as required. The frames and gates shall be fabricated in galvanized steel as per WATERMAN Industries Ltd, or equivalent approved.

All gates shall have rising spindles with protection tubes, headstock, hand wheel etc. and intermediate supports where the spindle is longer than 1500 mm. Intermediate guide brackets are to be located 600 mm above the gate frame, 400 mm below the base of the headstock and at a maximum spacing of 1500 mm, to suit or as recommended by the manufacturer and as approved by the Engineer.

All gates on structures in the link, main and branch canals having a base gate width of 500mm or more shall be of Type A (Sluice gate with a control rising spindle and wheel) as shown on the book of drawings. All gates on structures in the link, main and branch canals with a base gate width of less than 500mm shall be of Type B (slide gate or "Hand pull") as shown on the book of drawings. All gates on structures on the main feeder canals shall be Type B.

The gates shall conform to the following specifications or equivalent:

- Self-contained frame;
- Rising stainless steel frame;
- Flat back for wall mounting
- Maximum on seating pressure, measured from invert – 1.5 m
- Material for leaf, arms, hoist is: carbon steel Din 17100 St. 37-2(EN 10025 S235 JR)
- Non- geared hand wheel manual lift, mounted on the top of the frame
- Material of side rubbing plates, sill plate and pivot pins: Stainless steel ASTM A-276 type 304
- Side and bottom seals: Neoprene to ASTM D-200
- Mill finish on all stainless steel surfaces
- Epoxy paint on carbon steel surfaces

The contractor shall examine gate shape, measure and confirm all gate sizes on site. The contractor shall then obtain approval of the Engineer prior to purchase of the gates.

6.13 Stop-logs

Where shown on drawings, the stop-logs shall be hardwood of the stated dimensions and shall be approved by the Engineer before supplying to site. Where shown on the drawings stop logs shall be bolted to steel frames of stated dimensions to form hardwood gates.

7 ROAD WORKS

7.1 General

7.1.1 Earthworks

Earthworks shall be carried out in accordance with the requirements of Section 2 of this Specification.

In carrying out the earthworks, the Contractor shall take all necessary precautions to avoid damage to or deterioration of the earthwork materials. He shall so arrange his work that water, which is brought onto or enters the earthworks at any time either in advance of or during construction shall be rapidly dispersed until the permanent work is completed.

7.1.2 Formation Level

Formation level on embankments and in cuttings shall be the surface level of the ground obtained after completion of the earthworks.

7.1.3 Preparation and Formation

The formation to carriageways and verges shall be prepared to the satisfaction of the Project Manager, well cleaned, free from mud and slurry, properly shaped and compacted by rolling to an even and uniform surface as shown on the Drawings or directed by the Project Manager. Where soft pockets become evident during rolling, they shall be removed and replaced with sound compacted material.

Unless directed otherwise by the Project Manager the formation shall be covered by the sub-base within 48 hours after the preparation the formation.

Once the formation has been prepared, constructional traffic, other than that specifically required for subsequent roadwork operations, shall not be allowed to run thereon without the permission of the Project Manager.

7.1.4 Gravel Wearing Course

On completion of the road formation, the Contractor shall lay sufficient gravel wearing course over the full width of the carriageway to achieve the consolidated depth and camber shown on the drawings or as directed by the Project Manager.

Gravel wearing course shall consist of suitable natural gravel obtained from borrow pits approved by the Project Manager and complying with the wet sieve analysis given below:

Table 7.1: Wet Sieve Analysis

BS Sieve size (mm)	Percentage passing
75	100
37.5	100
20	95 – 100
10	65 – 100
5	45 – 85
2.36	30 – 70
0.60	20 – 45
0.075	10 — 30

The gravel-wearing course shall also comply with the following requirements:

- 4 day soaked CBR 20
- Plasticity Index 25
- Plastic Modulus 500

The CBR shall be determined in accordance with BS 1377 Test 16 on a sample compacted to 95% of maximum dry density as determined by BS 1377 Test B and then soaked for 4 days.

The material shall be spread in a uniform layer across the full width of the construction. The thickness of the layer shall be such that after compaction the thickness shall not exceed 150mm. Where a greater final thickness is required, the material shall be laid and processed in two or more equal layers.

The material shall be mixed to a uniform consistency and any oversize materials shall be removed to an approved spoil dump.

The work area shall be kept continuously drained and any damage caused by water accumulating on or running off the surface shall be made good.

If necessary, water shall be added to bring the moisture content to between 80% and 105% of the optimum moisture content as determined by AASHTO 99 prior to commencing compaction.

7.1.5 Compaction of Gravel Wearing Course

All rolling shall be carried out longitudinally along the carriageway commencing at the carriageway edges and working in towards the centre. Material is to be compacted to 95% of the centre. Material is to be compacted to 95% of its maximum dry density or such other percentages as indicated on the drawings. Maximum dry density shall be as determined by AASHTO T99.

The in-situ dry density of the compacted material will be determined by the sand replacement method described in Test No 15A in BS 1377 or such other test as the Project Manager shall consider appropriate. Each layer of fill material shall be approved by the Project Manager prior to the placing of subsequent layers. Where the material is too wet or too dry the Contractor shall have the option of collecting the moisture content by watering or drying as appropriate, or modifying his compaction procedure so as to obtain the required dry density.

7.2 Rehabilitation of Existing Access Roads

7.2.1 General

The provisions of Clause 2 shall apply save where expressly varied hereunder.

All interventions shown on strip maps provided are subject to confirmation by the Project Manager on Site.

7.2.2 Site Clearing

The width and length over which site clearing is to be carried out shall be as instructed by the Project Manager.

7.2.3 Spoil of Unsuitable Material

This shall be in situ material, which is unsuitable to remain in the road, and has been instructed by the Project Manager to be spoilt. Unsuitable material shall be deposited in spoil areas located by the Contractor subject to the approval by the Project Manager. The rate for spoil shall include for

the cost of excavating the material, loading, transporting, depositing, spreading and levelling the material in a spoil area, all to the satisfaction of the Project Manager.

7.2.4 Earthworks Fill

The Contractor shall supply from a source approved by the Project Manager, place and compact suitable borrow material having a minimum CBR of 10%, at 95% compaction as determined by AASHTO T99 to areas that require to be raised or where there is a deficiency of in situ material for reshaping.

7.2.5 Light Grading

Where this term is instructed, the road shall be graded to redistribute the existing material as required to achieve the specified cross section of the road, watered and compacted. This item applies where the required movement of material is not greater than $1m^3/m$

7.2.6 Heavy Grading

The Contractor shall scarify the road surface, add fill material where required, reshape and compact to achieve the specified cross section. This item applies where the required movement of material is greater than $1m^3/m$

7.2.7 Gravel Stockpiling

No separate measurement shall be made for stockpiling gravel and the Contractor will be deemed to have allowed for the costs elsewhere in his rates.

7.2.8 Overburden Removal

The removal of vegetation, topsoil and overburden at gravel borrow pits shall not be paid for separately. Contractor will be deemed to have allowed for the costs elsewhere in his rates. The same applies to any works required to access the borrow pits.

7.2.9 Haulage

The rate for gravel wearing course includes for the supply of material inclusive of extraction, loading and transportation to Site for a maximum haulage distance of 30km. Where suitable gravel is not available within this distance, overhaul will be paid for. Measurement shall be the product of the volume of compacted material in situ and the haulage distance in excess of 30km, one way, along the shortest route, as determined by the Project Manager.

7.3 Drainage Works

7.3.1 Culvert Installation

This shall include the provision and installation of a specified internal diameter including excavation and backfill to a compaction of 95% of maximum dry density as determined by AASHTO T99. The backfill material is to be approved by the Project Manager. The rate includes any provisions necessary for diversion of traffic.

7.3.2 Mass Concrete, Beds and Surrounds

Unless otherwise shown on the drawings, the concrete shall be class C20/20

7.3.3 Mitre Drains and Catch Water Drains

These will be formed at the locations and the lines and levels shown on the drawings or instructed by the Project Manager.

7.3.4 7.3.4 Side Drains

These will be formed to the lines and levels as shown in the drawings and at locations as instructed by the Project Manager. Material excavated from the side drains may be incorporated into the reshaped road if suitable. Otherwise, it shall be spoiled in approved spoil areas.

7.3.5 Cleaning of Existing Drains

The Contractor shall clean existing blocked culverts and clear side drains as may be directed by the Project Manager.

7.3.6 Repair of Existing Drains

The Contractor shall replace broken culverts, and repair or reconstruct broken wingwalls and headwalls as directed by the Project Manager.

8 BUILDING AND STRUCTURES WORKS

8.1 Materials

8.1.1 Submission of Samples

As soon as possible after the Contract has been awarded, the Contractor shall submit to the Engineer a list of the suppliers from whom he proposes to purchase the materials necessary for the execution of the Works. Each supplier shall be willing to admit the Engineer, or his representative, to his premises during ordinary working hours for the purpose of obtaining samples of the materials in question. Alternatively, if desired by the Engineer, the Contractor shall deliver the samples of the materials to the Engineer's office, without charge. Samples of materials to be used as aggregates shall be taken and tested in accordance with the provisions of British Standard 812: Sampling and Testing of Mineral Aggregates, Sands and Fillers. Subsequent supplies shall conform, within the specified tolerances, to the quality of approved samples.

The information regarding the names of the suppliers may be submitted at different times, as may be convenient, but not source of supply shall be changed without the Engineer's prior approval.

Samples of materials approved will be retained at the Engineer's office until the completion of the Contract. Samples may be tested to destruction.

All materials delivered to Site must be at least equal in all respects to approved samples.

8.1.2 Cement

Ordinary Portland Cement and rapid-hardening Portland cement shall comply with the relevant section of the "Concrete Specification" or other standards as given in Concrete Specification.

Sulphate resisting cement shall comply with the physical requirements of British Standard 12: Portland cement (Ordinary and Rapid-hardening).

High alumina cement shall comply with the requirements of British Standard 915: High Alumina Cement.

White or coloured cement shall be of approved quality and chemical composition, and shall comply with the physical requirements of British Standard 12: Portland cement (Ordinary and Rapid-hardening).

Cement shall be delivered in broken bags, barrels or by an approved bulk delivery vehicle.

Cement shall be stored in a dry weatherproof shed with a raised wooden floor, or in a silo, and shall be delivered in quantities sufficient to ensure that there is no suspension or interruption of the work of concreting at any time and if in sheds, each consignment shall be kept separate and distinct. Any cement which shall have become injuriously affected by damp or other causes shall at once be removed from the Site. Cement should be used in rotation.

The Contractor shall furnish as directed by the Engineer test certificates relating to the cement to be used on the work. Each certificate shall indicate that the sample has been tested and analysed by an approved laboratory and that it complies in all respects with the requirements of the appropriate Specification for the particular type of cement.

8.1.3 Aggregates for Concrete

Aggregates for concrete shall consist of naturally occurring material complying with the requirements of British Standard 882: Concrete Aggregates from Natural Resources.

A certificate as to compliance with the British Standard shall be provided by the supplier to the aggregate. Tests for the determination of impurities in the sand shall be made once daily, until the Engineer is satisfied that the specified compressive strength is being regularly obtained, when, with his approval, such tests shall be made once weekly and at other times as directed by the Engineer.

The coarse aggregate, unless otherwise 141alvanizin by the Engineer, shall be delivered to the Site in separate sizes (two sizes when the maximum size is 20mm and three sizes when the maximum size is 38mm or more).

The Flakiness Index when determined by the sieve method described in British Standard 812 shall not exceed 20 for 65mm and 38mm aggregates nor shall it exceed 35 for 20mm and 10mm aggregates.

All aggregates brought upon the Site shall be kept free from contact with deleterious matter and in the case of aggregates passing a 5mm sieve they shall have been deposited in the site of mixing for not less than 16 hours before further use; aggregates of different sizes shall be stored in different hoppers, or different stacks on a clean hard surface and shall be separated from each other as approved by the Engineer.

8.1.4 Sand for Mortar

a) Sand for mortar shall be natural or crushed stone sand and shall be in accordance with BS 1198-1200 where applicable to sands for general purpose mortars.

b) The source of the sand is to be approved by the Engineer.

c) At the Works the sand is to be stored on a clean, hard surface.

All building stone shall be capable of withstanding when wet a crushing stress of 10N/mm2. The source of stone shall be approved by the Engineer and stone supplied there from shall be free from Magadi, overburden, mudstone, cracks, sand holes, veins, laminations or other imperfections. The stone shall be chisel-dressed into true rectangular blocks, with each surface even and at right angles to all adjoining surfaces, to the size specified. For exposed stonework the maximum permissible variation of any of the specified dimensions shall be 6mm provided that cut stone, supplied as 'rock face' stone may be hammer dressed on one face only, or on one face and one end, if in other respects it conforms with this Specification. Stones shorter than 375mm will not be accepted.

Unless the Engineer allows otherwise the Contractor shall at his own expense provide and dress four 100mm cubes of stone for testing.

The stone shall be sound when tested in accordance with BS 1438: Media for Biological Percolating Filters, (Sodium Sulphate Soundless test) except that:

i) The treatment shall be repeated for 10 cycles only; and

ii) The second criterion of failure shall be amended to allow for a loss weight of not more than 20% of its original weight.

8.1.5 Stone Dust

Stone duct for blinding shall be black trap screened to the following grading:

- Passing 10mm sieve 100%
- Passing No. 4 sieve 85% - 100%
- Passing No. 100 Sieve 5% - 25%.

8.1.6 Murram

Murram shall be from an approved source quarried so as to exclude vegetable matter, loam, topsoil or clay. The California Bearing Ratio of the murram, as determined for a sample compacted to maximum density (as defined under Bs 1377) and allow to soak in water for four days, shall not be less than 30. This CBR is a guide to quality only and the compaction in the work will be judged by density.

8.1.7 Water for Cement Treated Materials

If water for the Works is not available from the Public Mains the Engineer's approval must be obtained regarding the source of supply and manner of its use. Water to be used with cement or lime shall be free from salt, oil, alkali, organic matter and other deleterious substances. If the water is required to be tested, this shall be done in accordance with the requirements of British Standard 3148: Tests for Water for Making Concrete.

8.1.8 Cement Mortar

Cement mortar shall consist of proportions by volume as specified of Portland cement and natural sand or crushed natural stone of a combination of both as specified in British Standard 1198-1200: Building Sands from Natural Sources. The constituent materials shall be accurately gauged and mixed in an approved manner.

Cement mortar shall be made in small quantities only as and when required, and any mortar which has begun to set or which has been mixed for a period of more than one hour shall be rejected.

8.1.9 Hydrated Lime

Hydrated Lime shall comply with British Standard 890: Building Lime, and shall be Class B of the semi-hydrated type.

8.1.10 Calcium Chloride

Calcium Chloride shall be of a good industrial grade, and shall be obtained from an approved source.

8.1.11 Lime Mortar

Lime mortar shall consist of proportions by volume as specified of hydrated lime and natural sand or crushed natural stone or a combination of both as specified for cement mortar in clause 14.10. The constituent materials shall be accurately gauged and mixed in an approved manner.

8.1.12 Cement-Lime Mortar

Cement-lime mortar shall consist of Portland cement, hydrated lime and natural sand or crushed natural stone or a combination of both, as specified for cement mortar in Section 3 of this Specification. The constituent materials shall be accurately gauged and mixed by volume in an approved manner in the proportions specified.

Cement-lime mortar shall be made only in small quantities as and when required and any mortar which has begun to set or which has been mixed for a period of more than two hours shall be rejected.

8.1.13 Cement Grout

Cement grout shall consist of Portland cement and water mixed in the proportion of one part by volume of cement and one-and-a-half parts by volume of water. The grout shall be used within one hour of mixing.

8.1.14 Concrete Building Blocks

Pre-cast concrete building blocks shall be in accordance with BS 2028 for Type A blocks from an approved source.

The faces of the blocks shall be smooth, true to shape with sharp arrises and be free from pitting and other surface defects.

8.1.15 Building Stone

Stone used for building shall be the best quality hard local stone obtained from approved quarries and shall be sound throughout so as to ring when struck and shall be free from all defects. Stones shall be dressed into true rectangular blocks with each surface even and at right angles to all adjoining surfaces and equal to samples submitted to and approved by the Engineer.

8.1.16 Steel Reinforcement

Mild steel and hot-rolled high tensile steel rod reinforcement for concrete shall be as specified in British Standards 4449, 4482: Rolled Steel Bars and Hard Drawn Wire for Concrete Reinforcements. Cold-twisted high tensile bars shall be as specified in British Standard 4461 Metric Units: Cold-twisted Steel Bars for Concrete Reinforcement. Steel fabric reinforcement shall be as specified in British Standard 4483 : Steel Fabric for Concrete Reinforcement, and shall be delivered to the Site in mats, unless the Engineer allows otherwise, and free from any permanent set tending to make it curl under vibration.

The Contractor shall furnish the Engineer with copies of the manufacturer's certificates of test for the steel reinforcement to be supplied. The Engineer, may however, order independent tests to be made and any steel which does not comply in all respects with the appropriate foregoing Specifications will be rejected.

8.1.17 Granular Material for Pipe Beddings

Granular material for pipe beddings shall consist of well and evenly graded material such as gravel or broken stone, having a grading of 19mm to 5mm, free from fines, readily compactible and free draining. The grading of supplies will be frequently checked.

8.1.18 Concrete Pipes and Specials

Concrete pipes and specials shall comply with the requirements of British Standards 5591. They shall carry the British Standards Institution registration certificate trade mark, or test certificates shall be furnished by the manufacturers.

8.1.19 Concrete Porous Pipes

Concrete porous pipes shall comply with the requirements of British Standard 5911: Concrete porous Pipes for Under-drainage.

8.1.20 Concrete Drain Invert Blocks

Pre-cast concrete invert blocks shall be 150 mm dia. Half round manufactured to the detail Drawings supplied from concrete of the appropriate Class specified in Section 3 of this Specification using maximum 12mm size aggregate. If required, cube test certificates shall be supplied by the manufacturer.

8.1.21 Concrete Slabs for Open Drains

Pre-cast concrete slabs for lining open drains shall be manufactured to the detail Drawings supplied from concrete of the appropriate Class as specified in Tables 14.2, 14.3 and 14.4 using maximum 12mm size aggregate. If required, cube test certificates shall be supplied by the manufacturers.

8.1.22 Drainage Ditch Warning Posts

Pre-cast concrete drainage ditch warning posts shall be manufactured to the detail drawings from concrete of the appropriate Class specified in Section 3 of this Specification. If required, cube test certificates shall be supplied by the manufacturers.

8.1.23 Agricultural Tiles and Pipes

Agricultural tiles and pipes shall be best well burnt earthenware, true and circular in bore and with an externally flat bottom and plain ends suitable for laying with open or butt joints.

8.1.24 Manhole Covers and Frames

Manhole covers and frames shall be basically in accordance with the requirements of BS EN 124: Cast Manhole Covers, Road Gully Gratings and Frames for Drainage Purposes, except that manhole covers shall be constructed of mild steel, concrete filled, and set in grease/bitumen for water tightness in accordance with the Local Authority's standard detail drawings.

Foul water sewer manholes shall have triangular Grade 'A' heavy duty covers and frames. Circular manhole covers and frames shall be used on surface water sewer manholes, and also heavy duty covers where indicated on the drawings.

8.1.25 Gully Gratings and Frames

Gully gratings and frames shall be basically in accordance with the requirements of BS EN 124 497, nominal size 500mm x 350mm, except that the gully gratings shall be constructed of mild steel, concrete filled in accordance with the Local Authority's standard detail Drawings.

8.1.26 Pre-cast Concrete Manholes and Inspection Chambers

Pre-cast concrete manholes and inspection chambers shall comply with the requirements of British Standard 5911: Concrete Cylindrical Pipes and Fittings including Manholes, Inspection Chambers and Street Gullies, and they carry the British Standard Institution registered certification trade mark, or test certificates shall be furnished by the manufacturers.

8.1.27 Pre-cast Concrete Gullies

Pre-cast concrete gullies shall be un-reinforced and shall comply with the requirements of British Standard 5911: Concrete Cylindrical Pipes and Fittings including Manholes, Inspection Chambers and Street Gullies.

8.1.28 Manhole Step-irons

Step-irons of general-purpose type shall comply in all respects with BS 1247: Malleable Step Irons.

8.1.29 Timber

Timber shall be sound, well-seasoned and entirely free from worm, beetle, warps, shakes, splits, and all forms of rot and deadwood. Where required, all timber shall be treated with creosote, as specified in British Standard 144: Coal Tar Creosote for the Preservation of Timber, or an alternative approved timber preservative.

8.1.30 PVC Pipes

Upvc pipes for potable water supply shall comply with BS 3505 and shall be of the type and class as specified in the Drawings or the Bills of Quantities. Where Upvc pipes are to be used for gravity sewerage, they shall be to BS 5481 for sizes DN200 and above and to BS 4660 for under sizes. Laying, jointing and testing shall be to BS 5955. The joint shall employ a flexible rubber ring which shall meet the requirements of BS 2494. Laying, jointing and testing shall generally be carried out according to the relevant Clauses of this Specification and all as per the manufacturer's instructions.

8.1.31 Bitumen

Bitumen shall unless otherwise stated be commercial straight run of penetration 85 — 100 as specified in Table IV — I of the Asphalt Handbook of the Asphalt Institute (USA).

8.1.32 Cut-Back Bitumen

Cut-back bitumen shall be of the specified grade stated in Tables IV — 2 to IV — 4 of the Asphalt Handbook of the Asphalt Institute (USA).

8.1.33 Bitumen Emulsion

Bitumen emulsion shall conform to the requirements of British Standard 434: Bitumen Road Emulsion.

8.1.34 Aggregates for Surface Dressing

Aggregates for surface dressing shall consist of hard, rough, clean crushed rock (blacktrap) as approved by the Engineer. It shall be of approved nominal size and quality and otherwise in conformity with the requirements of British Standard 63: Single Sized Road Stone and Chippings.

8.1.35 Dry Rubble Backing

Dry rubble backing shall consist of broken stone of approved quality, graded from 100mm to 50mm.

8.1.36 Pre-cast Concrete Kerbs, Channels, Edgings and Quadrants

Unless otherwise stated in the Bills of Quantities pre-cast concrete kerbs, channels and edgings shall comply with the requirements of British Standard 7263: Pre-cast Concrete Kerbs, Channels,

Edgings and Quadrants. The date of manufacture shall be marked on each unit. If required, test certificates shall be furnished by the manufacturers.

8.1.37 Pre-cast Concrete Flags

Pre-cast concrete flags/paving slabs shall comply with British Standard 7263: Pre-cast concrete paving slabs shall be 600 x 600 x 50 mm thick, laid on a 50 mm thick sand bed. If required, test certificates shall be furnished by the manufacturers.

8.1.38 Paint

All priming, undercoating and finishing paints shall be in accordance with British Standard 2521/4: Ready Mixed Oil-based Priming Paints, or British Standard 2525/32: Ready Mixed Oil-based Undercoating and Finishing Paints (Exterior Quality), as appropriate.

8.2 Masonry and Block work

8.2.1 General

All masonry work shall be constructed from building stone as specified in Part 4 or approved concrete block work as specified in Part 4.

For culvert headwalls and other small works, the stone shall, unless otherwise specified, be rough dressed. For walls, facing and other exposed works the stone shall, unless otherwise specified, be medium chisel-dressed.

8.2.2 Workmanship

All masonry work is to be constructed in compliance with BS 5.

The Contractor shall provide and use proper setting-out rods for all work.

Stones and blocks shall be well soaked before use and the tops of walls shall be kept wet as the work proceeds. The stones and blocks shall be properly bonded so that no vertical joint in a course is within 115mm of a joint in the previous course. Alternate courses of walling at angles and intersections shall be carried through the full thickness of the adjoining walls. All perpends; reveals and other angles of the walling shall be built strictly true and square.

The stones and blocks shall be bedded, jointed and pointed in mortar (1:3) in accordance with Part 4, with beds and joints 9mm thick flushed up and grouted solid as the work proceeds.

All work shall be cured in accordance with the relevant requirements of Part 4.

8.3 Walling

8.3.1 Materials

Cement

Cement used for making mortar shall be as described in the Engineering specifications for "Materials".

Lime

The lime for making mortar shall be obtained from an approved source and shall comply with BS 890 Class A for non-hydraulic lime. The lime to be run to putty in an approved lined pit or container. The water to be first run into the pit or container and the lime to be added until it is completely submerged, stirred vigorously until all lumps are disintegrated and shall be kept

constantly covered with water and regularly stirred for at least four weeks. The resulting milk-lime then to be run through a fine sieve and run into a pit or other container and kept clean and moist for not less than two weeks before being used in the works.

Sand

Sand used for making mortar shall be clean well graded siliceous sand of good sharp hard quality equal to samples which shall be deposited with and approved by the Architect. It shall be free from lumps of stone, earth, loam, dust, salt, organic matter and other deleterious substances, passed through a fine sieve and washed with clean water if so directed by the Architect.

Water

Shall be as described in "Concrete Work".

Concrete Blocks

Concrete blocks shall comply with the requirements of BS 2028, 1384 except where amended or extended by the following clause. Blocks shall have square arises and corners. For fair faced work damage to arises and corners shall not exceed the removal of 6 mm of the blocks depth or thickness.

Concrete blocks shall have a minimum crushing strength of 3.5 N/mm2 except when below the damp course level or in contact with soil when they shall have a minimum crushing strength of 7 N/mm2, unless noted otherwise on drawings.

Hollow concrete blocks shall not be used below the damp course level or in contact with soil.

Concrete blocks used for external walls shall be Class 'A' and for internal load bearing walls they shall be at least Class `B'. Class `C' blocks shall only be used for non-load bearing partitions.

No pre-cast blocks shall be incorporated into the works unless approved by the Architect. The delivery of present blocks from which samples tested do not comply with this specification shall be deemed defective. Any work constructed with blocks from which samples tested do not comply with this specification shall be deemed to be defective.

From every 1,000 pre-cast concrete blocks delivered to site ten blocks samples shall be provided for testing. The pre-cast block samples shall be selected in accordance with BS 2028, 1364. Samples of pre-cast concrete blocks for testing shall be tested for the following properties in accordance with the methods given in BS 2028, 1364 and the test results shall comply with the requirements of BS 2018, 1364 except where amended by this specification:-

(a) Drying shrinkage

(b) Compressive strength or transverse breaking load (as applicable)

I Wetting expansion *

(d) Density

I Dimensional Tolerance

(f) Cavity size

*Test only applicable for concrete blocks made with clinker aggregate.

Blocks shall also be tested to determine the suction rate. The test shall consist of weighing the block, placing in a tray of water such that only 3 mm of the block side is immersed for a period of

sixty seconds +/- 2 seconds; quickly wiping off excess water and reweighing. The suction rate is the increase in weight due to water absorbed and shall not exceed 2kg/m2/minute. Blocks which have a suction rate exceeding 2kg/m2/minute may be used if the Contractor uses an approved water reactive additive in the mortar or can show that the blocks are wetted such that the blocks will have a suction rate not exceeding 2kg/m2/minute for a period of 24 hours from being laid and provided the blocks comply with all other requirements.

Concrete blocks shall be stacked on prepared dry areas free of clinker, ashes and sulphate bearing strata. Blocks of different strengths shall be stacked separately and clearly marked to differentiate the strengths.

Blocks shall not be used for a minimum of 7 days after manufacture and shall not be loaded for at least 14 days after laying. For the first 7 days after manufacture, blocks shall be cured by maintaining in a damp condition, e.g. covering with polythene sheeting after wetting blocks.

Hollow Clay Blocks

Hollow clay partition blocks shall comply with the provisions of BS 1190 Section 1 and are to be hard, well burnt, true to size and shape and with sharp arrises and keyed faces and joints and are to be obtained from an approved manufacturer and to be equal in every respect to a sample to be deposited with, and approved by, the Architect.

Blocks are to be 190 mm high (to give 200 mm course height including the joint) and of the thickness given herein. Cutting of blocks is to be avoided wherever possible and full use is to be made of quarter, half and three-quarter blocks, and blocks with conduit recesses.

Louvre Block Walling

a) To be pre-cast concrete mix 1:1.5:3 or 25 N/mm2 (12 mm aggregate) but with 10 mm finished fair on all exposed surfaces, built in cement and sand (1:5) mortar with straight horizontal and vertical joints to flush pointed both sides.

b) Each block to be size 200 mm x 400 mm x 200 mm high and consisting of two ends each 200 m x 200 mm x 50 mm thick joined with a 50 mm thick twice cranked louvre with top end of louvre projecting 40 mm above tope of block.

Stone

All stone shall comply with the requirements of CP 121.202 for masonry and rubble walls respectively except where amended or extended by the following clauses.

Unless otherwise noted, all masonry walls shall be coursed squared rubble walling with mortar joints.

The size of stones for rubble walling shall be such that the length of stone does not exceed three times its height. For coursed squared rubble walls blocks shall not exceed 300 mm in height and shall be not less than 150 mm in height.

Where snecked rubble walls are specified, the snecks shall not be less than 100 mm square on the exposed face.

Stone for masonry shall have a minimum compressive strength of 10 N/mm2. (Stone shall not be required to be tested to failure). The density of stone for masonry shall be not less than 2300 kg/m3. The drying shrinkage of stone shall not exceed 0.05%

Samples of stone provided for testing shall be tested for the following in accordance with the methods given in BS 2028, 1364 and the test results shall comply with the requirements of this specification.

(a) Compressive strength

(b) Density

I Drying shrinkage

The colour and texture of stone shall be uniform and consistent. Prior to delivering any stone to site, the Contractor shall supply the Architect with a sample of stone in order that he may approve the colour and texture. The Contractor shall ensure that sufficient suitable stone is available for the whole of the project prior to ordering the stone.

Where cast stone including stone described as artificial stone, reconstructed stone, etc., is specified the stone shall comply with the requirements of BS 1217.

Masonry shall be of stone, having no irregular faces and only the back face if not visible shall be left as from the saw.

Prior to ordering dry stone the Contractor shall demonstrate that the stone is durable. This may be done by supplying details of buildings constructed with stone from the same quarry and which has been exposed to the same environmental condition for at least ten years.

The maximum projection from the face of stone for rubble walls shall be 20 mm beyond the specified face of the wall.

The Contractor shall provide six samples of stone measuring 150 mm x 150 mm for testing prior to delivering any stone to site. As work proceeds the Contractor shall provide six samples 150 x 150 x 150 mm for testing from every 300 m2 of work.

All stone shall be stacked on prepared dry areas free of clinker, ashes and sulphate bearing strata.

Fire Bricks

Clay fire bricks shall be obtained from an approved source and shall be hard, sound, square and clean well burnt and in respect of size shall comply with BS 3921: 1974 Section 2.

Wall Reinforcement

100mm Thick walls and where described other walls and partitions shall be reinforced with a 25 mm wide strip of No. 20 S.W.G. hoop iron built into alternate horizontal joints in the wall centre. The reinforcement shall be lapped and hooked at running joints, angles and intersections and carried at least 115 mm into abutting walls at junctions.

Wall Ties

To be 3 mm diameter galvanized mild steel wire twisted butterfly wall ties.

Damp-Proof Courses

The bituminous felt sheeting for damp-proof courses shall be hessian based bituminous felt complying with BS 743 type 4A weighing not less than 3.85 Kgs. Per square metre. The sheeting is to be lapped 150 mm at running joints and the full width of walls at angles.

8.3.2 Workmanship

Cement Mortar

Mortar described as cement mortar 1:4 shall be composed of 1 cubic metre (1498 Kgs.) of Portland cement and 4 cubic metres of sand. Other mixes such as 1:3, 1:5 etc. shall be similarly construed.

Mixing of Mortar

The constituent materials shall be measured separately when dry in specially prepared gauge boxes of sizes to give the proportions specified without consolidation of the contents by ramming and shaking. The mortar shall be mixed in an approved power driven mixer for not less than two minutes per batch and using the minimum quantity of water necessary to obtain a working consistency. The mixer shall be used as close as practicable to the works and mortar shall be used within 30 minutes of mixing. No partially or wholly set mortar will be allowed to be used or re-mixed.

General Construction

- *Setting out*

The Contractor shall provide proper setting out rods and set out all work on same for course, openings, heights etc., and shall build the walls, piers etc., to the widths, depths and heights indicated on the Drawings and as directed by the Architect.

- *Building in Wood Frames*

Openings for doors, ventilators etc., are to be set out and left un-built until the wooden frames have been fixed in position.

- *Building in Metal Windows and Doors*

Openings for metal frames are to be wide enough for the frames to fit without being forced into position. Build the lugs into the joints of the walling and fill in the space between the walling and frame with cement mortar well tamped into the channel of the frames and point all round externally.

All frames must be set plum and level and free from twist.

- *Walls to Receive Plaster & Similar Finishes*

All faces of walls to be plastered etc., to have all projections dressed off and joints raked out as key.

Building Walling

- *Laying and Jointing*

All blocks shall be well wetted before being laid and the top of walling where left off shall be well wetted before commencing building. Walls to be kept wet three days after building. All walls throughout the works shall be carried up evenly in 200 mm courses except where courses of less depth are required to bring walling up to level of floors, windows and the like and where otherwise described, no part being allowed to be carried up more than one metre higher at one time than any

other part and in such cases the joining shall be made in long steps so as to prevent cracks arising and all walls shall be levelled round at each stage. Not more than 3 metre height of wall shall be laid in any one day.

- *Bonding*

The blocks shall be properly bonded together and in such manner that no vertical joint in any one course shall be within 115 mm of a similar joint in the courses immediately above or below. All walling of 300 mm thickness or less shall be built in single thickness of blocks. Walling exceeding 300 mm in thickness shall be built with through bonders not more than 1070 mm apart in each course as directed by the Architect.

Alternate courses of walling at all angles and intersections shall be carried through the full thickness of the adjoining wall. All perpends, reveals and other angles of the walling shall be built strictly true and square.

- *Tolerances*

All courses of walls shall be level with a maximum deviation of +/- 3 mm in any one metre length and a maximum overall deviation of 10 mm for lengths of wall exceeding 3 metres. Walls shall be plumb with a maximum deviation of +/- 3 mm in any metre height of wall with a maximum deviation of +/- 10 mm in the total height of the wall or any storey.

All corners of walls which are shown as being at right angles shall be square with a maximum deviation of 3 in 1000. All walls shall be straight with a maximum deviation of +/- 3 mm in any one metre length and a maximum overall deviation of 10 mm in any length exceeding 3 metres.

All bed and vertical joints shall be an average of 10 mm thick with a maximum deviation of +/- 3 mm of block work, and stone rubble walls. Joints for stone masonry walls shall be 6 mm +/- 1 mm thick.

- *Curing*

All walls shall be maintained in a damp condition for at least 24 hours after laying. Walls under construction shall be dampened by applying water with a brush and no hosing directly on to the wall shall be permitted. When work ceases on any section of wall polythene or Hessian shall be draped over the wall, for at least 24 hours. If Hessian is used, it shall be maintained continuously wet.

- *Cavities*

Cavity walls shall be of the overall thickness shown on the drawings.

Cavities above ground level between leaves of block or masonry shall be free of mortar droppings or other debris. The Contractor shall take proper precautions to prevent mortar or debris entering the cavity.

Cavities below ground level shall be filled with mortar for cavities up to 75 mm wide and for cavities over 75 mm wide filling shall be concrete mix 1:3:6. Cavities shall be filled such that there is maximum of three times the thickness of the thinner leaf of the wall filled with wet mortar or concrete unless the wall is continuously supported for the depth.

- *Backfilling*

Earth backfilling against walls shall be carried out such that the level of the backfill is always equal on each side of the wall.

When a wall has filling material on one side only to a fill width of more than three times the wall thickness, the wall shall be continuously supported during backfilling.

Backfilling shall not be carried out until at least seven days have elapsed since the laying of the blocks or stone.

Reinforced Walls

Steel reinforcing bars in walls shall be carefully placed and spacers used to ensure that a minimum of 20 mm cover is given to the reinforcement unless otherwise specified.

Horizontal reinforcement in mortar joints shall be laid such that the reinforcement is not in contact with the blocks or stone.

Wall Ties

Wall ties shall be provided to connect walls to steel or concrete columns and beams to connect two unbounded leaves of wall.

Wall ties shall be provided at 450 mm centres both vertically and 900 mm centres horizontally and shall be staggered when used to connect two leaves of un-bonded wall. Wall ties shall be embedded into each material by a minimum of 50 mm.

Fair Face

All concrete and hollow clay block work described as finished with a fair face is to be built to a true and even face with the joints finished as specified hereinafter.

Pointing

Pointing of walls shall be carried out as the work proceeds wherever possible. When coloured mortar is specified for pointing only the pointing shall be carried out after work has been completed.

Existing walls shall be prepared for pointing by raking out all loose friable material to a minimum depth of 15 mm to form a square recess. The joints shall then be wetted and new mortar shall be forced into the joints and finished as directed.

Holes, Cutting and Chasing

(a) putlog holes shall be not less than one course deep and carefully filled with a block cut to fit size of opening with beds and joints filled with mortar well tamped in after scaffolding is removed, and if in faced walls to match facing.

(b) Where walling is cut, holed or chased for conduits, pipes and the like all such cuttings etc., shall be filled in solid with cement mortar (1:4) prior to the application of finishes.

8.4 Painting and Decorating

8.4.1 Materials

Manufacturers

Except where stated all materials shall be obtained from approved manufacturers. The Contractor shall state the name and address of the manufacturer whose materials he proposes to use. Once approval has been given the Contractor shall not obtain materials from other sources without the prior written agreement of the Architect.

Painting products shall be obtained from one of the following approved manufacturers

a) Crown Paints
b) Basco Paints
c) Sadolin paints
d) Dulux Paints

All paint shall be grade A quality

General

Each succeeding coat of priming, undercoating and finishing (pigment) or clear coating shall be sufficiently different in colour as to be readily distinguishable.

All primers and paints in one system upon a particular surface shall be obtained from the same manufacturer.

The mixing of paints, etc., of difference brands before or during application will not be permitted.

Emulsion paints

Emulsion paints shall be matt or satin finish vinyl emulsion paint. Silk vinyl finish shall be used where specified. The first (mist) coat shall be thinned in accordance with the manufacturer's instructions.

Gloss paint

Gloss paint shall be hard gloss finish oil paint.

Blucheuring paint

Blucheuring paint for door handles and gutters is to achieve a wrot iron effect to be obtained from Sadolin paints or equal approved.

Automotive paint

Automotive paint is to be two pack epoxy paint on specified surfaces factory applied, with baked finish, by Sadolin or other approved manufacturer. Colour selection is to be to the Architects approval.

Bituminous solution

Bituminous solution for use on coated pipes, RC and block work faces beneath ground level shall be obtained from a manufacturer approved by the Architect.

Traffic paint

To be as Crown Paints, Road Paint or other approved for use on concrete block paving.

Lead based paints

The use of lead-based paints will not be permitted.

Clear finishes

Clear finishes internally shall be clear polyurethane varnish one or two pack as specified.

Varnish

Varnish is to be an imported water-based varnish/stain by Sadolin Paints or other equal approved.

Primers and undercoats

Unless otherwise specified, primers and undercoats shall be the type recommended by the manufacturer of the finishing coats specified for a particular surface. Primer for external bare metalwork surfaces shall comply with B.S. 2523.

Knotting

Shellac knotting shall comply with B.S. 1336.

White spirit

The white shall comply with B.S. 245.

Timber stain

Timber stain shall be oil based pigmented stain. The application of this material shall be strictly in accordance with the manufacturers written instructions. Tint and degree of application shall be to the approval of the Architect.

Textured coating

Textured coating is to be of proprietary manufacture approved by the Architect of an approved colour.

Technical information concerning the coating is to be submitted to the Architect before ordering, but the minimum qualities of the coating are to be as follows: -

(i) Suitable for application internally and externally to plastered, rendered, concrete, block, stone, brick, asbestos and timber surfaces.
(ii) Minimum durability of 10 years even in exposed conditions.
(iii) Maintenance free.
(iv) Built-in mould resistant fungicide.

Stopping

The stopping shall be as follows: -

(i) Plasterwork shall be plaster based filler.
(ii) Concrete and brickwork shall be similar material to the background and finished in a similar texture.
(iii) Internal woodwork, plywood and block board shall be putty complying with B.S. 544.
(iv) External woodwork shall be white lead paste complying with B.S. 2029.

(v) Internal clear wood finishes: the stopping shall be that recommended by the clear lacquer manufacturer.

Fillers

The fillers for internal joinery shall be the type recommended by the paint manufacturer for use with his type of paint or lacquer.

Stopper and fillers shall be tinted to match the undercoat, and shall be compatible with both undercoats and primers.

All materials shall be used strictly in accordance with the manufacturer's instructions.

8.4.2 Workmanship

General

Workmanship generally shall be carried out in accordance with B.S. C.P. 231, unless otherwise specified.

Before painting is commenced floors shall be swept and washed over; surfaces to be painted shall be cleaned before applying paint as specified, and all precautions taken to keep down dust whilst work is in progress.

No paint shall be applied to surfaces structurally or superficially damp and all surfaces must be ascertained to be free from condensation, efflorescence, etc., before the application of each coat.

No painting shall be carried out externally during humid, rainy, damp, foggy or freezing conditions or conditions where surfaces have attained excessively high temperatures or during dust storms.

No new, primed or undercoated woodwork and metalwork shall be left in an exposed or unsuitable situation for an undue period before completing the process.

No dilution of paint materials shall be allowed except strictly as detailed by the manufacturer's own direction, either on the containers, or their literature, and with the special permission of the Architect. For external work dilution of paints will not be allowed whatsoever. For internal work, where permitted by the Architect, undercoats may be thinned by the addition of not more than 5% thinners. Gloss finish shall not be thinned at all.

Metal fittings such as ironmongery etc., not required to be painted shall first be fitted and then removed before the preparatory processes are commenced. When all painting is completed the fittings shall be cleaned as necessary and re-fixed in position.

Brushwork

Unless otherwise specified, all primers and paints shall be brush applied. Written permission must be obtained from the Architect's if an alternative method of application is to be used.

Stopping and filling

Unless otherwise specified by the manufacturer all primers and undercoats shall be stopped flush and rubbed down to a smooth surface with an abrasive paper and all dust removed before each succeeding coat is applied. Care shall be taken to prevent burnishing of the surface.

Stirring

Unless otherwise specified by the paint manufacturer all paint materials shall be thoroughly mixed and/or stirred before and during use, and suitably strained as and when necessary.

Inspection

No priming coats shall be applied until the surfaces have been inspected and the preparatory work has been approved by the Architect. No undercoats or finishing coats shall be applied until the previous coat has been similarly inspected and approved.

Paint application

Each coat of paint shall be so applied as to produce a film of uniform thickness. All paint shall be applied in accordance with the manufacturer's instructions. Special attention shall be given to ensure that all surfaces including edges, corners, crevices, welds and rivets receive a film thickness equivalent to that of adjacent painted surfaces.

Drying

All coats shall be thoroughly dried before succeeding coats are applied. Allow a minimum of 24 hours between applications on any one surface, unless otherwise specified by the manufacturer.

Un-primed woodwork

Un-primed woodwork scheduled to be painted shall be rubbed down with abrasive paper and dusted off. Care shall be taken to prevent `burnishing' of the surface. All knots and resinous areas shall be coated with two coats of knotting. Pitch on large, open unseasoned knots and all other beads or streaks of pitch shall be scraped off, or if still soft, shall be removed with white spirit before applying the knotting. Apply one coat of priming to all surface, two coats to all end grain, to be subsequently painted. Backs of all wood frames in contact with concrete, brickwork, block work and metalwork or similar materials shall be primed before fixing. After priming all joints, holes, cracks shall be stopped and filled, rubbed down and dusted off.

Primed woodwork

Woodwork delivered primed shall be lightly rubbed down with abrasive paper, and dusted off. Touch up bare areas with a similar priming including open grained ends. After touch priming all joints, holes, cracks and open grained ends shall be stopped and filled, rubbed down and dusted off.

Plywood and block board

Edges of exterior plywood and block board shall be sealed with two coats of aluminium primer and the backs treated with a lead primer.

Clear finished woodwork

All woodwork scheduled to receive a clear finish shall be well sanded with the grain removing all dirt etc., to give as smooth a surface as possible. Resinous timber shall be swabbed down with white spirit and dried thoroughly. Split or end grain shall be filled with suitable filler recommended by the clear lacquer manufacturer, in accordance with their instructions, and of the appropriate shade.

Bare metalwork

Bare metalwork shall be thoroughly cleaned off all dirt, grease, rust and scale by means of chipping, scrapping and wire brushing; particular attention should be given to the cleaning of welded, brazed and soldered joints. Wash down with white spirit and wipe dry with clean rags. Apply a coat of metal primer immediately the cleaned surfaces have been approved by the Architect.

Galvanized metalwork

Galvanized metalwork scheduled for painting shall be thoroughly cleaned of dirt, grease, dusted and washed down with white spirit and wiped dry with clean rags. Any minor areas of rust shall be removed by wire brushing and spot primed with a zinc rich primer. Apply at least one coat of calcium plumbate primer to all surfaces subsequently to be painted.

Primed metalwork

If the priming coat of pre-primed metalwork has suffered damage in transit, or during erection on site, the affected areas shall be cleaned off by wire brushing, abrading and dusting off, the bared patches touched up with a primer of a similar type to that already applied.

Copper

Copper scheduled for painting shall be lightly abraded with emery cloth, washed with white spirit and wiped dry with clean rags. Apply a coat of etch primer immediately the cleaned surfaces have been approved.

Brickwork, concrete etc.

All brickwork, block work, concrete, rendered and plaster surfaces scheduled to be painted shall be brushed down, all holes and cracks filled, all projections such as plaster, or mortar splashes etc., removed to leave a suitable dust free surface. All traces of mould oil shall be removed from concrete surfaces by scrubbing with water, detergent and rinsing with clean water. All these surfaces shall be thoroughly dry before any primer or pains are applied. Apply a coat of alkali resisting primer where surfaces are to be finished with oil paints or alkyd resin type emulsion.

Asbestos cement surfaces scheduled for painting shall be brushed down to remove powdery deposits, and a coat of alkali resisting primer applied where such surfaces are to be finished with oil paints or alkyd resin type emulsion.

Colours

The colours will be selected by the Architect from the paint manufacturer's standard colour range.

Toxic wash

Concrete, block work, plaster and timber surfaces which are to be painted shall be washed down prior to painting with a toxic wash applied by brush or spray. A second wash shall be applied two days after the first wash. The surfaces shall be then allowed to dry out completely before application of paint.

Protection

Proper care must be taken to protect surfaces while still wet by using of screens and 'wet paint' signs where necessary.

Damage

Care must be taken when preparing surfaces, or painting etc., not to stain or damage other work. Dust sheets and covers to the satisfaction of the Architect shall be used to protect adjacent work. Any such stains or damage shall be removed and made good at the Contractor's expense.

Cleanliness

All brushes, tools, pails, kettles and equipment shall be clean and free from foreign matter. They shall be thoroughly cleaned after use and before being used for different colours, types or classes of material. Painting shall not be carried out in the vicinity of other operations that may cause dust. Waste liquids, oil soaked rag, etc., shall be removed from the building each day. Waste liquids shall not be thrown down in any sanitary fittings or drains.

Performance

If, while the work is in progress, the paint appears to be faulty, such as consistency of colour, drying time, or quality of finish, the work shall be stopped at once and the manufacturer consulted.

The manufacturer's of the materials shall be given every facility for inspecting the work during progress in order to ascertain that the materials are being used in accordance to their directions, and to take samples of their products from the site if they so desire for tests.

The finishing coats of the various paints or surface finishings shall be free from sags, brush marks, runs, wrinkling, dust, bare or 'starved' patches, variations in colour and texture, and other blemishes.

When the work has been completed, the finished surfaces shall not be inferior in quality, colour and finish to the samples approved by the Architect, and imperfections in manufacture shall not be apparent through these finished surfaces.

In the event that the Architect is not satisfied that the quality of finish does not comply with the required standards and/or the sample panel the Contractor will be required to repaint at his own expense, such work to the satisfaction of the Architect. If in the opinion of the Architect it is necessary to remove completely the unsatisfactory paintwork this shall also be done under the direction of the Architect at the expense of the Contractor.

Packaging, delivery and storage

All paints and surface coatings shall be delivered in sound sealed containers, labelled clearly by the manufacturers, the label or decorated container must state the following:-

(i) The type of product.
(ii) The brand name and colour
(iii) The use for which it is intend
(iv) The manufacturer's batch number
(v) The B.S. number if applicable
(vi) All labels shall be printed — containers bearing type written labels will not be acceptable.

Materials shall be stored under cover in accordance with the manufacturer's instructions, and with local fire and safety regulations. The store itself must be maintained at a temperature of not less than 50 degrees F (10 degrees C) and must not be subjected to extreme changes of temperature.

The batch deliveries are to be dated and used strictly in order of delivery.

Vinyl emulsion paint

Surfaces to be painted shall receive one mist coat followed by two full coats of vinyl emulsion paint. Application may be by means of rollers or brushes.

Gloss finish paint

Surfaces to be painted shall be primed then painted with two undercoats followed by one coat gloss finish paint.

Clear polyurethane varnish

Surfaces to be clear varnished shall be treated with two coats water based as Sadolins (UK) Ltd or equal approved.

Textured Coating

The manufacturer's instructions concerning application of the coating are to be strictly followed under the direction of the Architect.

All surfaces to receive textured coatings are to be clean and dry with surfaces scraped and brushed before application of the coating.

Application of the coating is to be with textured roller or fibre brush as directed by the Architect with a minimum spreading capacity of 1 kilogramme per square metre. Under no circumstances is the coating to be thinned.

8.5 Painting

8.5.1 General

The Contractor shall supply all paints, primers, varnishes, distemper, oil, etc. ready mixed in original sealed containers bearing the brand maker's name identifying the contents and giving directions for its proper use.

Painting materials shall be of the best quality products of 159alvanizin manufacturers, and shall be subject to the approval of the Architect. The quality of the finishing colours shall be capable of giving three years' minimum satisfactory performance under tropical conditions with high temperatures and humidity, and capable of withstanding temperatures of up to 60 Deg. C for long periods without colour change. Paints shall also be resistant to oils, acids and alkalis.

All surfaces to be painted shall be adequately cleaned and prepared to the satisfaction of the Engineer's Representative and shall be dry and free from any oils, greases, stains or other marks prior to being painted. The paint shall be well and evenly applied. Where sprays are used, markings of the edges of the painted area shall be carried out to provide a definite edge. Brushes and sprays shall be the correct size and type for the work being executed.

For painting applied in several coats each coat shall be of a different shade or colour from the others. Each coat shall be allowed to dry thoroughly and sufficiently harden before the next coat is applied.

All colours shall be selected and approved by the Architect.

All hardware and furniture for doors and windows, together with any exposed electrical installation in walls shall be removed before painting commences. Upon completion of all paintwork all such

hardware and furniture etc. shall be re-installed and left in good working order. Floors shall be covered as protection against staining by paint.

8.5.2 Block Work

Surfaces of concrete and rendering to be painted shall first be washed down and then allowed to dry. Any efflorescence present shall be thoroughly removed, and the areas so affected shall be given a coat of porous alkali-resistant primer. After any traces of grease have been removed the surfaces shall be painted with two coats of emulsion paint of the copolymer acrylic type. Any cracks in walls shall be cleaned, filled and puttied up then left to dry before application of paint.

Plastered surfaces shall be left as long as possible to dry out before being painted and after any efflorescence has ceased to form and has been removed, they shall be painted with two coats of an approved porous emulsion paint. When a gloss paint finish is called for, this coat or coats should only be applied over the emulsion paint after an interval of at least six months.

8.5.3 Woodwork

Woodwork to be painted shall be reasonably dry and its surfaces shall be cleaned and made smooth by the use of fine sand paper obliquely across the grain. The surfaces shall then be dusted off with a dusting brush.

Knots shall be sealed with knotting putty to BS 1336, unless very resinous, when they shall be cut out and the depressions filled after priming. The work shall then be thoroughly primed by brush with a priming paint to BS 5082 and 5358, end grain being given two coats. Cracks, holes and open joints shall be stopped with a mixture of equal parts of hard stopping and linseed oil putty.

Two coats of undercoating of approved manufacture shall be applied, the surfaces being rubbed down between coats. The surfaces on being dry shall then be painted with a final coat of gloss paint leaving no brush traces or irregularities.

Hardwood surfaces shall not be painted but shall instead be treated with two coats of linseed oil, of the clear boiled type. The linseed oil shall be well rubbed in, until the surface of the wood is clearly capable of not absorbing any further linseed oil. The second coat shall be applied between 8 and 12 days after the application of the first coat.

8.5.4 Metalwork

Galvanised metal surfaces shall first be treated with one coat of mordant solution which shall in due time be carefully washed off. The surface shall then be primed with a calcium plumbate primer. When this has dried thoroughly, the surfaces shall be given one coat of undercoat and one of a gloss finishing paint.

All metalwork shall be cleaned free from all rust, scales, grease, oils and any other surface stains, and shall be given one coat of an approved primer compatible with the metal to be painted, two applications of undercoat and one application of a gloss finishing coat.

The Contractor shall seek specific instructions to paint any non-ferrous metal surface.

All metalwork which has been supplied with bituminous protection or painting prior to 160alvaniz from the place of manufacture, such as pipes, tubes, valves, manhole covers, etcetera, shall have all exposed surfaces painted after erection.

The manufacturer's primer or coating shall be made good to the same standard and specification as supplied, and shall then be given two coats of paint as follows: -

(a) Pipes, valves, manhole covers, and fittings, etc. exposed to view shall be painted with two coats of an approved "bitumastic aluminium paint" or similar approved paint.

(b) Pipes, valves and fittings, etcetera in manholes, or chambers shall be painted with two coats of bitumastic paint or other approved paint.

8.5.5 Structural Steelwork

All surfaces to be painted shall be dried and cleansed free of all oil, grease, dirt or other extraneous matter by the use of white spirit, water or other appropriate cleaning material. Where surfaces have been damaged in transit they shall be made good to the same standard to which they were originally protected. Where as a result of such damage the metal has been bared, the paint immediately adjacent to the affected area shall be trimmed down, the affected area cleaned by wire brushing and the protective paint system restored, to provide a coat by coat lapping at the junction of the new and old paint systems. Where welding has been carried out on site, the welds shall be de-slagged and wire brushed, and a protective paint system applied similar to that of the surrounding steel surfaces.

Where surfaces have been left unpainted and are to be connected by High strength friction grip bolts they shall be cleaned as specified in Specifications Section 20 and the contact surfaces brought together without further treatment. After bolting up, those surfaces which, being exposed are not protected, shall be wire brushed, primed and painted to the requirements of Specifications Section 20 to give a coat by coat lapping with adjoining painted surfaces.

Where surfaces have been left unpainted and are to be completely embedded in concrete they shall be cleaned of all oil, grease millscale or other extraneous matter immediately prior to concreting but shall otherwise be left untreated. Where steelwork is to be partially embedded in concrete the paint system shall be continued into the concrete for a distance equal to the least lateral dimension of the concrete forming the surround.

Unless otherwise specified the final coat of finishing paint Specifications Section 20 shall be applied to the immediate area of all steelwork connections after completion of erection. The main body of the steelwork, however, may be painted on site before erection, in which case any damage sustained during the course of erection shall be made good to the satisfaction of the Engineer. Painting will not be permitted when the temperature is below 3 C or when Relative Humidity is in excess of 85% or during wet weather.

8.5.6 Galvanising

Galvanising shall be hot dip 161alvanizing conforming to the requirements of BS 729. Galvanising shall be applied at the rate of 610 g/m² of surface area in a uniform covering of 100 microns thickness.

8.5.7 Finishing Off

All surfaces including window panes shall be left clean and doors and window hinges lubricated.

9 SPECIFICATIONS FOR BOREHOLE DRILLING & EQUIPPING

9.1 Purpose

The borehole to be drilled, constructed, test pumped and equipped with a submersible pump under this contract will be to provide water intended for irrigation use.

The execution of the works shall be in full compliance with relevant provisions of the Water Act.

The Borehole Contractor is deemed to have visited the site, and if unable to locate it or its details apply to the Management of TDB for direction. No claims will be allowed for the traveling or other expenses, which may be incurred by the Borehole Contractor's works.

9.2 Scope of the Work

The works included in the contract consist of two stages: -

STAGE 1:

Stage one comprises of:

A) Confirmatory Hydro-geological Study and Survey to confirm opportunity of borehole

Borehole contractor will be required to conduct a Confirmatory Hydro-geological site survey using an independent, qualified and registered hydrogeologist (at Engineers approval) to establish the best point and depth of drill a borehole based on the identified site. A detailed report is to be given to the Engineer. The report should clearly indicate if it is viable to drill a borehole and other specifications as requested by the Engineer.

B) Formal Submittal to governing agencies

Borehole Contractor will have to make applications and acquire permits for drilling a bore hole from relevant authorities. This include County Government, WRM and NEMA licenses and all other necessary documents as per the local authority requirements at the time of application. This will necessitate the activity of the next event.

NOTE: - Stage 2 (Borehole drilling) shall take place if items A and B in stage 1 are successful and approved by the Engineer/Project manager.

STAGE 2:

Stage 2 consist of the following:

(i) The drilling of one borehole of sufficient diameter to provide for a finished cased and screened borehole of 200 mm diameter to the provisional depth of about (as per BoQ) or otherwise as directed by the Engineer.

(ii) The provision and installation of plain high-density synthetic, slotted synthetic casings, and gravel pack, borehole cap, together with cementation works necessary.

(iii) The collection of formation samples at 2-meter interval (or otherwise as directed by the Engineer) of drilling progress to the bottom and also water sample at every aquifer struck and at the beginning and at the end of test pumping operation for both chemical and biological analysis.

NOTE: - These depths and any other works can be varied by the Engineer depending on the actual conditions encountered in the process of executing of the works.

(iv) The supply and installation of 1No. Submersible borehole solar pump, complete with the necessary controls.

(v) Supply of solar panel for the pump, their mounting and connection to the pump as directed by the Engineer.

(vi) Connection of the water from the borehole to the water storage tank through the rising main pipeline.

9.3 Borehole Data

a) Total depth – (as per BoQ) or otherwise as directed by the Engineer.
b) Casings to be 152 mm diameter and screened depth to be determined after borehole construction.
c) Static water level – not known
d) Dynamic water level – not known
e) Recommended pumping rate – (as per BoQ) or otherwise as directed by the Engineer. (for the purpose of quotation but to be confirmed after testing)
f) (Pump) setting level – 20m (for the purpose of quotation but to be confirmed after testing)
g) Total dynamic head to be determined on site

9.4 Local Conditions

The borehole will be drilled, constructed and test pump in both unconsolidated and consolidated formation and the Borehole Contractor must be prepared to carry out the required work through any type of formation in the project area.

9.5 Conformity Visit for Drilling Rigs and Contractor's Equipment

Before erection of the drilling rig at the borehole location, the Engineer will verify that the Contractors has mobilized the equipment listed in the Contract or otherwise all necessary equipment. No authorization to start the drilling works will be given if necessary, equipment is not mobilized.

At any moment during drilling operations, the Engineer may interruption works operations if the equipment mobilized by the Contractor differs from those listed in the Contract.

9.6 Drilling Techniques/Method

a) Depth and boreholes design

The boreholes to be drilled may be required to penetrate thickness up to 10 m to 20 m soil or poorly consolidated sediments. The contractor should indicate clearly in his proposal the drilling technique how he will operate for drilling the first poorly consolidated levels.

The required drilling technique down to a depth of about 200 m is rotary drilling with bentonite accepted in the drilling fluid (see below for characteristics of the drilling fluid).

b) Centralisers and end plug

In order to achieve the required borehole linearity, all casing permanently installed in wells should be fitted with centralisers at 6-meter intervals or as otherwise directed by the Engineer. The centralisers should be factory manufactured from spring steel straps welded to hinged steel collars to the approval and direction of the Engineer.

A factory manufactured stainless steel end plug will be installed at the bottom of the screen and tubes.

c) Gravel pack installation

A special attention will be paid to quality of gravel pack installation. The mud circulation should be maintained during gravel pack installation.

No gravel pack could be installed in the well without use of a cross-over tool. With this tool, the fluid and filter pack pumped down through the drill pipe will discharge bellow the packed associated to the cross-over tool while the return flow will be conducted up through the packer into the annular space around the drill pipe. The stinger pipe below cross-over tool will extend to some 1 m of the bottom of the screen.

In order to prevent undesirable separation of coarse and fine fraction of the gravel pack, the uniformity coefficient of the mixture will be lower than 2.5 (see below for Characteristics of the gravel pack). In order to check the perfect installation of the gravel pack, a 3m piece of telltale screen will be installed above the production screen, inside the telescoped section.

d) Partial backfilling of wells

The Contractor may be required to backfill an existing well to a depth specified by the Engineer. The backfill material will consist of sand and ten millimetres by twenty millimetres crushed or graded gravel or other sized gravel. All such backfill material must be approved by the Engineer before being used in the well.

e) Cementation under pressure

The Cementation under pressure should be done from the bottom through a cementing shoe: the annular space shall be filled in by cement up to cement appears at the surface. If cement fail to reach the surface, the Contractor, should at his own cost and to the satisfaction of the Engineer, demonstrate that the cement is continuously sealing the casing from the bottom to half of the cemented depth. It should then continue the cementation from the surface and finally demonstrate at his own cost and to the satisfaction of the Engineer, that cement is continuously sealing the whole casing.

Should the Contractor fail to conduct these operations to the satisfaction of the Engineer, the borehole may be declared lost.

f) Failure of casing strings to enter well

In the event that any string of casing will not enter the well, the casing will be removed and the well will be renamed or re-drilled. If the string of casing still does not enter the well, the well will be declared lost.

9.7 Drilling Sequence

Drilling of the poorly unconsolidated levels, up to 10 to 20 m or as applicable

Installing of a surface casing from the bottom of the hole to the surface

The surface casing will be fixed in position by cement being placed in the bottom half meter of the hole by tremmie pipe installed inside the casing, to ensure that the surface pipe remains plumb, and that there is an annular seal for the cement. The annular space between the well and the surface

casing will then be filled with cement up to 1 m below ground surface. Once in place the cement will be allowed to set for a period of 12 hours

Drilling of the borehole down to a depth of about 200 m (diam. 12") below the ground.

An electrical well logging shall be performed and decision can be taken to continue drilling (come back to previous indented line).

The extrados of the casing is cemented under pressure from the bottom up to the surface. The Contractor will provide all necessary equipment to ensure the correct and successful displacement of the cement. Before proceeding with the cementing of the casing, circulation should be established around the casing without any loss and on completion of the cementing some cement should return to the surface.

The cement is allowed to set for 24 hours' minimum

Gravel pack shall be installed beneath the screens and tubes using a cross-over tool. The borehole is then developed

A full pumping test is completed

The well head is constructed

9.8 Sampling and logging

a. Formation Sampling

Representative samples of the strata penetrated will be collected every meter (or as otherwise directed and approved by the Engineer), by whatever method is standard for the drilling technique in use.

A sample of the formation cuttings will be removed from the drilling medium by collecting the sample in a screen, or by collecting a large sample of the drilling fluid and allowing the cuttings to settle out. Care will be taken to ensure that the sample is representative of the material being drilled and not contaminated by hole erosion or cavings.

The samples will be placed in approved and appropriately marked heavy plastic sample bags and handed over in a sturdy box to the Engineer. The sample box will be a container fitted with individual compartments for the samples. A card will be inserted into each compartment along with the sample, indicating, in water-proof ink, the depth from which the sample was recovered.

When requested by the Engineer, the samples will be displayed in a neat and organized manner so that the entire geologic section is clearly represented.

b. Well head logging

Penetration rates, measured as minutes per meter drilled, must be recorded for every meter in the drillers log in regard with the pressure on the tool. The Contractor must report immediately to the Engineer's representative on site any changes in the penetration rate. The penetration rate report must include the method of drilling used and if any changes in the drilling method must be recorded its depth and time of change. Drilling interruption for flushing without drilling, stoppage during installation of additional drill pipes; breakdowns, etc must be properly recorded so that the drilling rates can be properly interpreted purely based on tame taken for drilling.

The contractor shall endeavour to operation in such a way as to detect water strikes by noting increases in flow rates. For this purpose, marsh funnel and stopwatch must be available. In order to measure yield rates during drilling and so to obtain an indication of water strikes, the return water must be directed through a gauging weir consisting of a 90o weir plate (V – Notch) installed at a suitable point in the return water circulation system. The dimension of the V-Notch should be at least 800mm wide across the top and the V- and 400-mm vertical depth.

9.9 Borehole development and clean-up

Well development will be conducted with successively both airlift pump system and interrupted over-pumping. All well development methods and chemicals must be approved by the Engineer.

For airlift pump system, it is a requirement that the double-tube airlift method to be used by the drilling contractor for the development of boreholes. Development must begin from the bottom of the borehole; the apparatus being placed about 1 m above the base of the borehole. The air is turned on and off repeatedly to agitate the fine material within the gravel pack and

the surrounding formation. This process continued every two meters upward within the borehole until the static water level is reached. Once this is completed the apparatus is lowered to the bottom of the borehole to remove sand and gravel and the borehole is then further airlifted until the water is totally clean to the satisfaction of the Engineer.

For interrupted pumping, the pumping shall be done at rates up to 2 times the design capacity. The pumping should be carried out in at least 5 steps, which should include pumping rates of 0.25, 0.5, 1, 1.5 and 2 times the design capacity, with no check valve nor foot valve present. Pumping shall be conducted in 5-minute cycles.

Development shall continue for a minimum of 6 hours' air-lift development plus 3 hours interrupted pumping development and until the discharge water is clean and free of sand (i.e. no more than 1 cm diam. Sand stain test) or until such time as the Engineer finds acceptable. No payment shall be made for the extra hours necessary after 15 hours of development.

9.10 Borehole Disinfection

The Contractor shall at all times take every precaution to ensure that the borehole is kept free of contamination. The Contractor will ensure that formation stabilizer material is disinfected prior to installation.

Disinfection of the borehole shall be undertaken immediately after the borehole development process has been completed. The Contractor will devise a method for the disinfection procedure that meets the approval of the Engineer. The Contractor will include the cost of the disinfection process in his unit process for borehole construction.

The Contractor shall ensure that the disinfecting agent is uniformly applied throughout the entire water depth of the borehole. The disinfecting agent may be placed by a tremie pipe of sufficient length to extend to the bottom of the borehole. The disinfecting agent shall be applied through the hose that shall be raised and lowered to achieve uniform distribution of the solution throughout the borehole.

9.11 Concrete slab, well heads and capping of boreholes

a. Sanitary seal

The annular space between the borehole and wall of the surface casing shall be grouted for sanitary seal for a depth not less than 2 m below ground surface with mixture of cement and water slurry by a pour-in method from the top.

Cement grouting shall be carried out in one continuous operation before initial setting of the cement occurs. Regardless of the method used, the grout shall be introduced at the bottom of the space to be grouted. In no circumstance will this be less than 2 m below the wellhead. The method proposed by the Contractor will be changed or modified if and required to suit the local conditions.

b. Construction of concrete slab

After the completion of the borehole to the satisfaction of the Engineer, the Contractor if must excavate around the sanitary seal until reasonably firm formation is reached.

The ends of the surface casing shall be cut off 0.5 m below the surface level.

The Contractor shall construct a reinforced concrete block (with 12 mm steel reinforcing rods at equal spacing) with the surface dimension of 1 m width, 1 m length and 1.5 m high (1 m below the surface level, 0.5 m above the surface level). Surface of the concrete block will have a divergent slope.

The well casing must protrude 0.2 m above the concrete block unless otherwise specified by the Engineer.

The wellhead block shall be cast around the surface casing in accordance with the Contract drawings, with 0.5 m inside the concrete slab.

c. Wellhead block and capping

The wellhead block without artesian pressure is detailed in the drawings section. The Contractor shall supply all materials and carry out the construction of the wellhead according to the following instructions:

on the top of this casing, a welded flange (stainless steel, 10 mm tick);

over the flange, a capping plate (stainless steel, 10 mm tick) bolted together with the coupling in 8 points and welded in 10 points.

The wellhead block with artesian pressure will be equivalent to the above, but should stand up to 3 bars pressure.

The well head shall be marked with the well number, in a manner approved by the Engineer.

9.12 Lost boreholes and abandonment

a) Failure to complete wells

Should any accident to the plant, jamming of the tools or casing, collapse of the borehole, or any other causes due to the Contractor ‘s negligence, prevent the satisfactory completion of the works, the borehole shall be deemed to be lost and no payment shall be made for that borehole or for any material not recovered there from, nor for any time spent during operations or while attempting to overcome the problems. The option of declaring such lost well shall rest with the Contractor.

In the event of a well potentially being deemed lost, the Engineer may where possible redesign the well so that it is of use to the Employer and payment will be made in accordance with quantities and rates written in the Contract document. Should it not be possible to do this, the well shall be declared 'lost'.

A well may also be declared lost by the Engineer if it is not completed as required due to uncontrolled caving, lost tools down-hole which cannot be recovered, lost circulation zones, unsuccessful cementing or any other reason which leads to failure of completion and which renders the well useless or of little value to the Employer.

A lost hole should be neutralised by a full cementation at the satisfaction of the Engineer.

No payment shall be made for a lost well and its neutralisation.

In the event of lost well the Contractor shall drill a new well at a site indicated by the Engineer.

b) Fishing

Under no circumstances will the Employer pay any charge for time spent on fishing operations due to the Contractor's negligence, broken drill string components, stuck pipe, junk in the hole or any other reason. Contractors are advised to assure themselves of the good condition of all drill string components and maintain adequate wellhead security at all times.

c) Abandonment

The Engineer shall have the right at any time during the progress of the work to order the abandonment of a borehole.

The Contractor thereupon shall withdraw the casing from the borehole, if applicable, and salvage or attempt to salvage all such materials as the Engineer shall direct and/or up until the Engineer revokes such direction and shall fill in or leave the borehole to the satisfaction of the Engineer. Aquifers may be sealed by cement.

Payment shall be made for such abandoned boreholes at the rates and tariffs shown in the Bill of Quantities.

9.13 Aquifer Testing and Water Quality

9.13.1 4.1. Introduction

The aquifer pumping test is a thorough and precise test of the characteristics of the water bearing formation in the vicinity of the well. It is of prime importance that the Contractor correctly monitors test pumping operations to ensure that accurate data is obtained. Testing work will be carried out with the intent of maximising the chances of success in completing tests within the allocated period of time.

For testing operations, the pump test will be installed at the bottom of the pump house, i.e. the bottom of the casing.

9.13.2 Calibration test

Before beginning the actual tests on each well, a calibration test must be undertaken. This involves checking that all equipment including the pump, generator, manometer and pipes are working satisfactorily. The discharge pipeline shall be checked for leaks. The gate valve shall be graduated and relative discharge positions marked in preparation for the step test. Once the calibration test

has been completed the well must be allowed to recover to the satisfaction of the Engineer, before the actual test pumping operations can begin.

The cost of the calibration test shall be uniformly spread over the pump test items of the Bill of Quantities.

9.13.3 Tests sequence and duration

If calibration test shows that a well has sufficient capacity to be interest, pump testing shall be carried out. The following two types of test may be conducted according to the instruction of the Engineer.

Continuous Step Draw-Down test: The Step Draw-Down test shall have six (6) steps of one (1) hour each, without rest period. The test shall begin with the lowest discharge rate (about 1/5 of the pump capacity) and increase consecutively until the maximum discharge rate is reached. (about 150% of the planned well yield). Upon completion of the step drawdown test, a step undertaken, which should normally last for at least two (2) hours or as otherwise directed by the Engineer.

Constant discharge test. Constant discharge tests will be hundred twenty (120) hours in length followed by a twenty-four (24) hours recovery period, at a pumping rate close to the planned well yield (70 l/s or 115 l/s). The Engineer or his representative during the test on the basis of the measurements made and his analysis may increase or reduce both periods thereof.

The pump test shall be terminated only upon the written notice of the Engineer or his representative.

The test pump cannot be removed from the well during the recovery periods.

The pumped water during pumping test should not be allowed to from pools to avoid re-infiltration in the vicinity of the wells. If the Engineer feels that infiltration would take place around the well he can order the Contractor to dispose the water by means of discharge pipes toward a nearby natural drain over a distance where infiltration in to the aquifer during testing is negligible.

9.13.4 Water level measurements

During the period of the tests, the Contractor shall measure and record water levels in the pumped well. For measurement of water levels in wells, pressure meter or electric water level indicators shall be used.

If water level indicator is used, the Contractor shall have at lest two water level indicators on each site. In the tested well, the measurement will be done through a temporary measurement pipe which shall be deep enough to reach the top of the pump.

The water level measurement will also be done in up to 2 neighbour wells designated by the Engineer.

For the tested borehole, the following time intervals are recommended:

Every	1	minutes from	0	to	10	minutes of pumping
Every	2	minutes from	10	to	30	minutes of pumping
Every	5	minutes from	30	to	60	minutes of pumping
Every	10	minutes from	60	to	360	minutes of pumping
Every	15	minutes from	360	to	600	minutes of pumping
Every	30	minutes from	10	to	24	Hours of pumping
Every	60	minutes from	24	to	72	Hours of pumping

9.13.5 Flow measurements

Flow measurements shall be made by means of a gauging weir consisting of a 90° weir plate (V – Notch) as described in the drawing section.

Flow measurements will be made for any water level measurement.

The contractor is responsible with mobilising testing pump with sufficient capacity to meet the planned well yield.

9.13.6 Interruption of the test pumping

The discharge rate during the pumping shall be maintained within five per cent of the rate established by the Engineer and the Contractor shall maintain uninterrupted pumping during the period of all tests. If not so, the Engineer may declare the test interrupted.

Shall the Contractor fail to provide accurate water level and flow measurement with the recommended frequency, the Engineer may also declare the test interrupted. No payment will be made for the elapsed time of the test prior to the interruption.

Unless otherwise directed by the Engineer, interrupted tests shall not be restarted until sufficient time has elapsed for complete recovery of the water levels in the pump or observation well and shall not be considered to be a part of the pumping test for purposes of payment even though water level measurements shall be made during that period by the Contractor if so directed by the Engineer.

9.13.7 Reporting

The contractor shall record test-pumping data on prepared sheets after the approval of the Engineer. The data sheet shall be filled in the English language. The data sheets prepared in triplicate shall include the following information:

The location of the well being tested.

The physical characteristic of the well including depth, diameter, size length of casing screen setting and length of screen.

Characteristics of the test pump

Depth of setting of the test pump in meters.

Date and time of start and finish of pumping test.

Static water level at commencement of test, dynamic water levels and discharge rates at prescribed time intervals.

Draw -down recovery after pumping is completed.

Date and time of start of removal of test pump from the borehole.

9.13.8 Water samples and analysis

Water samples for water quality analysis must be collected during the pumping test as directed by the Engineer. Each sample consists of 4 containers as in a glass or suitable plastic container of 1-liter capacity each.

Water samples should be clearly marked showing name and number of well, date of sampling, hour of sampling, temperature and conductivity of water during sampling and signature of person taking the sample.

2 sets of samples are dedicated for future ICP-MS analyses and will be stored.

1 set will be stored for cross-check analysis if required.

One sample shall be sent to a Laboratory approved by the Engineer within 12 hours after sampling. During transportation, the sample shall be kept in an isotherm box.

The contractor shall carry out water analysis for at least the following: -:

- Temperature
- Electrical conductivity at 25°C
- Ph at 20°C
- Cations: Ca++ Mg++ Na+ K+ and total Fe
- Anions: Cl-, NO3-, SO4—and HCO3-

Note:

The Engineer may order additional analyses if deemed necessary to achieve project objectives

Contractor is responsible in ensuring that the samples are stored in correct temperature condition throughout the contract, if deemed necessary the contractor shall provide air-conditioned room exclusively for storing the samples.

Time of storing: till the demobilization.

9.14 Quality of Materials and Works

9.14.1 Erection of drilling machine at borehole site

The drilling machine must be erected at the borehole site in such a way that the hole will be drilled within 1 m of the marks which is shown to the contractor by the Engineer. No payment will be made for a well not located at the designed site.

9.14.2 Verticality and alignment of boreholes

The wells will be drilled and cased straight and vertical, and all casing, screen or liners will be set plumb and true to line.

Upon completion of drilling or at any other time, the borehole shall be tested for verticality and straightness using deviation-measuring instruments like Inclinometer, Draft Indicator…etc provided and operated by the Contractor at the Contractor ‘s own expenses. Readings of deviation and direction will be taken at three meters’ depth intervals. Deviation shall be no more than 10%.

After pump house casing installation, verticality will be tested by the plumb-bob method. The dummy will consist of an axially suspended cylinder (or cage-ring) at least 7 m long with an external diameter as specified in the Conventional Code of Testing Boreholes. The suspending wire should be less than 5 millimetres diameter of uniform cross section with no kinks. Dummy should freely be passed down the borehole without force. Dummy is provided and operated by the Contractor at the Contractor ‘s own expenses.

Should the plumb or dummy fail to move freely throughout the length of the casing or hole to the bottom of the housing line or should the borehole vary from the vertical in excess of above specified value, or beyond limitations of this test, the plumbness and alignment of the borehole shall be corrected by the contractor at his own expense. Should the contractor fail to correct such faulty alignment or verticality, the well may be deemed lost. The Engineer may waive the requirements of this paragraph for verticality if in his judgment he establish that:-

The Contractor has exercised all possible care in constructing the borehole and the defect is due to circumstances beyond his control.

The usefulness of the completed borehole will not be materially affected.

The cost of necessary remedial measures will be excessive.

In no event will the provisions of this paragraph with respect to alignment be waived.

9.14.3 Assembling of casing, tubes and screens

The assembling methodology for casing, tubes and screen will be submitted to and approved by the Engineer before operation. A particular attention will be paid to the external diameter of tubes and screens, and his compatibility with cementing or gravel pack installation.

The 18”5/8 casing may be coupled to each other either with welds. In order to secure mechanical and corrosion resistances, the Contractor should submit the certificates and qualifications of the

welding operator as well as the welding procedures to the Engineer and get his approval before starting operations. All welding electrodes must comply with the Standard Specifications DIN 1913 or AWS (American Welding Society) standards.

The 13”3/8 tubes and screens may be coupled to each other either with tight sleeve connection (ZSM connection 2 rods version).

The 8”5/8 and 10”3/4 (type 2) tubes and screens may be coupled to each other either with tight sleeve connection (ZSM connection 2 rods version) or with API round threaded connection.

The 10”3/4 (type 1) tubes and screens may be coupled to each other either with API round threaded connection.

In case of threaded connections, the lubricating compound shall not contain any heavy metal or hydrocarbon.

9.14.4 Characteristics of the drilling fluid and additives

In order to limit the environmental impact and to improve the mud quality, the contractor should use mud tanks. Hand dug pits for mud are forbidden.

Drilling mud should of biodegradable type and non-toxic and amenable to degradation by an appropriate chemical agent. The use of bentonite mud is only authorized for drilling of the sealed terrain, i.e. less than about 230 m.

The Contractor must ensure that if the Employer or Engineer specifies mud drilling, he has the necessary equipment including mud pumps, viscosity-measuring apparatus, water tanks etc., to enable him successfully complete the works.

The Contractor shall specify the brand name and manufacturer of any mud or chemicals or additives proposed to be used and include technical specifications or any other relevant data. Readings of the

mud condition (Ph, viscosity, density and sand content) will be collected and recorded as directed by the Engineer. Steps will be taken immediately to correct any variations of the preferred values.

A special and permanent attention should be paid to the density of the drilling mud, in regard to the expected high artesianism of the aquifer. Balanced mud weights will be used for control of the artesian conditions. Barite may be used for mud weight control.

Where applicable and required, mud dispersing agents (such as glassy phosphate), acids for washing limestone, and other chemicals applicable to standard procedures may be used as. If polyphosphates are used, it must be followed by well disinfection. It is recommended,

however, to provide a polyphosphate product that already contains disinfecting agents (i.e.

_Weltone‘ or equivalent).

9.14.5 Characteristics of the casings and screens

Surface casing can be standard black steel casing. All other casing, plain tubes and screens will be made of 304L stainless steel or equivalent.

The 10 ¾” tubes and screens characteristics should be:

Tubes: Internal and external longitudinally welded pipe AISI 304L according to ASTM A312 or DIN 4922 with ferrite content <5% and OD 273 mm

Tubes and screens: the minimum collapse resistance will be 65 bars for the type 1 (the standard pipe 273 x 9.27 mm should meet this requirement) and 50 bars for the type 2.

Before shipment material will be picked and passivated according to ASTM A380

The 8 5/8” tubes and screens characteristics should be:

Tubes: Internal and external longitudinally welded pipe AISI 304L according to ASTM A312 or DIN 4922 with ferrite content <5% and OD 219 mm

Tubes and screens: the minimum collapse Strength will be 70 bars (the standard pipe 219 x 8,18 mm (Sch 40) should meet this requirement).

Before shipment material will be picked and passivated according to ASTM A380

All screens to be installed into the boreholes would be with 0.75 mm slot (tolerance 0.2 mm). This slot might be modified to 1 mm (tolerance 0.2 mm) slot after the first series of tests. The authorized open area will range from 6.5% to 9.5%, in order to maintain an entry velocity from 2 to 3 cm/s. In case of use of pipe base wire wound screens, the pipe has to offer an open area significantly higher than the continuous wire open area, and 13% minimum.

All casing and tubes supplied by the Contractor and which will be installed permanently in the boreholes must be with no circular welding; only longitudinally welding is allowed except to connect the fittings. None of the pipes will made of short pieces welded together.

All casing and tubes supplied by the Contractor and which will be installed permanently in the boreholes must be new and must comply with the ASTM standards. The appropriate manufacturer ‘s product information pamphlets with full details of the offered casing, tubes and screens, including method of joining must be provided to the Engineer and accepted before installation in the hole. The following information should be engraved on equipments:

Customer project name Supplier name

Material

OD and slot for screens, OD and nominal thickness for tubes

The Contractor will organise at his own costs a qualitative inspection, carried out by a recognized international certification company (third part inspection – choice of the third

party to be given to Engineer). It must be held for the release of the equipment at supplier site to check conformity of:

Origin of stainless steel, traceability during manufacturing process to avoid mix of different stainless steel.

Quality plan, quality certificate and qualification of manufacturer, welding operators' qualifications, welding procedures

Material manufacturer certificates according to EN 10204 / 3.1

Dimensional results (slot measurements, tally list)

X-Ray control of the longitudinal welded joint (for 2% of length over 10% of the pipes number randomly selected)

Before shipment material will be picked and passivated according to ASTM A380

Destructive tensile test (on a partial length of 13"3/8, 10 ¾ and 85/8"screen). The

Contractor should demonstrate that these figures are compatible with the weight of columns of screen and tubes.

Full length destructive collapse test (on pipes and screens 13"3/8 , 10 ¾ and 85/8")

Internal pickling report and internal acceptance report of the production, as well as environmental report on passivation plan

The Contractor will organise at his own costs (covering travel, accommodation for a minimum of 3 days, subsidence) the participation of two (2) representatives of the Client to the qualitative inspection.

9.14.6 Characteristics of the gravel pack

The gravel pack will consist of quartz sand and gravel will not contain any carbonate calcium. The material must be clean well-rounded 90 % composed of quartz. The use angular crushed material is not acceptable. Considering the nature of the aquifer material and the specified screen aperture, the required grain size for 95% of the gravel pack material should be 1.0 mm to 2,5 mm.

5 kg sample of the gravel pack material must be submitted to the Engineer for approval before use. Such approval shall be issued in writing and under no circumstances is the contractor to produce gravel for the work until such approval has been received.

9.14.7 Characteristics of the cement

0) **Cement**

All cement, which is used, must comply with the Standard Specification DIN 1164, EN 197, DIN 18555 and must not be older than three months. Unless otherwise instructed by the Engineer or the

Employer, a hardening agent such as calcium chloride should not be used to accelerate the cement setting process. The normal aggregate size for use with the cement may not exceed 19 mm unless otherwise stated.

0) **Cement slurry**

The cement used for cement slurry will be PORTLAND artificial CPA325 type.

The water used shall be potable water. No less than 800 kg of cement will be used per cubic meter of water.

0) **Cement mortar**

The cement used for cement slurry will be PORTLAND artificial CPA325 type.

The water used shall be potable water. No less than 50 kg of cement will be used for 100 l of water. A minimum of 600 kg of cement shall be used per cubic meter of sand.

9.14.8 Tools and accessories

For accessories listed below, the contractor should provide and get approved drawings including all technical details, quality plan, reference and origin:

Production well head with and without artesian pressure

Bottom plug; Centralizers;

Handling tools and clamps for pipes and screens (according to EEC safety rules), and; Cross-over tool

9.15 Supply and Installation of Pump

The Borehole Contractor shall supply and install: -

a) One solar powered submersible pump which will conform to the specification stated, for operation on 3-phase.
b) All necessary electrical equipment for the pump such as mounted solar panel, control panel with starter, ammeter, single phasing cut-out, low voltage cut-out and all necessary cables for connection.
c) Suitable diameter Galvanized Steel pipe class ‘C’ or PVC-U to carry water to the surface/ to water storage tank
d) Low level cut-out switch
e) Airline 20mm galvanized steel pipe for water level measurements
f) Pressure gauge
g) The gate valves, non-return valves before the master meter
h) Master meter for measuring the water from the borehole.

In addition, the Borehole Contractor shall carry out 24 hours test run at the completion of the works. This test has to be certified by the Project Manager.

Note on Pump Installation

The Borehole Contractor shall install the borehole pump complete with all necessary accessories.

The Borehole Contractor shall make the necessary electrical connections and include in his prices all cable, starter-panel, switches etc. required to put the pump in operation while tendering for this

part of the document and return it with full description literature and performance curves for the proposed equipment together with the tender for drilling works.

The installation of the submersible pump into the borehole shall be done immediately the borehole drilling is completed, test pumped and water analyzed for suitability for human consumption.

The final production pump to be installed in the newly drilled borehole shall be determined and installed as per the actual conditions encountered on completion of the drilling works. Hence the specifications given under the section of 'borehole data' are only for the purpose of quotation. After establishing the actual conditions of the drilled borehole, only the Services Engineer's approved submersible pump shall be installed.

9.16 Electrical works

It shall be the responsibility of the Borehole Contractor to provide all electrical wiring between all items of his Contract to ensure the correct function of his equipment. The Borehole Contractor's electrical works shall start from the nearest electrical isolator which is available within the site or which it has installed as per the contract.

10 SPECIFICATIONS FOR ELECTRO-MECHANICAL EQUIPMENT

10.1 General

All the electrical works shall comply with the British standards adopted in Kenya.

All the electrical works carried out strictly in accordance with the following: -

i) The 13th Edition of the Regulations for electrical equipment of Building issued by the Institute of Electrical Engineer of Great Britain with Kenya amendments.
ii) The Licenses by-laws
iii) The Government Electrical Specification/GES No. 1 and No. 2
iv) The power acts
v) The Relevant British standard Specifications and codes of practice published by the British Institution/here-in after referred to as BS an CP respectively).
vi) Specification
vii) The contract drawing and the working drawing produced by the Contractor and approved by the Engineer.
viii) The Engineers Instructions.

The Contractor shall undertake all modifications demanded by the authorities in order to comply with the regulation and produce all certificates if any from the authority without change. After completion of the work the Contractor shall deliver a complete set of as built drawings showing the complete installation including all alterations and modifications. The set of drawings shall include but is not limited to all floor plans and diagrams.

10.2 Material

All materials, fittings and accessories are to be new and in accordance with the requirement of the current rules and regulations where such exist with the relevant KBS standards, BS or others.

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

Competent workmen under skilled and experienced supervision shall carry out the work.

The Engineer shall have the right to have any part of the work taken down or changed at the Contractors expense which is executed in an unsatisfactory manner.

10.3 Pump Design Details

The pump set shall be to the particular specifications capable of delivering required discharge at design head at temperatures of 20 – 30 ^{0}C

The pumps shall be the high pressure, vertical mounting, multi-stage, centrifugal type running at a full load speed of not less than 2800 rpm. The entire pump body including the strainer, cable guard, non-return valve shall be made of heavy duty grade stainless steel material AISI 304 or similar approved heavy duty grade stainless steel material while the impellers, shaft, locking nuts and washers shall be made from stainless steel (AISI 316) material or similar approved heavy duty grade stainless steel material. The bearings shall be the water lubricated type, wear resistant.

11 SAFETY, HEALTH AND ENVIRONMENT

11.1 Introduction

The prevention of injury and/or illness to the site personnel and the public, damage to the Works and to public and private property, protection of the environment, and compliance with applicable laws, are primary objectives of the Employer. Because of the importance the Employer places on meeting these objectives, selected minimum requirements are outlined in these Safety, Health and Environmental Specifications with which Contractors shall comply while working on this contract. Given that these Specifications cannot cover every eventuality, the Contractor shall be expected to exercise good judgment in all such matters, even though not mentioned in these Specifications, and shall take any and all additional measures, as required or necessary, to meet his responsibility for safety, health and environmental matters during the period of the Contract.

The Employer nor its representatives shall not be held liable for any actions taken by the Contractor that are attributed to following the minimum requirements stated hereinafter.

The Contractor shall throughout the execution and completion of the Works and the remedying of any defects therein:

(a) have full regard for the safety of all persons on the Site and keep the Site and the Works in an orderly state appropriate to the avoidance of danger to any person;
(b) know and understand all laws governing his activities along with any site requirements and work site hazards. Such information shall be communicated by the Contractor to his personnel and subcontractors;
(c) take all necessary measures to protect his personnel, the Employer's personnel, other persons, the general public and the environment;
(d) avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequent of carrying out the Works.

11.2 Compliance with Specifications

The Contractor shall comply with the requirements of these Safety, Health and Environmental Specifications and all other applicable regulations or requirements under Kenyan laws, laid down by relevant authorities or issued by the Employer or the Project Manager concerning safety, health and the environment, in force or introduced or issued from time to time during the period of the Contract.

The Contractor shall adopt a positive approach, awareness and responsibility towards safety, health and the environment, and take appropriate action, by:

a) ensuring the Specifications are enforced and followed by the Contractor's personnel. Any failure by the Contractor's personnel to follow the Specifications shall be regarded as a failure by the Contractor.
b) paying attention to possible injury to unauthorized persons entering the site, particularly children.

Whenever in these Specifications the Contractor is required to provide test certificates for equipment and personnel and to comply with the relevant authorities' requirements and no independent test facilities are available or no relevant authorities exist in Kenya, the Contractor shall provide:

a) in lieu of independent test certificates:

- for equipment – details of the tests that have been carried out by the Contractor and a written statement that the Contractor has satisfied himself that the item of equipment is fit and safe for use;
- for personnel – details of the training and experience of the personnel and a written statement that the Contractor has satisfied himself that they have the required level of competency;

b) in lieu of relevant authorities' requirements – details of the Contractor's own rules, regulations, requirements and procedures regarding safety, health and the environment.

If the Project Manager is dissatisfied with the details provided by the Contractor, the Contractor shall provide further details or carry out further tests or provide further written statements as may be reasonably required by the Project Manager.

11.3 Failure to Comply with Specifications

11.3.1 General

Should the Contractor fail to comply with any of the Specifications or requirements of the Project Manager:

(a) the Project Manager may suspend the Works of part of the Works until the Contractor has taken the necessary steps, to the satisfaction of the Project Manager, to comply with the Specifications or requirements.

(b) the Employer may, following written notice to the Contractor, carry out themselves or arrange for another contractor to carry out such measures as they may consider appropriate on behalf of the Contractor. Any such actions by the Employer shall not affect or diminish the Contractor's obligations or responsibilities under the Contract.

(c) the Project Manager may, by written notice of suspension to the Contractor, suspend all payment to the Contractor under the Contract if the Contractor fails to rectify any breach of the Specifications within the period specified by the Project Manager, provided that such notice of suspension:

(0) shall specify the nature of the failure or failures; and

(ii) shall request the Contractor to remedy each such failure within a specified period after receipt by the Contractor of such notice of suspension.

Such suspension of payment shall remain in force until such time as the Contractor has rectified the breach or breaches to the satisfaction of the Project Manager. No interest shall be paid on the suspended payments.

Failure to comply with the Specifications or requirements shall be considered a breach of the Contract by the Contractor and may result in termination of the Contract by the Employer. In the event of the Employer taking action based on this Clause, the Contractor shall not be entitled to any additional costs or extension to the Contract Completion Date. All costs incurred by the Employer pursuant to Sub-Clause 703.1.1 (b) shall be deducted from the amounts otherwise due to the Contractor.

11.4 General Requirements

11.4.1 Preamble

All references to safety shall be deemed to include health and the environment.

11.4.2 Safety Officer

The Contractor shall appoint a competent Safety Officer who shall be responsible for safety, health and the environment. The Safety Officer shall be given sufficient time by the Contractor to carry out his duties; minimum requirements shall be as follows:

Workforce on site of over 250	- full time Safety Officer;
Workforce on Site of 100 – 250	- 50% of Safety Officer's time;
Workforce on site below 100	- as required for the Works but a minimum of 5 hours per week of Safety Officer's time where more than 20 workers.

The Contractor shall provide the Safety Officer with appropriate identification, including a white hard hat with red cross symbol and an identification badge. The appointment of the Safety Officer shall be in writing and copied to the Project Manager.

The Safety Officer shall be provided with a mobile phone or other similar means of communication. The Safety Officer shall be accessible and available at all times including normal working hours.

11.4.3 Safety Training

The Contractor shall provide safety induction training for all site personnel upon starting on site.

The Contractor shall provide safety refresher/reinforcement training at regular intervals for his staff.

11.4.4 Safety Meetings

The Contractor shall hold regular safety meetings to provide safety instructions and receive feedback from site personnel on safety, health and environmental matters. A weekly safety Meeting shall be chaired by the Safety Officer and minutes shall be taken of the meeting. The meeting/minutes shall be given to the Project Manager. The Safety Officer should attend the Contractor's weekly site meetings and "Safety" shall be an item on the agenda.

11.4.5 Safety Inspections

The Safety Officer shall make regular safety inspection of the work site. The Safety Officer shall prepare a report of each inspection. This report shall include details of all breaches of these Specifications and any other matters or situations relating to safety found during the inspection, instructions issued by the Safety Offices and actions taken by the Contractor. A copy of the Safety Officer's reports shall be given to the Project Manager.

11.4.6 Control of Substances Hazardous to Health

Hazardous materials shall be stored in approved safety containers and handled in a manner specified by the manufacturers and/or prescribed by relevant authorities .

Only properly trained and equipped personnel shall handle hazardous materials.

11.4.7 Potential Hazards

The Contractor shall inform employees of potential hazards, take the appropriate steps to reduce hazards and be prepared for emergency situations. The Contractor shall make an assessment of every operation involving hazardous substances.

11.4.8 Accident Reporting

The Contractor shall report **all accidents and dangerous occurrences** to the Project Manager. The Contractor shall prepare a report on each accident or dangerous occurrence and a copy of the report, together with witness statements and any other relevant information, shall be submitted to the Project Manager. A reportable accident or dangerous occurrence shall include any accident to any person on site requiring medical attention or resulting in the loss of working hours or any incident that resulted, or could have resulted, in injury, damage or a danger to the Works, persons, property or the environment.

All accidents and dangerous occurrences shall be recorded in a Site Accident Book. The Site Accident Book shall be available at all times for inspection by the Project Manager.

The Contractor shall immediately rectify any situation or condition that could result in injury, damage or a danger to the Works, person, property or the environment. If the situation or condition cannot be corrected immediately, the Contractor shall provide temporary barriers and appropriate warning signs and devices and/or take other appropriate action necessary for the protection of persons, property and the environment.

11.4.9 Notices, Signs, Etc.

All safety, health, environmental and other notices and signs shall be clearly displayed and written in English. All requirements, instructions, procedures, etc. issued by the Contractor concerning these Specifications shall be printed in English and displayed and readily available to the Contractor's personnel.

11.4.10 First Aid and Medical Attention

The Contractor shall have **comprehensive First Aid Kit(s) on Site at all times**. First Aid Kits shall be conveniently located and clearly identifiable.

The Contractor shall make contingency arrangements for calling a Doctor and transporting injured persons to hospital. The telephone numbers of the emergency services and the name, address and telephone number of the Doctor and nearest hospital shall be prominently displayed in the Contractor's site office.

11.4.11 Employee Qualification and Conduct

The Contractor shall employ only persons who are fit, qualified and skilled in the work to be performed. All persons shall be above the minimum working age. Contractor's personnel shall use the toilet facilities provided by the Contractor.

The Contractor shall ensure:

(a) that no firearms, weapons, controlled or illegal substances or alcoholic beverages are brought onto the Site and that no personnel under the influence of alcohol or drugs are permitted on Site.

(b) That all personnel obey warning signs, product or process labels and posted instructions.

(c) That drivers or operators of vehicles, machinery, plant and equipment follow the rules for safe operations. Drivers shall wear seat belts and obey all signs and posted speed limits.

11.5 Safety Requirements

11.5.1 Personal Protective Equipment

The **Contractor shall provide personal protective equipment**, including hard hats, safety glasses, respirators, gloves, safety shoes, and such other equipment as required, and shall take all measures or actions for the protection and safety of Contractor's personnel.

When handling acids, caustics and chemicals with corrosive or toxic properties, suitable protection, such as acid suits or chemical resistant aprons and gloves, shall be worn to prevent accidental contact with the substance.

Personnel shall not be permitted to work whilst wearing personal clothing or footwear likely to be hazardous to themselves or others.

The Contactor shall encourage employees to wear substantial work gloves whenever practical and safe to do so.

11.5.2 Fire Protection and Prevention

The Contractor shall comply with fire protection instructions given by the Authorities having jurisdiction in regard to fire protection regulations. The Contractor shall, upon moving on site, provide to the Project Manager and the Authorities a fire prevention and evacuation plan. This shall include drawing(s) showing the fire assembly points. The fire prevention and evacuation plan and drawing(s) shall be updated from time to time as the Works progress. The Contractor shall ensure all personnel are fully informed on escape routes and assembly points and any changes thereto. Fuel storage will not be permitted in construction work areas. Contractors may establish fuel storage tanks in specified areas set aside for the purpose and approved by the Project Manager. Storage tanks shall be adequately bunded to control spillage. Fire extinguishers shall be provided and installed in a suitable nearby location.

All temporary accommodation and stores shall be provided with smoke detectors and fire alarms.

Smoking shall be banned in high risk areas.

Expanded polystyrene with or without flame retarding additive, polythene, cardboard and hardwood shall not be used as protection materials. Plywood and chipboard shall only be used as protection on floors. Vertical protection shall be non-combustible. Debris netting and weather protection sheeting shall be fire retardant.

An adequate number of fire extinguishers of types suited to the fire risk and the material exposed shall be provided. These shall be placed in accessible, well-marked locations throughout the job site. Contractor's personnel shall be trained in their use. Extinguishers shall be checked monthly for service condition and replaced or recharged, as appropriate after use.

Only approved containers shall be used for storage, transport and dispensing of flammable substances. Portable containers used for transporting or transferring gasoline or other flammable liquids shall be approved safety cans. Fuel burning engines shall be shut off while being 182nservic. Adequate ventilation to prevent an accumulation of flammable vapours shall be provided where solvents or volatile cleaning agents are used.

Flammables shall not be stored under overhead pipelines, cable trays, electrical wires or stairways used for emergency egress. Paints shall be stored and mixed in a room assigned for the purpose. This room shall be kept under lock and key.

Oily waste, rags and other such combustible materials shall be stored in proper metal containers with self-closing lids and removed every night to a safe area or off site. Every precaution shall be taken to prevent spontaneous combustion.

11.5.3 Electrical Safety

All temporary electrical installations, tools and equipment shall comply with current regulations dealing with on-site electrical installations. The Contractor shall establish a permit-to-work system for work in or in proximity to energized circuits of any voltage. Contractor's personnel shall not commence work on such circuits unless a permit to work has been issued and adequate safety measures have been taken and the work operation has been reviewed and approved by the Project Manager.

Only authorized personnel shall be allowed to work or repair electrical installations and equipment. Portable tools and equipment shall be 240 volt, unless otherwise agreed by the Project Manager.

When portable or semi-portable equipment operates at voltages in excess of 240 volts, the supply shall be protected by a Residual Current Device (RCD) regardless of any such device fitted to the equipment. The RCD must have a tripping characteristic of 30 milliamps at 30 milliseconds maximum.

All static, electrically powered equipment, including motors, transformers, generators, welders and other machinery, shall be properly earthed, insulated, and/or protected by a ground fault interruption device. In addition, the skin metal buildings and trailers with electric service shall be earthed. Metal steps, when used shall be securely fixed to the trailer.

Lamp holders on festoon lighting shall be moulded to flexible cable and be of the screw in type. Clip on guards shall be fitted to each lamp unit.

All tungsten-halogen lamps shall be fitted with a glass guard to the element. These lamps must be permanently fixed at high level.

Electrical equipment shall be periodically inspected and repaired as necessary by competent persons.

Any work in electrical equipment and systems shall be made safe through locking, tagging, and/or isolation of the equipment before work commences. Prior to the start of the work, the equipment or systems shall be tested to ensure that they have been properly de-energised and isolated.

Electrical repair work on energized systems shall be avoided whenever possible.

Electrical trouble shooting shall be conducted only after getting written approval of the Project Manager.

Unauthorized personnel shall not enter enclosures or area containing high voltage equipment such as switchgear, transformers or substations.

11.5.4 Scaffolding/Temporary Works

No aluminium tube shall be used, except for proprietary mobile towers, unless otherwise agreed with the Project Manager.

Drawings and calculations shall be submitted to the Project Manager, prior to commencement of work on the site, for all Temporary Works, including excavations, false work, tower cranes, hoists, services and scaffolding. Designs shall conform to international standards.

The Project Manager will not approve Temporary Work designs but the Contractor shall take account of any comments on such designs made by the Project Manager.

All scaffolds used for storing materials, for brick or block laying, for access to formwork or for any other purpose where materials may be accidentally fall, shall be provided with wire mesh guards of a substantial material, in addition to kick boards.

11.5.5 Use of Ladders

Manufactured ladders shall meet the applicable safety codes for wood or metal ladders. Metal ladders shall not be used where there is any likelihood of contact with electric cables and equipment. All metal ladders shall be clearly marked: "Caution – Do not use around electrical equipment". Job made ladders shall not be permitted.

Ladders rungs and steps shall be kept clean and free of grease and oil. Extension and straight ladders shall be tied off at the top and/or bottom when in use. Only one person shall be allowed in a ladder at a time.

Defective ladder shall be taken out of service and not used. Ladders shall not be painted and shall be inspected for defects prior to use.

11.5.6 Elevated Work

The Contractor shall provide all personnel, while working at an elevated position, with adequate protection from falls. Details of such protections shall be submitted to the Project Manager.

The Contractor shall carry out daily inspections of all elevated work platforms. Defects shall be corrected prior to use.

(a) Roofing and Sheet Metal Laying

(a) A Method Statement detailing the procedures to be adopted shall be submitted to and agreed with the Project Manager prior to commencement of work on the site.
(b) Mobile elevating work platforms or the equivalent shall be used to install roofing and sheet materials wherever practicable and a suitable base is available.

(b) Erection of Structures

(a) A Method Statement detailing the procedures to be adopted shall be submitted to and agreed with the Project Manager prior to commencement of work on the site.
(b) Safety harness and lines shall be provided by the Contractor for use by the erection personnel and worn at all times.
(c) Mobile elevating work platforms or the equivalent shall be used to erect structures wherever practicable and a suitable base is available.

(c) Mobile Elevating Work Platforms

Operators shall be trained in the safe use of such platforms and hold a current Certificate of Competence.

(d) Hoists

(a) A copy of the current Test Certificate shall be submitted to the Project Manager before any hoist (personnel or material) is brought into operation on the site. Where the range of travel is increased or reduced a copy of the revised Test Certificate shall be submitted.
(b) Each landing gate shall be fitted with a mechanical or electrical interlock to prevent movement of the hoist when any such gates is in the open position.
(c) Safety harness must be worn and used by personnel erecting, altering and dismantling hoists.

(e) Suspended Cradles

(a) Suspended cradles shall be installed, moved and dismantled by a specialist contractor.
(b) Suspended cradles shall comply with local regulations.
(c) All powered suspended cradles shall incorporate independent safety lines to over speed braking devices and independent suspension lines for personal safety harness attachment.

11.5.7 Use of Temporary Equipment

The safe design of any piece of equipment shall not be exceeded, nor shall the equipment be modified in any manner that alters the original factor of safety or capacity. Mobile equipment shall be fitted with suitable alarm and motion sensing devices, including back-up alarm, when required. The Contractor shall ensure that the installation and use of equipment are in accordance with the safety rules and recommendations laid down by the manufacturer, taking into account the other installations already in place or to be installed in the future.

When mobile or heavy equipment is travelling onto a public thoroughfare or roadway, a flagman shall ensure that traffic has been stopped prior to such equipment proceeding. While the mobile or heavy equipment is travelling on a public roadway, a trailing escort vehicle with a sign warning of a slow-moving vehicle that is dangerous to pass shall be provided.

11.5.8 Demolition

A detailed Method Statement detailing the demolition procedures/techniques to be used shall be submitted to and approved by the Project Manager prior to commencement of work on site.

The Method Statement must include full details of measures to be taken to ensure that there are no persons remaining in the building/structure and to distance members of the public and Contractor's personnel from the building/structure prior to demolition.

11.5.9 Excavation and Trenching

An excavation permit (approval) signed by the Project Manager must be issued before excavation proceeds in any work location. The contractor shall investigate and identify the location of existing services by study of the drawings, a visual/physical study of the site, sweeping by appropriate detection equipment and where necessary hand excavation of trial holes.

Following this investigation, the Contractor shall submit a written request for an excavation permit to the Project Manager.

The Project Manager will return the permit signed and dated to indicate:

- services which are to be maintained.
- services which are to be isolated.

- any special precautions to be taken.

A sample Excavation Permit is given in Annex 1 to this Specification. The issue of an Excavation Permit by the Project Manager shall not relieve the Contractor of his responsibilities under the Contract.

Excavations 1.3 metres or more in depth and occupied by personnel shall be provided with ladders as a means for entrance and egress. Ladders shall extend not less than 1 metre above the top of the excavation.

Excavated or other materials shall be stored at least 0.65 metres from the sides of excavations.

11.5.10 Concrete Reinforcement Starter Bars

The Contractor shall ensure concrete reinforcement starter bars are not a danger to personnel. Where permitted by the Project Manager, starter bars shall be bent down. Alternatively, the starter bars shall be protected using either hooked starters, plastic caps, plywood covers or other methods agreed with the Project Manager.

11.6 Environmental and Health Requirements

11.6.1 Protection of the Environment

The Contractor shall be knowledgeable of and comply with the Environmental Management Plan (EMP) and with all environmental laws, rules and regulations for materials, including hazardous substances or wastes under his control. The contractor shall not dump, release or otherwise discharge or dispose of any such materials without the authorization of the Project Manager.

11.6.2 Air Pollution

The Contractor, depending on the type and quantity of materials being used, may be required to have an emergency episode plan for any releases to the atmosphere. The Contractor shall also be aware of local ordinances affecting air pollution.

The contractor shall ensure that all trucks leaving the Site are properly covered to prevent discharge of dust, rocks, sand, etc.

11.6.3 Water Pollution

The contractor shall not dispose of waste solvents, petroleum products, toxic chemicals or solutions on the city drainage system or watercourse, and shall not dump or bury garbage on the Site. These types of waste shall be taken to an approved disposal facility regularly, and in accordance with requirements of relevant Authorities. The Contractor shall also be responsible for the control of all run-offs, erosion, etc.

11.6.4 Solid Waste

(a) General Housekeeping

(a) The Contractor shall maintain the site and any ancillary areas used and occupied for performance of the Works in a clean, tidy and rubbish-free condition at all times.

(b) Upon the issue of any Taking-Over Certificate, the Contractor shall clear away and remove from the Works and the Site to which the Taking-Over Certificate relates, all Contractor's Equipment, surplus material, rubbish and Temporary Works of every kind, and leave the said Works and Site in a clean condition to the satisfaction of the Project Manager. Provided that the Contractor shall be entitled to retain on Site, until the end of the Defects Liability Period, such materials, Contractor's Equipment and

Temporary Works as are required by him for the purpose of fulfilling his obligations during the Defects Notification Period.

(b) Rubbish Removal and Disposal

(a) The Contractor shall comply with statutory and municipal regulations and requirements for the disposal of rubbish and waste.
(b) The Contractor shall provide suitable metal containers for the temporary storage of waste.
(c) The Contractor shall provide suitable metal containers from site as soon as they are full. Rubbish containers shall not be allowed to overflow.
(d) The Contractor shall provide hard standings for and clear vehicle access to rubbish containers.

(c) Pest Control

The Contractor shall be responsible for the rodent and pest control on the Site. If requested, the contractor shall submit to the Project Manager, for approval, a detailed programme of the measures to be taken for the control and eradication of rodents and pests.

Anti-termite treatment is recommended to be applied on the soil beneath the foundations for the main structures and strictly in accordance with manufacturer's guidelines, the Pesticide control Board regulations and in line with the annexed specific specifications (annex 4).

11.6.5 Noise Control

The Contractor shall ensure that the works is conducted in a manner so as to comply with all restrictions of the Authorities having jurisdiction, as they relate to noise.

The Contractor shall, in all cases, adopt the best available plant/and or machinery shall be used. All equipment shall be maintained in good mechanical order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable. Stationary noise sources shall be sited as far away as possible from noise-sensitive areas and, where necessary, acoustic barriers shall be used to shield them. Such barriers may be proprietary types, or may consist of site materials such as bricks or earth mounds as appropriate.

Areas where noise levels exceed 90 decibels, even on a temporary basis, shall be posted as high noise level areas.

11.7 Additional Requirements for Work in Public Areas

11.7.1 General

Those additional requirements shall apply to all works carried out in Public Areas.

Public Areas are defined as areas still used by or accessible to the public. These include public roads and pavements, occupied buildings and areas outside the Contractor's boundary fencing.

All work in Public Areas shall be carried out to minimize disturbance and avoid dangers to the public.

Before commencing work, the Contractor shall ensure that all necessary resources, including labour, plant and materials will be available when required and that the works will proceed without delays and be completed in the shortest possible time. Period of inactivity and slow progress or delays in meeting the agreed programme for the Works, resulting from the Contractor's failure to provide necessary resources or other causes within the control of the Contractor, will not be

accepted. In the event of such inactivity, slow progress or delays, the Contractor shall take immediate action to rectify the situation, including all possible acceleration measures to complete the works within the agreed programme. Details of the actions and acceleration measures shall be submitted to the Project Manager. If the Project Manager is dissatisfied with the Contractor's proposals, the Contractor shall take such further actions or measures as required by the Project Manager. All costs incurred shall be the responsibility of the Contractor.

11.7.2 Method Statement

The Contractor shall submit to the Project Manager a method statement for each separate area or work in Public Areas. The Method Statement shall include:

a) a general description of the Works and methodology of how it will be carried out.
b) Details of the measures and temporary works to 188nservic disturbance and safeguard the public. These shall include temporary diversions, safety barriers, screens, signs, lighting, watchmen and arrangements for control of traffic and pedestrians and advance warning to be given to the public.
c) Details of temporary reinstatement and maintenance of same prior to final reinstatement.
d) For works involving long lengths of trenches or works to be completed in sections, the lengths or sections of each activity (e.g. up to temporary reinstatement, final reinstatement) to be carried out at any one time.
e) Details of the availability of necessary resources (labour, plant, materials, etc.) to complete the work.
f) A programme showing start and completion dates and period for all activities of each length or section, including temporary works, and the works overall.
g) Such further information as necessary or required by the Project Manager.

The Contractor shall not commence work, including temporary works, until after the approval of the Contractor's Method Statement by the Project Manager.

Method Statements shall be updated bases on actual progress or as and when required by the Project Manager.

11.7.3 Closure of Roads, Etc.

The closure or partial closure of roads, pavements and other public areas will only be permitted if approved by the Project Manager and Relevant Authorities. The Contractor shall detail for each closure the extent of area to be closed, the reasons and duration of the closure, and where appropriate, proposed diversions. A sample Street Closure Permit is given at Annex 2 to this Specification.

11.7.4 Trench and Other Excavations

The requirements covering trench and other excavations will depend on the location and type of the excavation and the potential risks to the public.

The following guidelines apply particularly to trenches but shall also apply to other types of excavations:

(a) before commencing work the Contractor shall:
- notify the Project Manager of the location and duration of the work. An excavation permit signed by the Project Manager must be issued in accordance with Sub-Clause 705.16 before excavation proceeds in any work location;

- obtain permission from relevant authorities including the police when required;
- erect all temporary works such as barriers, warning signs, lighting, etc.;
- have available adequate materials for temporary supports to sides of excavations and necessary labour, plant and materials to complete the work within the shortest possible time.

(b) in carrying out the works the Contractor shall, unless otherwise permitted or required by the Project Manager:

- not open more than one excavation within a radius of 250 metes;
- limit the length of trench excavation open at one time to 150 metres;
- maintain and alter or adapt all temporary works including supports to sides of excavations;
- remove all surplus excavated material the same day it is excavated;
- complete the works, including final reinstatement within ten days;
- where final reinstatement is not achieved within the required time, to carry out temporary reinstatement;
- ensure that any temporary reinstatement is maintained at the correct level until final reinstatement is achieved.

The above guidelines shall not relieve the Contractor of his obligations and responsibilities.

11.7.5 Safety Barriers

Safety barriers shall be provided to the perimeter of work areas and to trench and other types of excavations and to existing openings such as manholes, draw pits and the like. When exposed to the public, safety barriers shall be provided to both sides and ends of trenches and around all sides of openings.

The type of safety barrier used shall be appropriate to the particular location and the potential risks to the public. Examples of different types of safety barriers are given below:

- Type 1 - excavated material;
- Type 2 - non-rigid barrier of rope or florescent tape strung between metal rods driven into the ground;
- Type 3 - rigid barrier of timber, steel or concrete. Such barriers could be in the form of horizontal rail(s) or sheet material secured to posts driven or concreted onto the ground.

The following are guidelines on the type of safety barriers that could be used in differing situations. They apply particularly to trenches but also apply to other types of excavation, existing openings onto the perimeter of work areas:

- areas not subject to vehicular traffic - Types 1 or 2;
- roadways (low traffic speed) - Types 1 or 2;
- roadways (high traffic speed or where excavation are greater than 2 m) - Type 3.

The above examples of the types of barriers and the guidelines on situations in which they could be used shall not relieve the Contractor of his obligations and responsibilities.

11.8 Contractor's Site Check List

A sample Contractor's Site Check List is included in Annex 3 to this Specification. This is included to assist contractors should they wish to introduce such a system as part of their site management procedures. The list is not exhaustive and further items will need to be added by the Contractor.

The list is issued for guidance only, and does not, in any way, revise or limit the requirements covered elsewhere in these Specifications.

11.9 Notable Potential Negative Impacts and Mitigation Measures

A summary of potential negative impacts specific to this project and their mitigation measures is presented below:

Impacts	Proposed Mitigation Measures
Destruction of Vegetation on the construction sites	• Site Clearance and Construction activities will be limited to available reserves within which the pipelines are to be laid so as to minimize destruction to vegetation cover • Reinstatement of the project sites to their original state to be carried out once construction works are completed to allow growth of vegetation.
Soil Erosion resulting to loss of top soil	• To minimize the risk of soil erosion especially on the sloppy sites the consultant recommends use of temporary gabions during construction stage and reinstatement of soil cover upon completion of the project.
Solid wastes generation from construction activities	• Construction wastes (residual earth and debris) to be collected at designated points and Contractor to dispose to approved dumping sites • Contractor's Camps and Construction Sites to have designated waste collection points, • Environmental Management, Health and Safety Training Programmes to be conducted for Contractor's Staff to create awareness on proper solid wastes management
Disruption of existing Public Utilities	• Contractor to carry out piloting to locate services such as pipes and cables along the Pipeline Route before commencing excavation works • The relevant Services Providers and Agencies to be notified prior to commencement of Works so that any relocation works can be carried out before the Pipeline Construction Works begin • Length of excavation to be restricted to sections that can be reinstated within the shortest period possible to minimize time of disruption of services
Labour Influx and sexual offences	• Effective community engagement and strong grievance mechanisms on matters related to labour • Proper records of labour force on site while avoiding child and forced labour • Fair treatment, non-discrimination, and equal opportunity of workers • Comply to Kenya labour Laws

12 CONSTRUCTION TOLERANCES

12.1 General

The following are the tolerances within which the works are to be executed or as directed by the Engineer:

12.2 Earthworks

Top level of Embankments after compaction		+100/ -0 mm
Sides of Embankments over a 10 m length		+100/ -0 mm
Channel or Excavation cutting		+20/ -20 mm
Channel Water Way Area		- 0
Horizontal Alignment of Channels:	Maximum	300 mm
	Over 20 m length	100 mm
Formation Level for Structures		+0/ -ve filled with concrete
Formation Level for Gabions		+0/ -100 mm

12.3 Concrete Structures

The following tolerances shall apply to all wrought formed and fair or fine unformed finishes.

Tolerance from Specified Position

Maximum departure of plan position of structure 150 mm

Tolerance from Specified Dimension

Maximum departure in thickness, cross-sectional dimension or position of columns, beams, walls, footings and the like +25/ -10 mm

Surface Tolerance on Straightness or Departure from Specified Curve

General Surfaces

Maximum deviation in horizontal or vertical direction

- gradual over a 10m length 25 mm
- abrupt 10 mm.

Surfaces in Contact with Flowing Water

Maximum deviation in direction of flow or normal to flow

- gradual over a 10m length 15 mm
- abrupt 5 mm

Reinforcement

Maximum departure in required spacing 15 mm

Minimum lap length shall be:

- In the case of mild steel reinforcing 40 times bar diameter
- in the case of high yield steel reinforcing 50 times bar diameter

12.4 Stonework

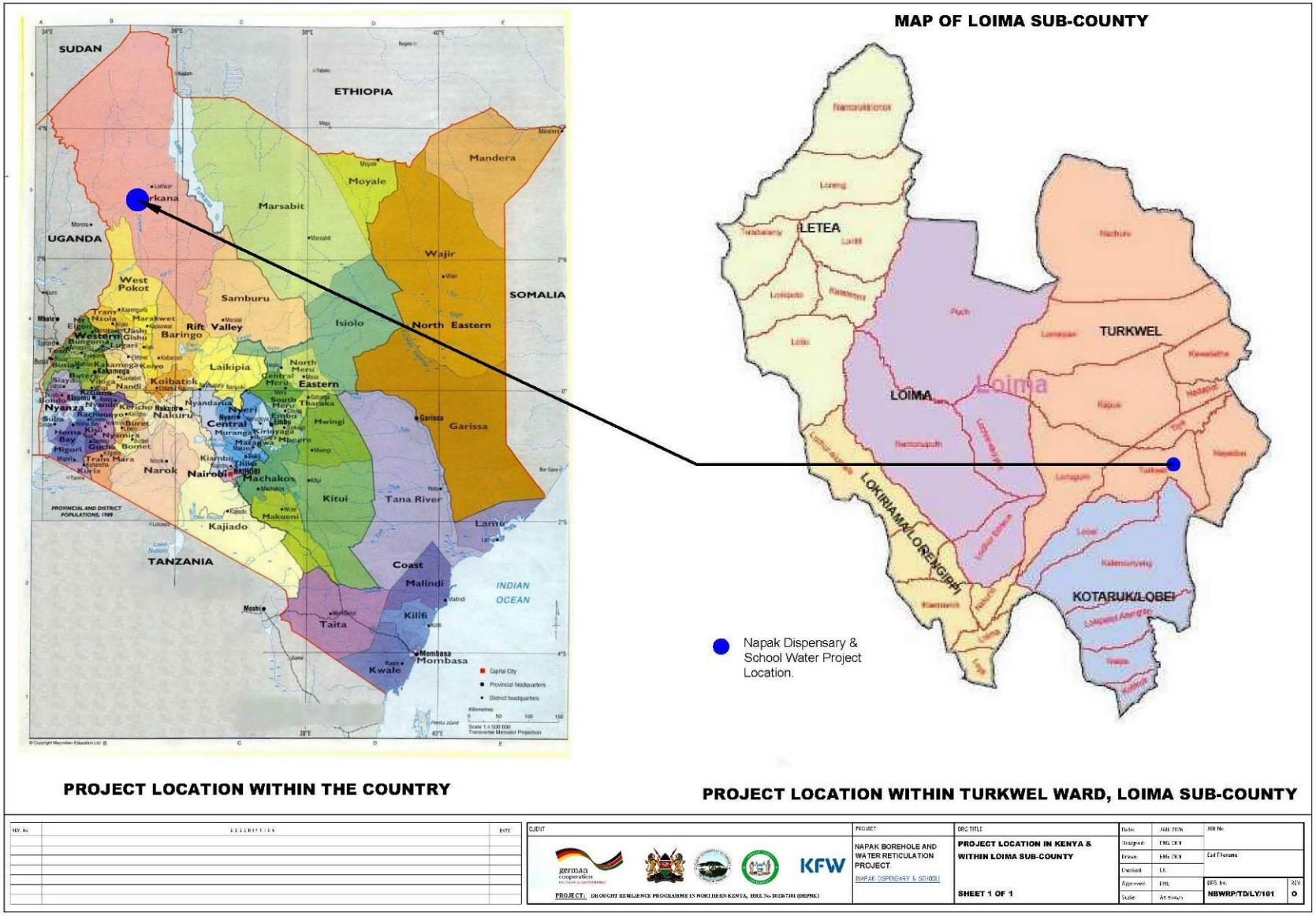
Pitching and Masonry over a 2 m length	+100/ -25 mm
Face of gabion basket	+ 75/ -25 mm
Thickness of tipped rock or filter layer	+100/ - 0 mm

Section VIII: DRAWINGS

Note: A list of drawings is hereby attached. A separate book of drawing in PDF format will be provided with similar clear construction drawings.

NAPAK DISPENSARY AND SCHOOL BOREHOLE AND WATER RETICULATION PROJECT		
LIST OF TENDER DRAWINGS		
DRG No	**DRAWING TITLE**	**SHEETS**
NBWRP/TD/DL/000	DRAWING LIST	1/1
	LAYOUTS	
NBWRP/TD/LY/101	PROJECT LOCATION IN KENYA & WITHIN TURKANA COUNTY.	1/1
NBWRP/TD/LY/102	PROJECT AREA SATELLITE IMAGE MAP	1/1
NBWRP/TD/LY/103	PROJECT PIPELINE NETWORK LAYOUT MAP	1/1
NBWRP/TD/LY/104	PROJECT CONTOUR MAP	1/1
	HEADWORKS'	
NBWRP/TD/BH/201	BOREHOLE ARRANGEMENT	1/1
NBWRP/TD/BH/202	STANDARD TANK DETAILS & ARRANGEMENTS	1/1
	PROFILES	
NBWRP/TD/PR/301	RISING MAIN PIPELINE PROFILE CH.0+000.00 - 0+460.00 m	1/1
NBWRP/TD/PR/302	GRAVITY MAIN PIPELINE PROFILE CH.0+000.00 - 0+380.00 m	1/1
	STANDARD DRAWING & STRUCTURES	
NBWRP/TD/STD/401	SUPPORT & THRUST BLOCKS AND PIPE TRENCH BEDDING STD DETAILS	1/1
NBWRP/TD/STD/402	SECTION/BLOCK VALVE CHAMBERS	1/1
NBWRP/TD/STD/403	TYPICAL PIPE TRENCH BACKFILLING DETAILS	1/1
	WATER POINT DRAWINGS	
NBWRP/TD/WP/501	TYPE-1 WATER KIOSK (PLAN AND SECTIONS VIEW DETAILS)	1/2
NBWRP/TD/WP/501	TYPE -1 WATER KIOSK (STRUCTURAL& PLUMBING WORK DETAILS)	2/2
NBWRP/TD/WP/502	WATER STAND PLAN AND SECTION & STRUCTURAL DETAILS	1/1
	CATTLE TROUGH DETAILS	
NBWRP/TD/CT/601	CATTLE TROUGH LAYOUT PLAN AND SECTION DETAILS	1/3
NBWRP/TD/CT/601	CATTLE TROUGH SECTION & STRUCTURAL REINFORCEMENT DETAILS	2/3
NBWRP/TD/CT/601	CATTLE TROUGH SECTION & STRUCTURAL REINFORCEMENT DETAILS	3/3
	TOILETS	
NBWRP/TD/VIPT/701	VIP TOILET PLAN & SECTIONS	1/2
NBWRP/TD/VIPT/701	FLOOR BEAMS, SOAK PIT AND FLOOR SLAB REINFORCEMENT DETAILS	2/2
	PROJECT FACILITIES	
NBWRP/TD/PF/801	PROJECT SIGN BOARD	1/1
NBWRP/TD/PF/802	PIPELINE MARKER POSTS AND BENCHMARK DETAILS	1/1
NBWRP/TD/PF/803	GATE AND FENCING DETAIL STANDARD DRAWING	1/2
NBWRP/TD/PF/803	FENCING DETAIL STANDARD DRAWING	2/2

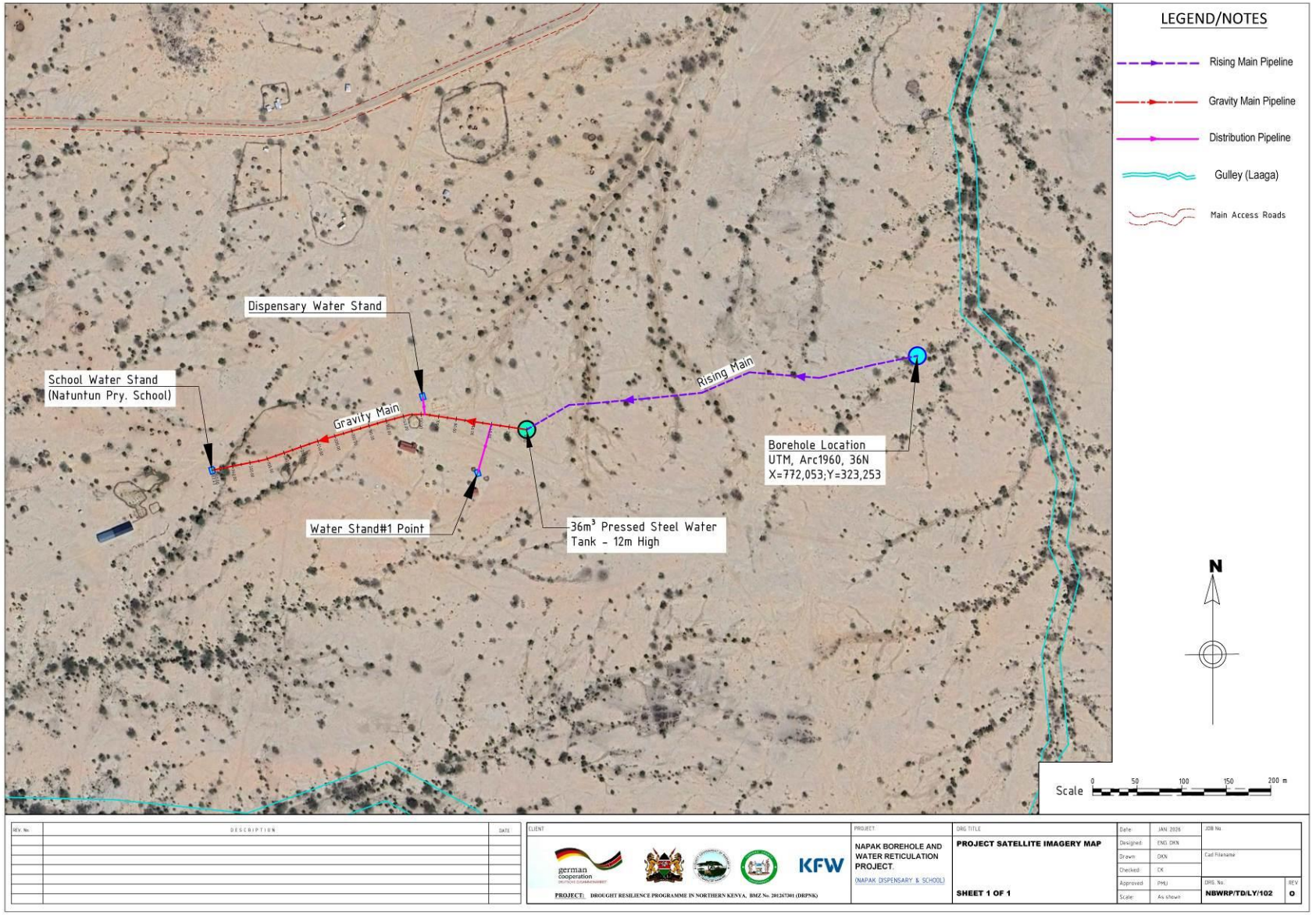
LOCATION LAYOUT MAP

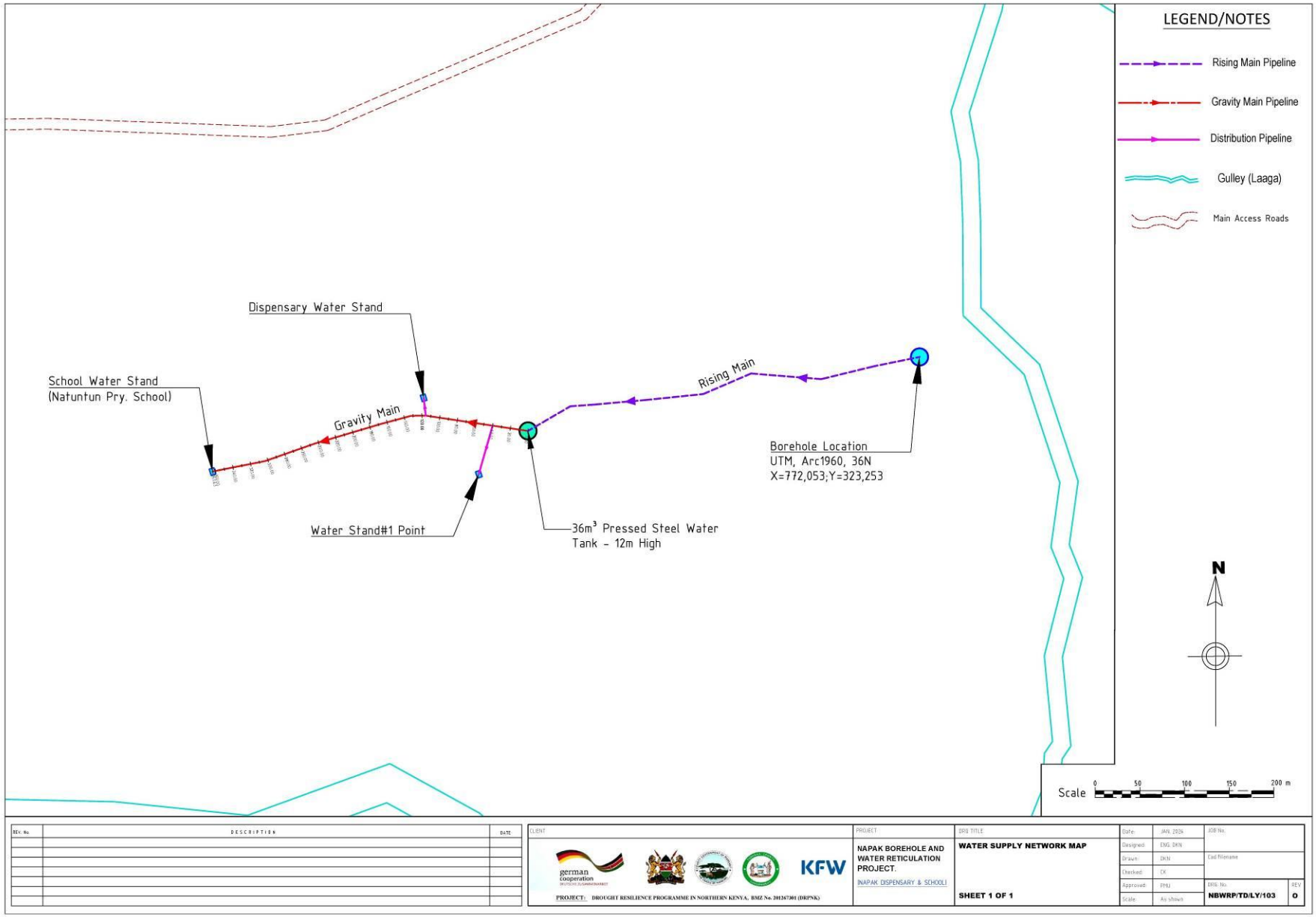


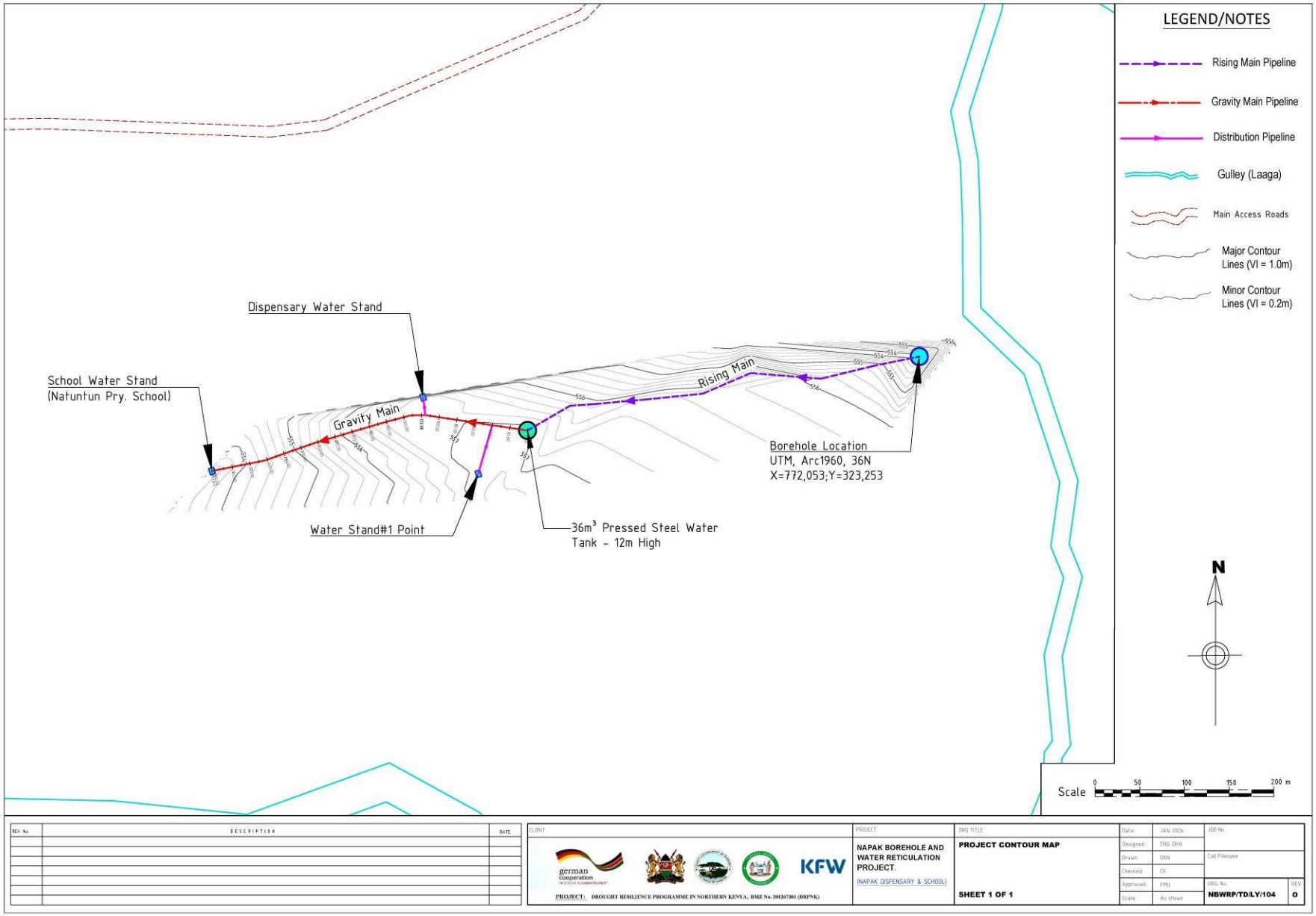
REV. No.	DESCRIPTION	DATE

CLIENT	PROJECT	DRG TITLE	Date: JAN 2016 / JOB No.
german cooperation / KFW	NAPAK BOREHOLE AND WATER RETICULATION PROJECT. NAPAK DISPENSARY & SCHOOL	PROJECT LOCATION IN KENYA & WITHIN LOIMA SUB-COUNTY	Designed: ENG. OKM / Drawn: ENG. OKM / Checked: CE / Approved: PPM / Scale: As shown / Cad Filename
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, IDLE No.2012/6701 (DRPNK)		SHEET 1 OF 1	DRG. No. NBWRP/TD/LY/101 / REV. 0

GENERAL LAYOUT




LEGEND/NOTES
Rising Main Pipeline
Gravity Main Pipeline
Distribution Pipeline
Gulley (Laaga)
Main Access Roads
Dispensary Water Stand
School Water Stand
(Natuntun Pry. School)
Gravity Main
Rising Main
Borehole Location
UTM, Arc1960, 36N
X=772,053;Y=323,253
Water Stand#1 Point
36m³ Pressed Steel Water
Tank - 12m High
N
Scale
0
50
100
150
200 m
REV. No.
DESCRIPTION
DATE
CLIENT
PROJECT
NAPAK BOREHOLE AND WATER RETICULATION PROJECT.
INAPAK DISPENSARY & SCHOOLS
DRG TITLE
WATER SUPPLY NETWORK MAP
SHEET 1 OF 1
Date: JAN, 2026
Designed: ENG. DKN
Drawn: DKN
Checked: CK
Approved: PMU
Scale: As shown
JOB No.
Cad Filename
DRG. No.
NBWRP/TD/LY/103
REV.
0
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 20126701 (DRPNK)


LEGEND/NOTES
Rising Main Pipeline
Gravity Main Pipeline
Distribution Pipeline
Gulley (Laaga)
Main Access Roads
Major Contour Lines (VI = 1.0m)
Minor Contour Lines (VI = 0.2m)
Dispensary Water Stand
School Water Stand
(Natuntun Pry. School)
Gravity Main
Rising Main
Borehole Location
UTM, Arc1960, 36N
X=772,053;Y=323,253
Water Stand#1 Point
36m³ Pressed Steel Water Tank - 12m High
N
Scale
0
50
100
150
200 m
REV. No.
DESCRIPTION
DATE
CLIENT
german cooperation
KFW
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA; BMZ No. 201267301 (DRPNK)
PROJECT
NAPAK BOREHOLE AND WATER RETICULATION PROJECT.
(NAPAK DISPENSARY & SCHOOL)
DRG TITLE
PROJECT CONTOUR MAP
SHEET 1 OF 1
Date: JAN 2026
Designed: ENG. DKN
Drawn: DKN
Checked: CK
Approved: PMU
Scale: As shown
JOB No.
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DRG. No.
NBWRP/TD/LY/104
REV
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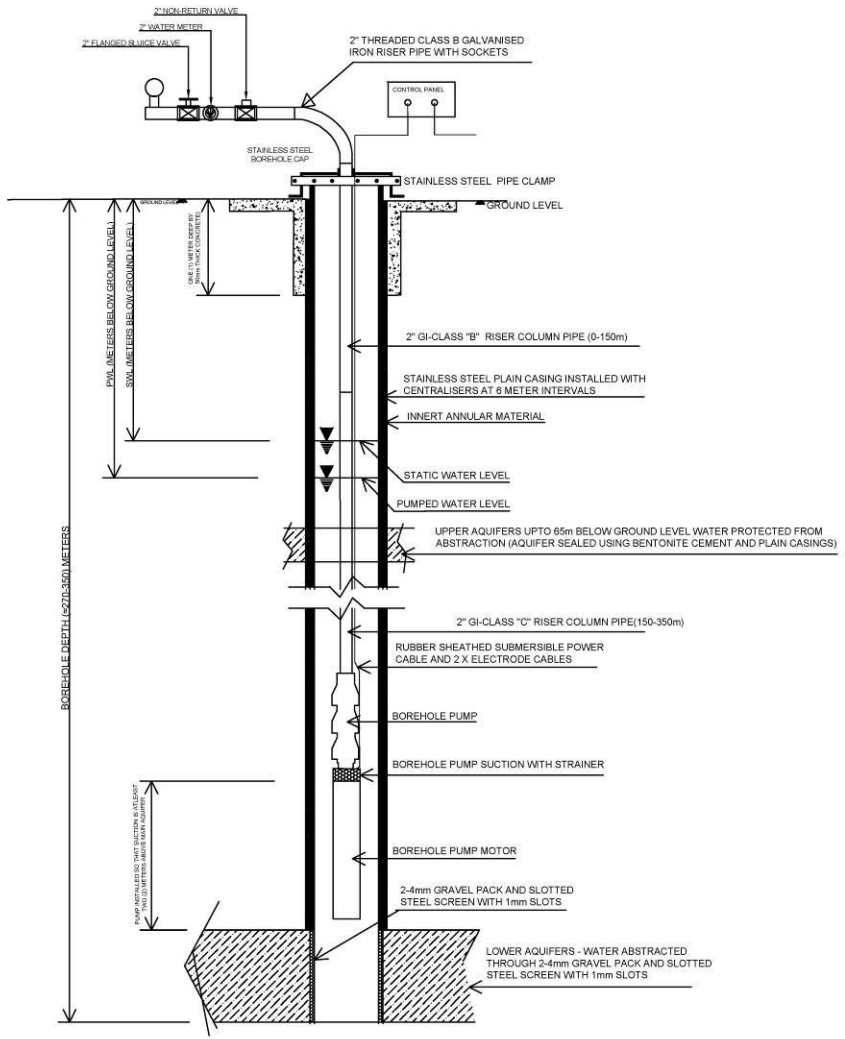

REV. No.	DESCRIPTION	DATE

CLIENT

german cooperation

KFW

PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA. BMZ No. 20126700 (DRPNK)

PROJECT

NAPAK BOREHOLE AND WATER RETICULATION PROJECT.

(NAPAK DISPENSARY & SCHOOL)

DRG TITLE

BOREHOLE ARRANGEMENT

SHEET 1 OF 1

Date:	MARCH 2026	JOB No.	
Designed	ENG. DKN		
Drawn	ENG. DKN	Cad Filename	
Checked:	CK		
Approved:	PHJ	DRG. No.	REV
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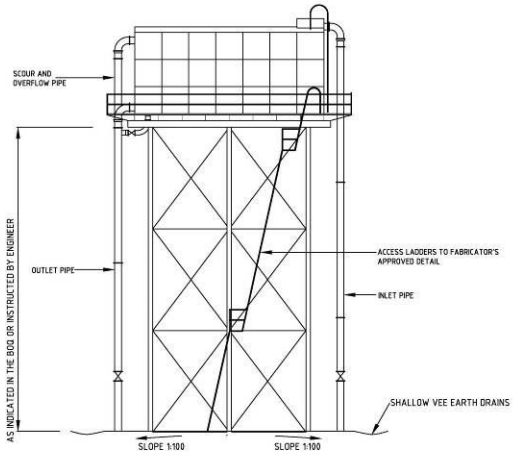
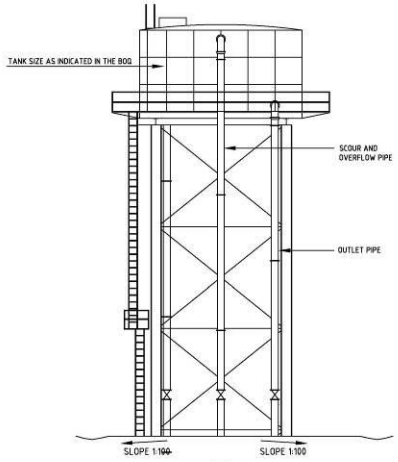
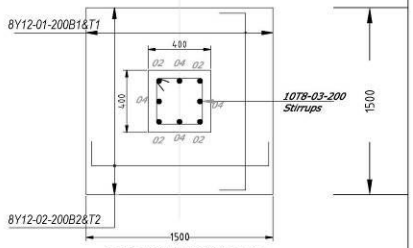




SECTION B-B

NOTES

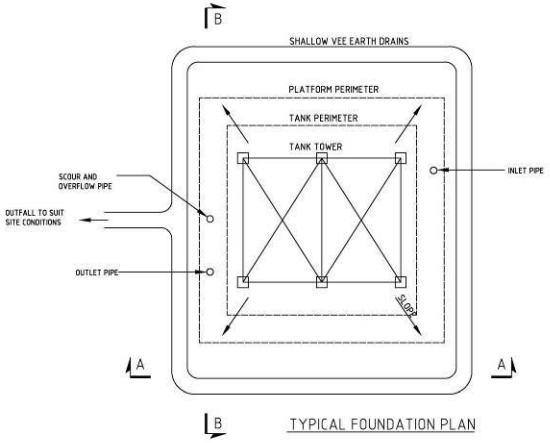
1. THIS TYPICAL DRAWING SHOWS THE GENERAL ARRANGEMENT OF THE PRESSED STEEL ELEVATED WATER TANKS FOR THE WATER SUPPLIES.
2. THE SIZE OF WATER TANK REQUIRED IS DETAILED IN THE TABLE BOQ.
3. ALL MATERIALS AND FABRICATION SHALL CONFORM WITH THE RELEVANT B.S. / EN.
4. THE LOCATION OF THE STRUCTURAL STEEL WATER TOWER IS TO BE INDICATED ON SITE BY THE ENGINEER
5. THE DIMENSIONS AND HEIGHT OF THE STRUCTURAL STEEL WATER TOWER IS TO DETAILED BY CONTRACTOR TO ENGINEER'S APPROVAL



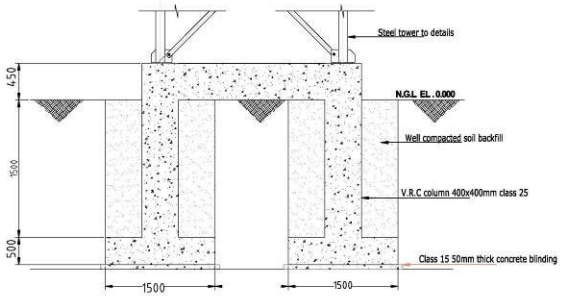
BASE FOUNDATION PLAN



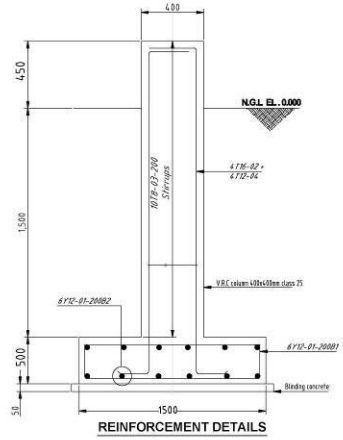
PLINTH BEAM 450 X 250mm



TYPICAL FOUNDATION PLAN



SECTION X-X



REINFORCEMENT DETAILS

Project Name

PROPOSED HIGH AS PER BoQ ELEVATED TANK PLATFORM FOUNDATION DETAILS

REV. No.	DESCRIPTION	DATE

CLIENT

german cooperation

KFW

PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 20126701 (DRPNK)

PROJECT

NAPAK BOREHOLE AND WATER RETICULATION PROJECT.

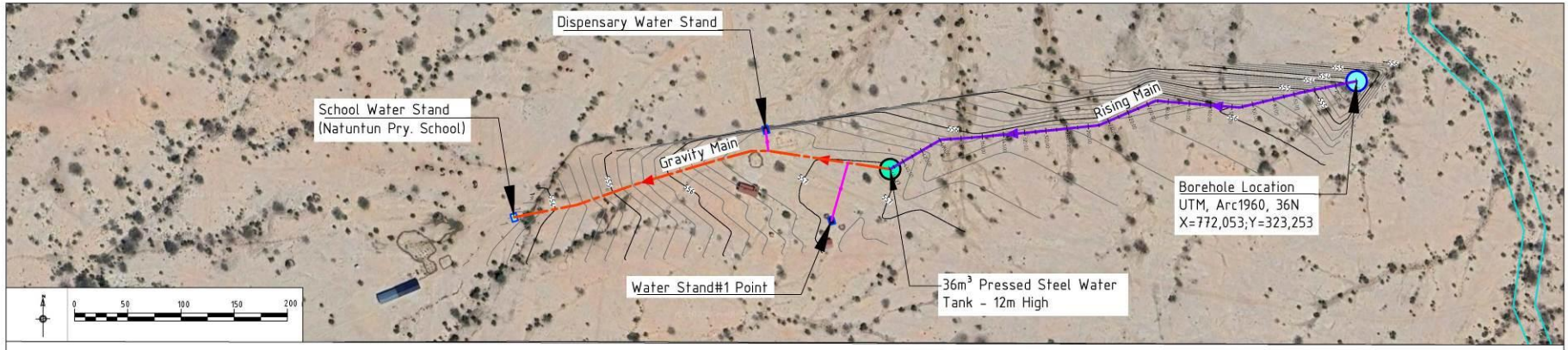
INAPAK DISPENSARY & SCHOOL)

DRG TITLE

STEEL ELEVATED TANK FOUNDATION PLAN AND SECTIONS

SHEET 1 OF 1

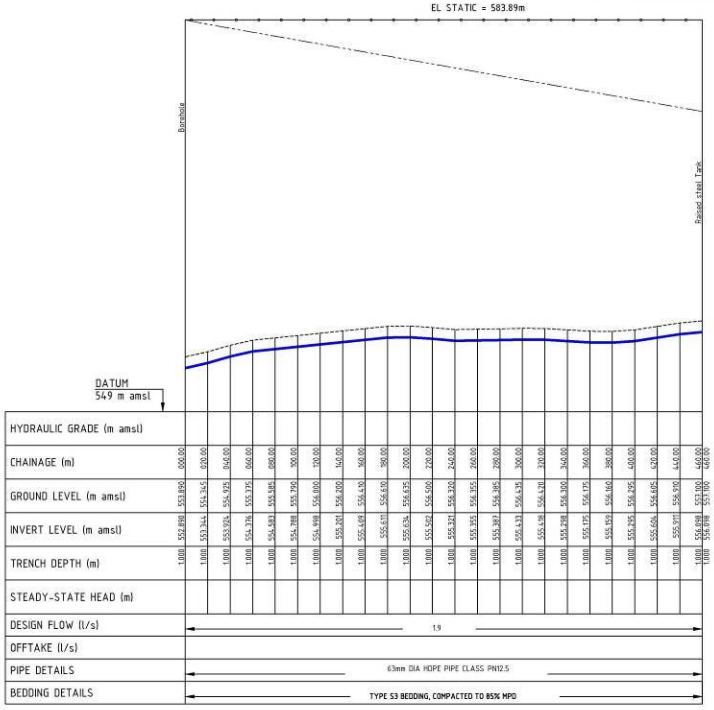
Date:	MARCH 2026	JOB No.	
Designed:	ENG. DKN		
Drawn:	ENG. DKN	Cad Filename	
Checked:	CK		
Approved:	PMU	DRG. No.	REV
Scale:	As shown	**NBWRP/TD/BH/202**	**O**



LEGEND

- STATIC LEVEL
- HYDRAULIC GRADE LINE
- EXISTING GROUND PROFILE
- PIPE INVERT
- SINGLE AIR VALVE
- WASHOUT
- AV AIR VALVE
- WO WASHOUT
- SV SECTION VALVE

Verfical Scale 1:200 (At A1)
Horizontal Scale 1:200 (At A1)



REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 201267301 (DRPNK)

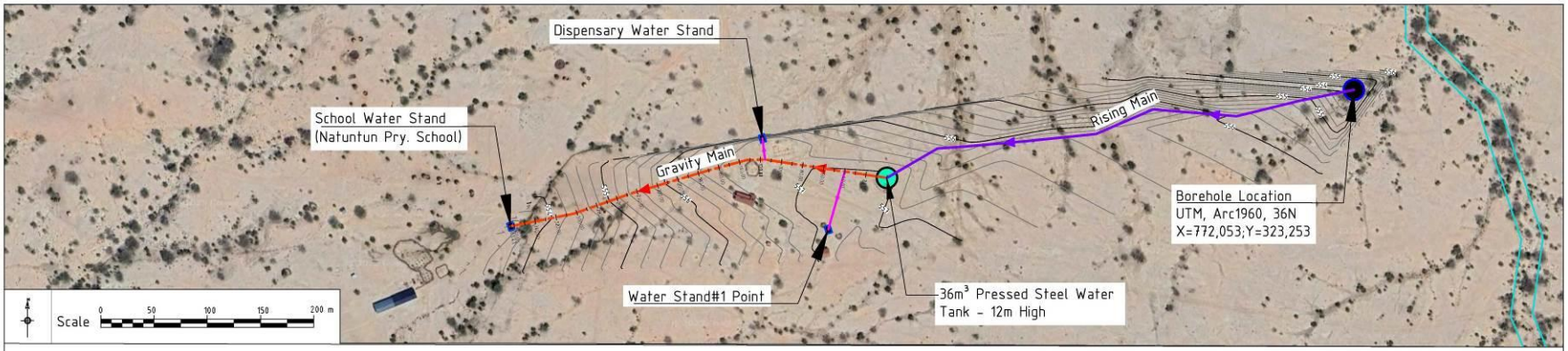
PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT. (NAPAK DISPENSARY & SCHOOL)

DRG TITLE: **RISING MAIN PIPELINE PROFILE**

CH. 0+000.00 - 0+460.00 m

SHEET 1 OF 1

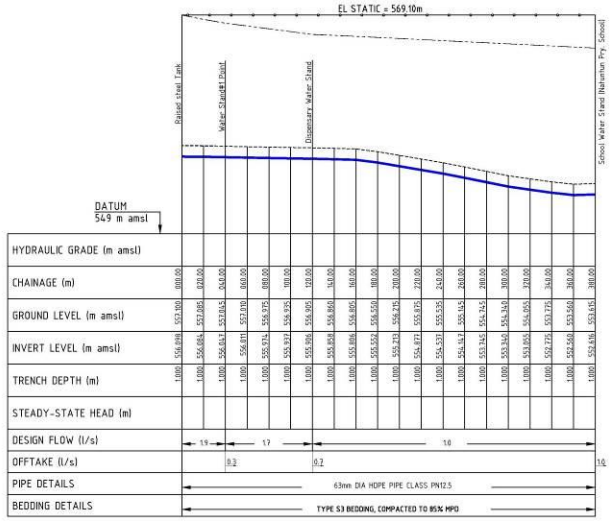
Date:	MARCH 2026	JOB No.	
Designed:	ENG DKN		
Drawn:	ENG DKN	Cad Filename	
Checked:	KC		
Approved:	PMU	DRG No.	REV
Scale:	As shown	**NBWRP/TD/PR/301**	**0**



LEGEND

- STATIC LEVEL
- HYDRAULIC GRADE LINE
- EXISTING GROUND PROFILE
- PIPE INVERT
- SINGLE AIR VALVE
- WASHOUT
- AV AIR VALVE
- WO WASHOUT
- SV SECTION VALVE

Vertical Scale 1:200 (At A1)
0 5 10 15 20m
Horizontal Scale 1:200 (At A1)
0 5 10 15 20m



REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA; BMZ No. 20126701 (DRPNK)

PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT. (NAPAK DISPENSARY & SCHOOL)

DRG TITLE: **GRAVITY MAIN PIPELINE PROFILE**

CH. 0+000.00 - 0+380.00 m

SHEET 1 OF 1

Date:	MARCH 2026	JOB No.
Designed:	ENG. DKN	
Drawn:	ENG. DKN	Cad Filename:
Checked:	KC	
Approved:	PMU	DRG. No. / REV
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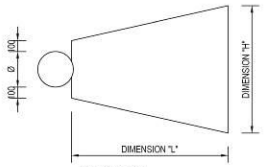
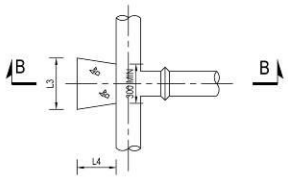


SECTION

PIPELINE DIAMETER D (mm)	W1 (mm)	A1 (mm)
63	100	300
90	300	300
110	350	500
160	450	500

GATE VALVE THRUST BLOCK DIMENSIONS



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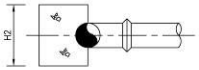
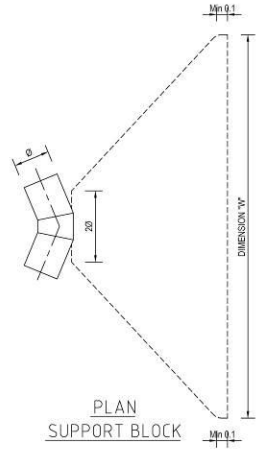


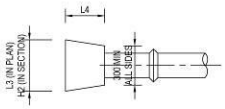
SECTION B-B



PLAN
SUPPORT BLOCK

NOMINAL BORE (mm)		110	160	200	250	300	400	500	600
11.25° BEND	L (m)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	W (m)	0.30	0.30	0.30	0.38	0.38	0.48	0.60	0.71
	H (m)	0.33	0.48	0.60	0.97	0.97	1.22	1.52	1.83
22.5° BEND	L (m)	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	W (m)	0.30	0.34	0.42	0.52	0.68	0.85	1.07	1.28
	H (m)	0.33	0.48	0.60	0.75	0.97	1.22	1.52	1.83
45° BEND	L (m)	0.30	0.30	0.30	0.30	0.30	0.35	0.44	0.53
	W (m)	0.41	0.60	0.75	0.93	1.21	1.52	1.90	2.28
	H (m)	0.33	0.48	0.60	0.75	0.97	1.22	1.52	1.83
90° BEND	L (m)	0.30	0.34	0.42	0.53	0.68	0.86	1.07	1.29
	W (m)	0.68	1.00	1.24	1.56	2.02	2.53	3.16	3.79
	H (m)	0.33	0.48	0.60	0.75	0.97	1.22	1.52	1.83

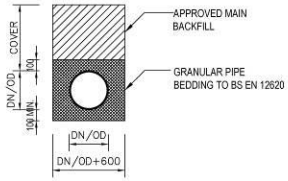
SUPPORT BLOCK SCHEDULE OF DIMENSIONS



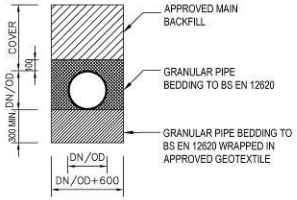
END CAP

NOMINAL BORE (mm)	110	160	200	250	300	400	500	600
H2 (m)	0.33	0.48	0.60	0.75	0.97	1.22	1.52	1.83
L3 (m)	0.50	0.72	0.90	1.13	1.46	1.83	2.29	2.74
L4 (m)	0.30	0.30	0.34	0.43	0.55	0.69	0.87	1.04

THRUST BLOCK FOR TEES AND END CAPS
FINAL DIMENSIONS TO BE CONFIRMED ON SITE BY THE ENGINEER.



PIPE LAID IN NORMAL & ROCK CONDITIONS
1:25 (AT A1), 1:50 (AT A3)



PIPE LAID ON SOFT TRENCH BOTTOM
1:25 (AT A1), 1:50 (AT A3)

NOTES
PIPE TRENCHES DESIGNED IN ACCORDANCE WITH THE NATIONAL ANNEX TO BS EN 1295-1:1998.
MODULUS OF NATIVE SOIL ASSUMED TO BE:
7 MPa FOR TRENCHES IN NORMAL SOILS
2 MPa CROSSING SWAMPY GROUND.
TRENCHES DESIGNED FOR:
BACKFILL LOADS;
SURCHARGE FOR MINOR ROADS;
INTERNAL PRESSURES 80 kPa BELOW ATMOSPHERIC (EXCEPT WHERE SUCH PRESSURES CANNOT OCCUR IN THE SYSTEM)
THE DESIGN PRESSURE IN THE PIPE UNDER ZERO FLOW CONDITIONS.
BEDDING MATERIALS AND THE REQUIRED DEGREES OF COMPACTION ARE SHOWN ON THE RELEVANT PIPE LONGITUDINAL SECTIONS.

REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

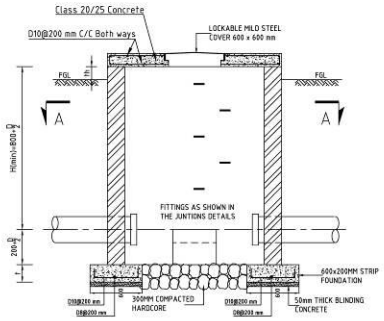
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA. BMZ No. 2012670.01 (DRPNK)

PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT. (NAPAK DISPENSARY & SCHOOL)

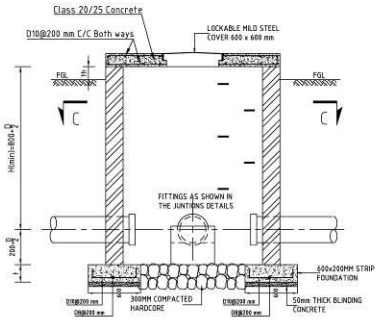
DRG TITLE: SUPPORT & THRUST BLOCKS AND PIPE TRENCH BEDDING STD DETAILS

SHEET 1 OF 1

Date:	MARCH 2026	JOB No.	
Designed:	ENG. DKN		
Drawn:	ENG. DKN	Cad Filename	
Checked:	CK		
Approved:	PMU	DRG. No.	REV
Scale:	As shown	NBWRP/TD/STD/401	0



SECTION B-B
SCALE 1:25



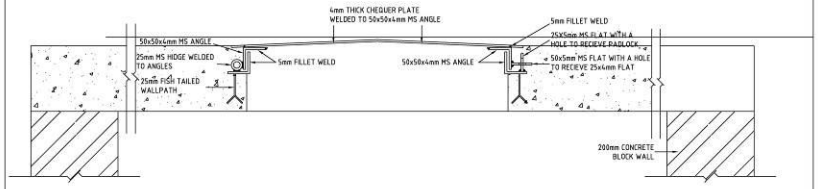
SECTION D-D
SCALE 1:25

DIMENSIONS FOR CHAMBER VALVE CHAMBERS

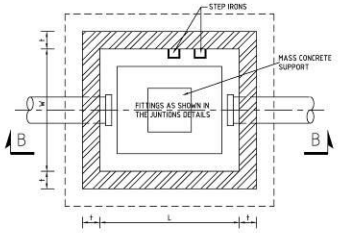
CHAINAGE(m)	SIZE(mm)			LINE	OFFTAKE	TYPE	NO.
	L	W	H				

NOTES

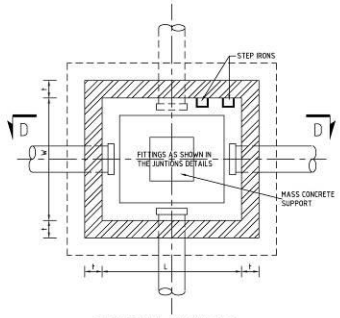
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED
2. MASS CONCRETE CLASS C15 IN STRIP FOOTING
3. BLINDING CONCRETE CLASS C10
4. ALL THE FITTINGS IN THE CHAMBERS ARE TO BE ASSEMBLED AS SPECIFIED IN THE JUNCTION DETAILS DRAWINGS



SECTION E-E
SCALE 1:5



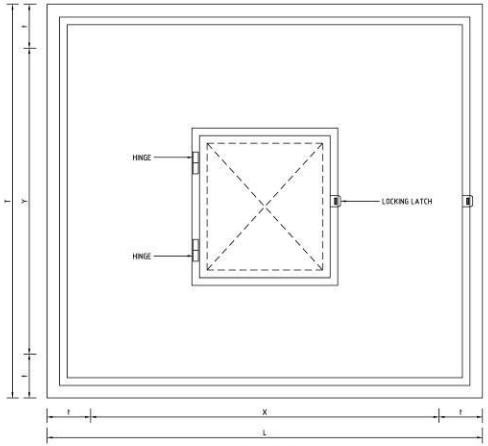
SECTIONAL PLAN A-A
SCALE 1:25



SECTIONAL PLAN C-C
SCALE 1:25

SECTION VALVE CHAMBER (TYPE I)

OFFTAKE AND SECTION VALVE CHAMBER (TYPE II)



COVER PLAN
SCALE 1:5

MS COVER PLATE

REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT (NAPAK DISPENSARY & SCHOOL)

DRG TITLE: SECTION/BLOCK VALVES DIMENSIONS AND CHAMBERS DETAILS

SHEET 1 OF 1

PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA. BMZ No. 201267301 (DRPNK)

Date:	MARCH 2026	JOB No.	
Designed:	ENG. DKN		
Drawn:	ENG. DKN	Cad Filename:	
Checked:	CK		
Approved:	PMU	DRG. No.	REV
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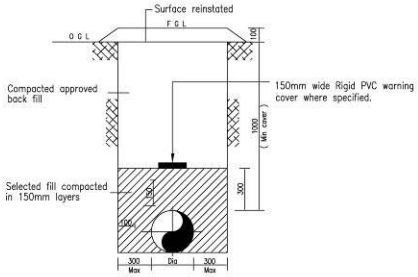
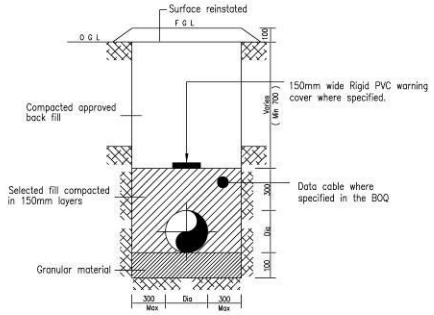
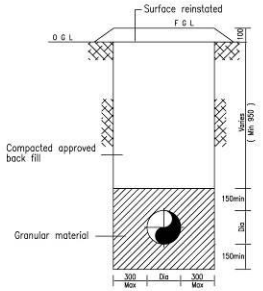


Typical Trench
1 : 20



Trench in Rock
1 : 20

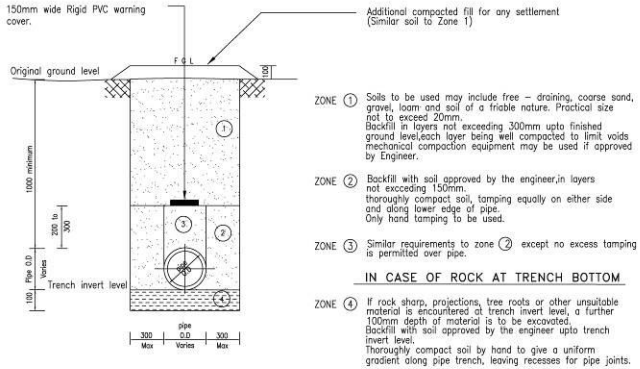


Pipe Bedding Detail in Black Cotton Soil
1 : 20

STEEL MAIN TRENCH DETAILS

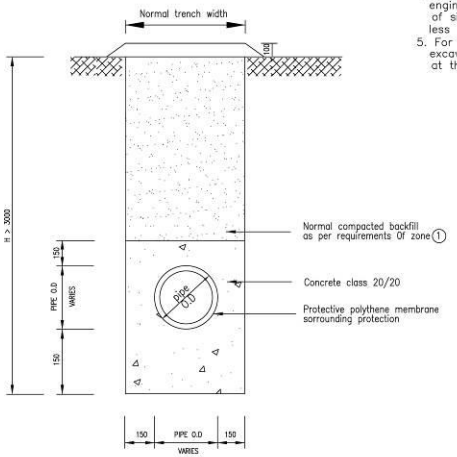
NOTES

1. All dimensions are in mm unless otherwise stated
2. All pipes to be laid with a minimum cover of 0.7m and minimum slope of 1: 500.
3. Trench side slope to be at contractors discretion depending on stability of excavated surfaces and ensuring safety of labour at work. However site to be measured based on nominal trench width.
4. Granular material to be approved by the engineer and shall not have any grains of size greater than 10mm and fines less than 0.05mm
5. For purposes of trench Backfilling all excavated trenches with coral material at the bed shall be considered as rock



TYPICAL TRENCH FOR uPVC/HDPE PIPES

uPVC/HDPE MAIN TRENCH DETAILS



CONCRETE PROTECTION TO uPVC/HDPE PIPES LAID AT DEPTHS GREATER THAN 3.0m

REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

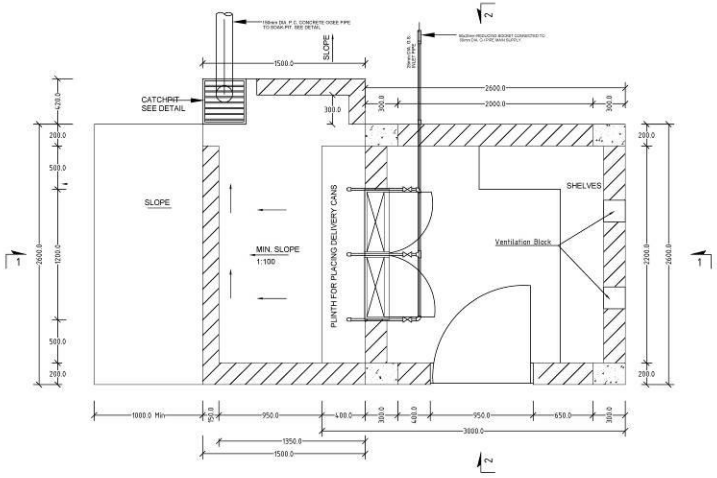
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 20126701 (DRPNK)

PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT. (NAPAK DISPENSARY & SCHOOL)

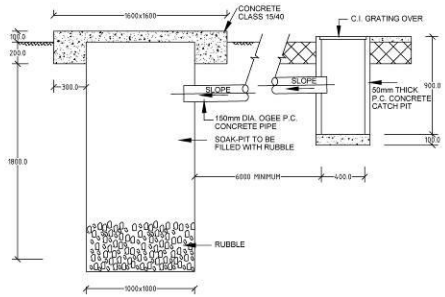
DRG TITLE: TYPICAL PIPE TRENCH BACKFILLING DETAILS

SHEET 1 OF 1

Date:	MARCH 2026	JOB No.	
Designed:	ENG. DKN		
Drawn:	DKN	Cad Filename	
Checked:	CK		
Approved:	PMU	DRG. No.	REV
Scale:	As shown	NBWRP/TD/STD/403	0

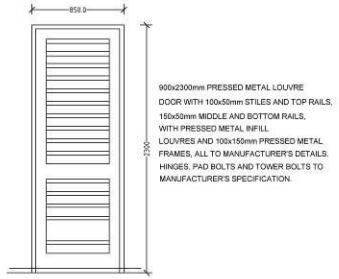


FLOOR SLAB LAYOUT PLAN



DETAIL OF SOAK-PIT AND CATCH PIT

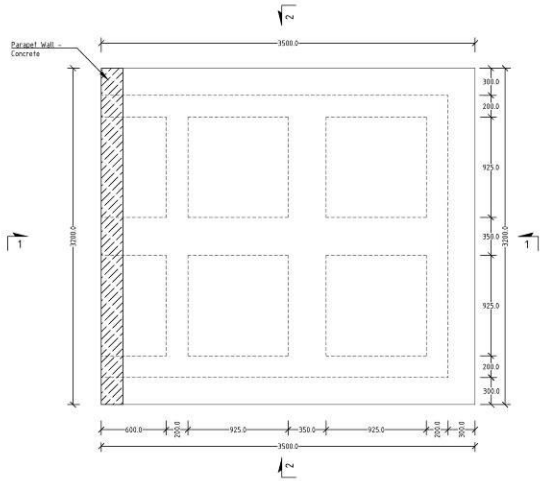
SCALE 1:40



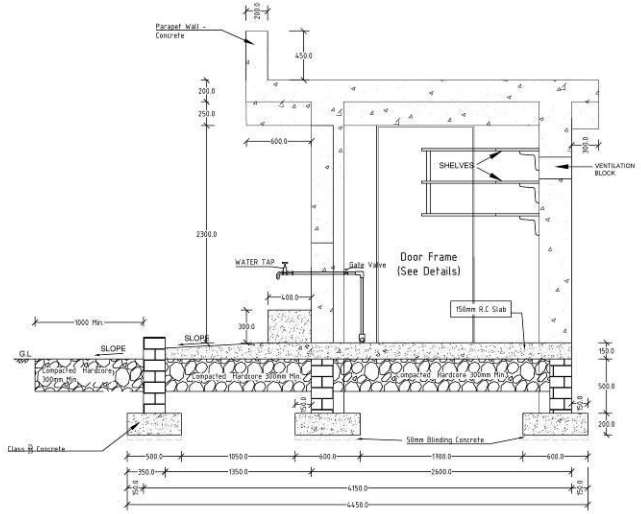
900x2300mm PRESSED METAL LOUVRE DOOR WITH 100x50mm STILES AND TOP RAILS, 150x50mm MIDDLE AND BOTTOM RAILS, WITH PRESSED METAL INFILL. LOUVRES AND 100x150mm PRESSED METAL FRAMES, ALL TO MANUFACTURER'S DETAILS. HINGES, PAD BOLTS AND TOWER BOLTS TO MANUFACTURER'S SPECIFICATION.

DOOR DETAILS

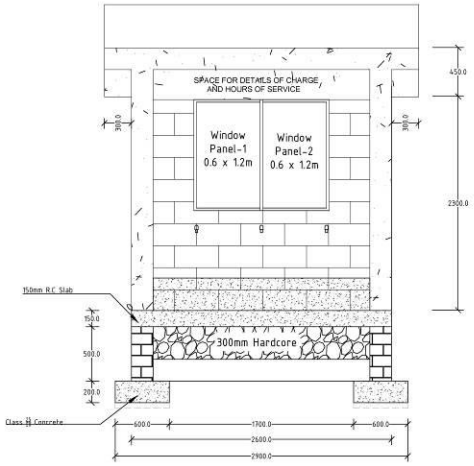
SCALE 1:40



TOP SLAB-BEAM LAYOUT PLAN



SECTION 1-1



SECTION 2-2
FRONT ELEVATION

REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

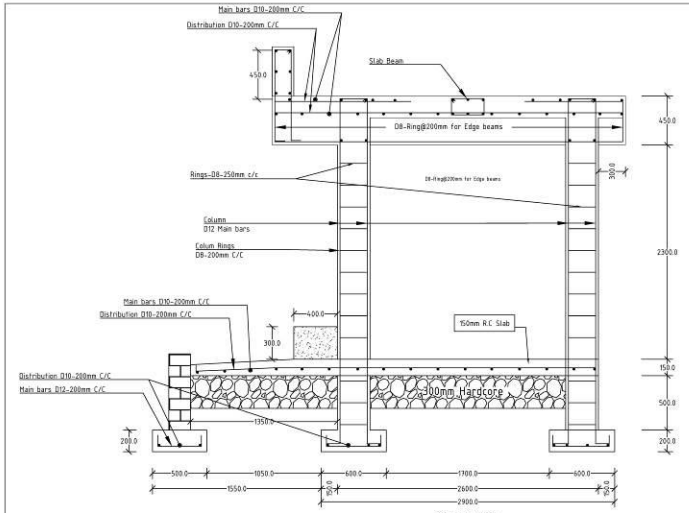
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 201267301 (DRPNK)

PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT. (NAPAK DISPENSARY & SCHOOL)

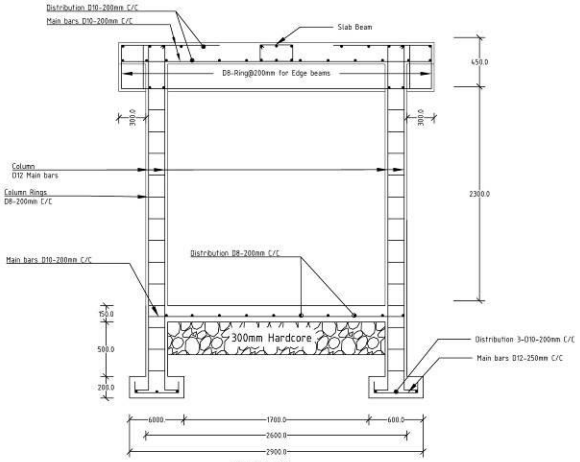
DRG TITLE: TYPE 1 -WATER KIOSK PLAN AND SECTIONS (NO TANK)

SHEET 1 OF 2

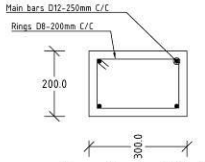
Date:	MARCH 2026	JOB No.	
Designed:	ENG. DKN		
Drawn:	DKN	Cad Filename	
Checked:	CK		
Approved:	PMU	DRG. No.	REV
Scale:	As shown	NBWRP/TD/WK/501	0



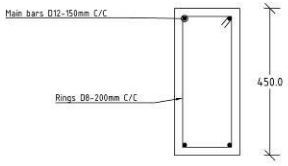
SECTION 1-1
FOUNDATION STRUCTURAL DETAILS



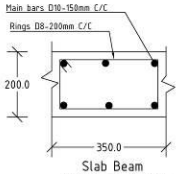
SECTION 2-2
FOUNDATION STRUCTURAL DETAILS



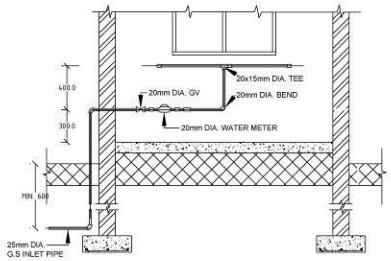
Column Structural Detail:



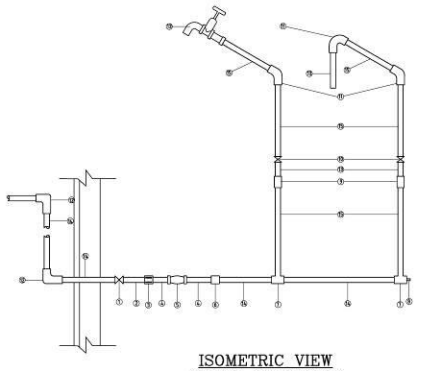
Beam Structural Details



Slab Beam
Structural Details



SECTION B-B



ISOMETRIC VIEW
DETAIL OF PIPING
SCALE 1:10

LIST OF PIPE MATERIAL

ITEM	DESCRIPTION	UNIT	QUANTITY
15	15mm G.S PIPE	PIECES	1200mm
14	20mm G.S PIPE	PIECES	1425mm
13	15mm Tap / BARREL NIPPLE	PIECES	4
12	20mm BEND	PIECES	2
11	15mm BEND	PIECES	4
10	15mm GLOBE VALVE	PIECES	2
9	15mm UNION SOCKET	PIECES	2
8	20mm PLUG	PIECES	1
7	20X15 REDUCING TEE	PIECES	2
6	20mm SOCKET	PIECES	1
5	20mm WASH WATER METER	PIECES	1
4	20mm METER UNION	PIECES	2
3	20mm SOCKET UNION	PIECES	1
2	20mm BARREL NIPPLE	PIECES	2
1	20mm GATE VALVE	PIECES	1

REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

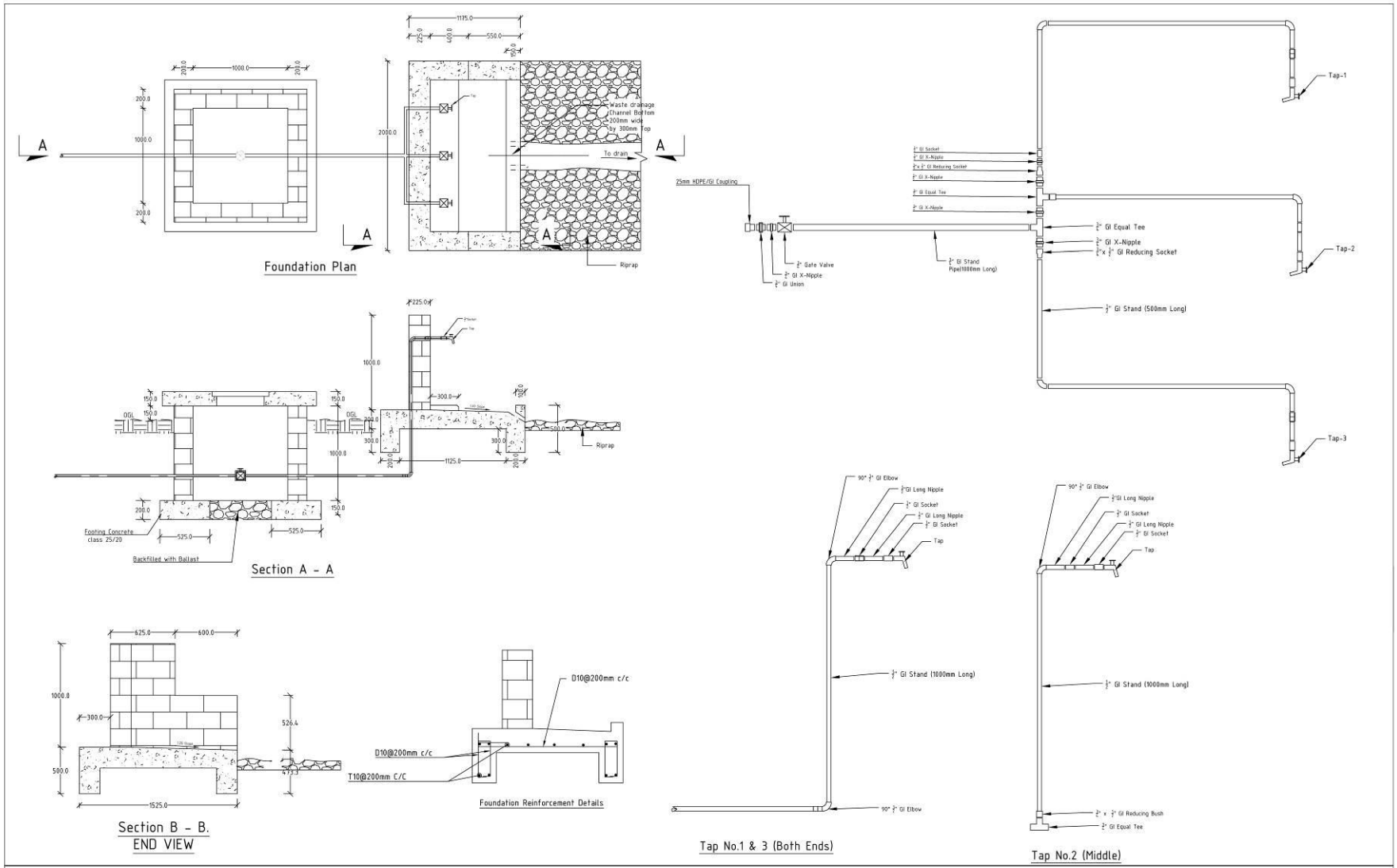
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA. BMZ No. 201267301 (DRPNK)

PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT. (NAPAK DISPENSARY & SCHOOL)

DRG TITLE: **TYPE 1 - WATER KIOSK STRUCTURAL & PLUMBING DETAILS (NO TANK)**

SHEET 2 OF 2

Date:	MARCH 2026	JOB No.	
Designed:	ENG. DKN		
Drawn:	DKN	Cad Filename:	
Checked:	CK		
Approved:	PMU	DRG. No.	REV
Scale:	As shown	**NBWRP/TD/WK/501**	**0**



REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

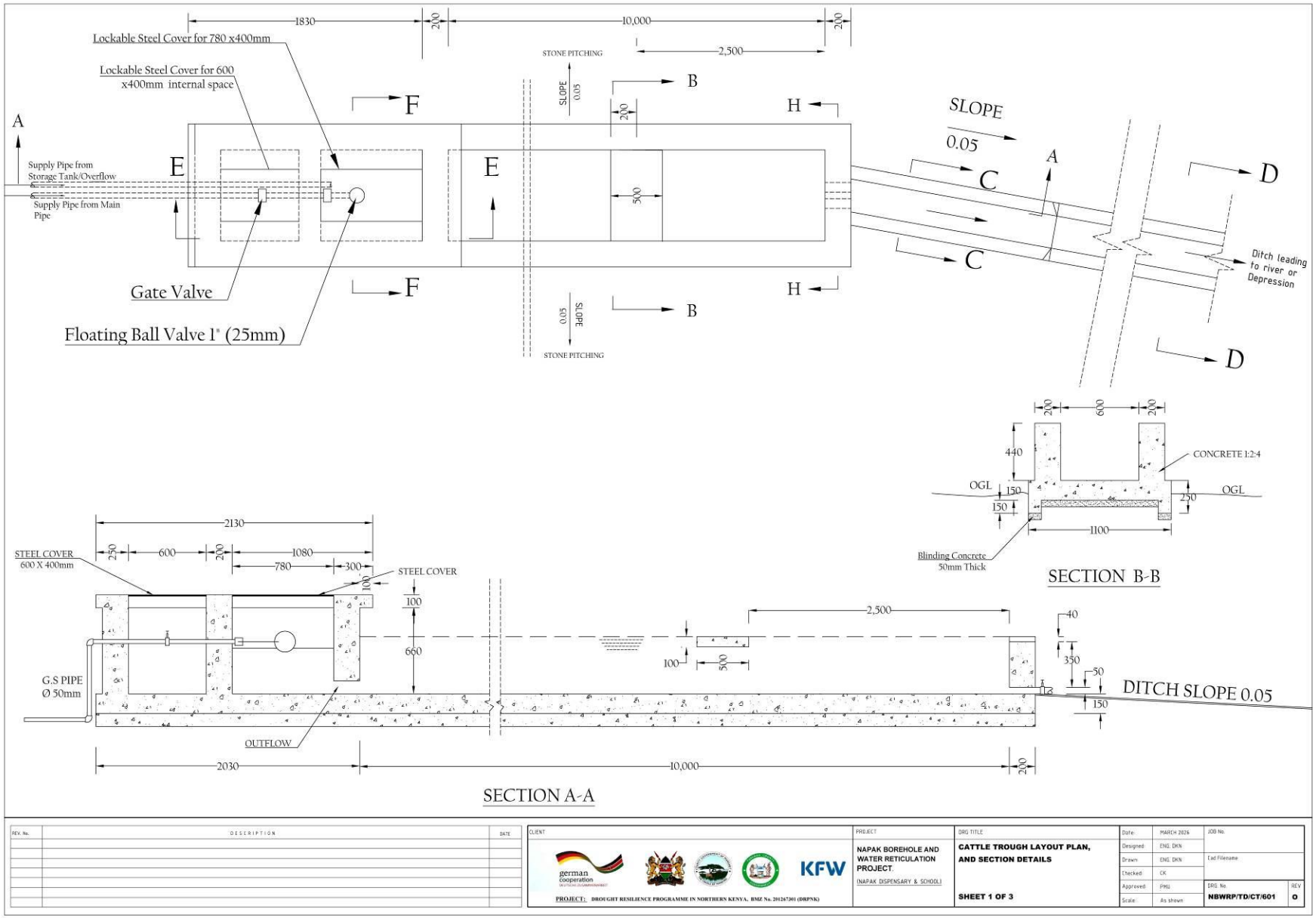
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA. BMZ No. 20126706 (DRPNK)

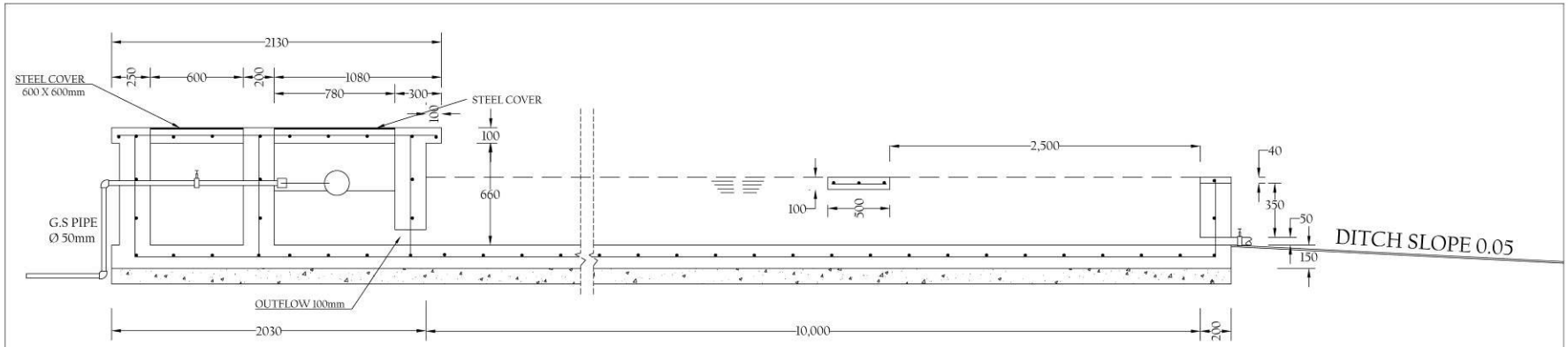
PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT. (NAPAK DISPENSARY & SCHOOL)

DRG TITLE: **WATER STAND PLAN AND SECTION & STRUCTURAL DETAILS**

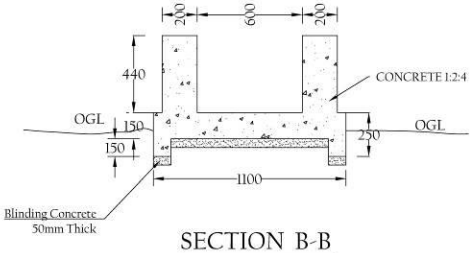
SHEET 1 OF 1

Date:	MARCH 2026	JOB No:	
Designed:	ENG. DKN		
Drawn:	DKN	Cad Filename:	
Checked:	CK		
Aproved:	PMU	DRG. No.	REV.
Scale:	As shown	NBWRP/TD/WP/502	0

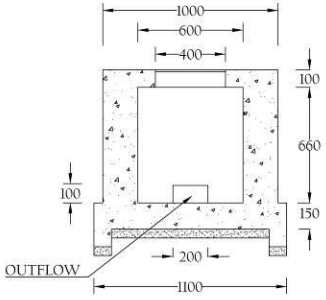

1830
200
10,000
200
2,500
Lockable Steel Cover for 780 x400mm
Lockable Steel Cover for 600
x400mm internal space
STONE PITCHING
SLOPE
0.05
A
B
F
H
E
Supply Pipe from
Storage Tank/Overflow
Supply Pipe from Main
Pipe
500
Gate Valve
Floating Ball Valve 1" (25mm)
SLOPE
0.05
C
D
Ditch leading
to river or
Depression
600
440
CONCRETE 1:2:4
OGL
150
250
1100
Blinding Concrete
50mm Thick
SECTION B-B
2130
STEEL COVER
600 X 400mm
250
600
200
1080
780
300
100
660
2,500
40
350
50
150
G.S PIPE
Ø 50mm
OUTFLOW
DITCH SLOPE 0.05
2030
10,000
SECTION A-A
REV. No.
DESCRIPTION
DATE
CLIENT
german cooperation
KFW
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 201267301 (DRPNK)
PROJECT
NAPAK BOREHOLE AND WATER RETICULATION PROJECT.
(NAPAK DISPENSARY & SCHOOL)
DRG TITLE
CATTLE TROUGH LAYOUT PLAN, AND SECTION DETAILS
SHEET 1 OF 3
Date: MARCH 2026
Designed: ENG. DKN
Drawn: ENG. DKN
Checked: CK
Approved: PMU
Scale: As shown
JOB No.
Cad Filename
DRG. No. NBWRP/TD/CT/601
REV 0



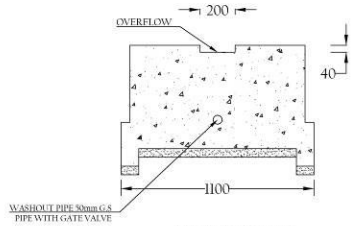
SECTION A-A
Structural



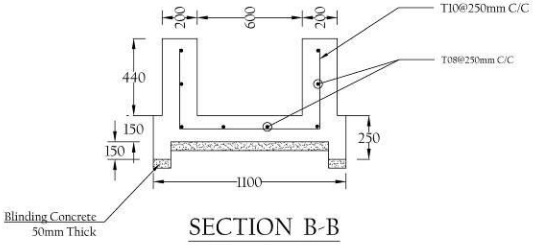
SECTION B-B



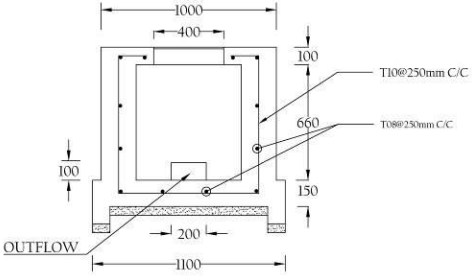
SECTION F-F



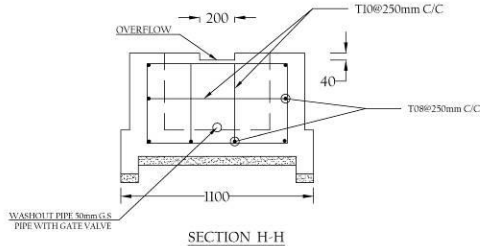
SECTION H-H



SECTION B-B
Structural



SECTION F-F
Structural



SECTION H-H
Structural

REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

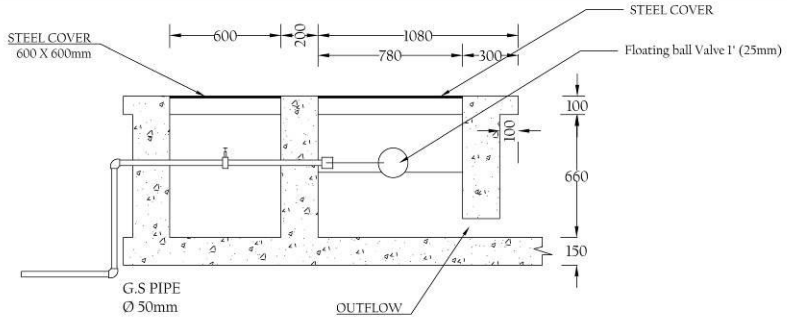
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 201267301 (DRPNK)

PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT. (NAPAK DISPENSARY & SCHOOL)

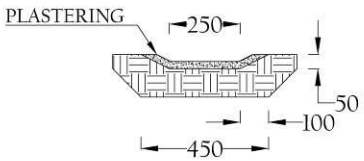
DRG TITLE: **CATTLE TROUGH SECTION & STRUCTURAL DETAILS**

SHEET 2 OF 3

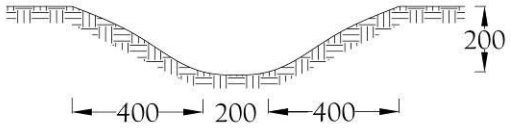
Date:	MARCH 2026	JOB No.	
Designed:	ENG. DKN		
Drawn:	ENG. DKN	Cad Filename:	
Checked:	EK		
Approved:	PMU	DRG. No.	REV
Scale:	As shown	**NBWRP/TD/CT/601**	**0**



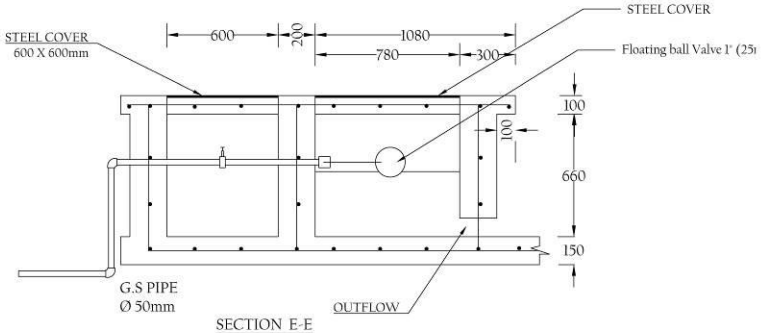
SECTION E-E
SCALE 1:20



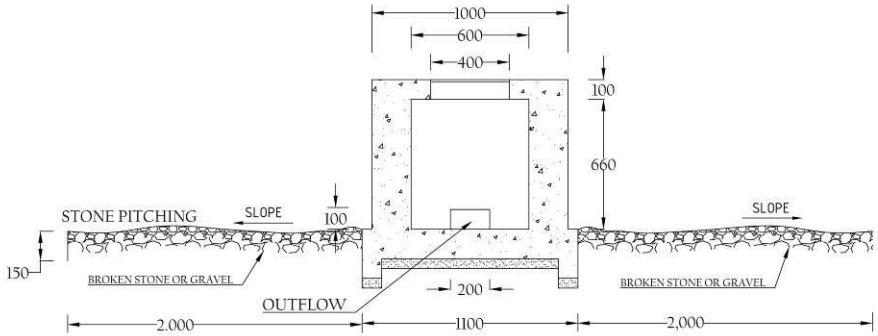
SECTION C-C
SCALE 1:20



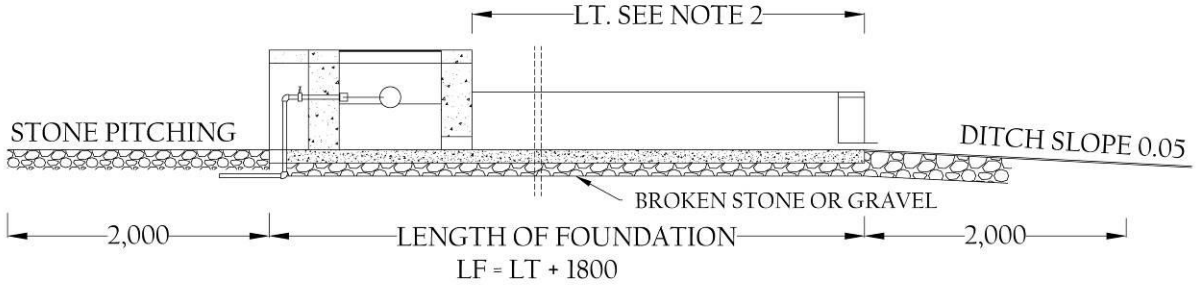
SECTION D - D
SCALE 1:20



SECTION E-E
Structural



SECTION F-F
STONE PITCHING DETAILS



REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

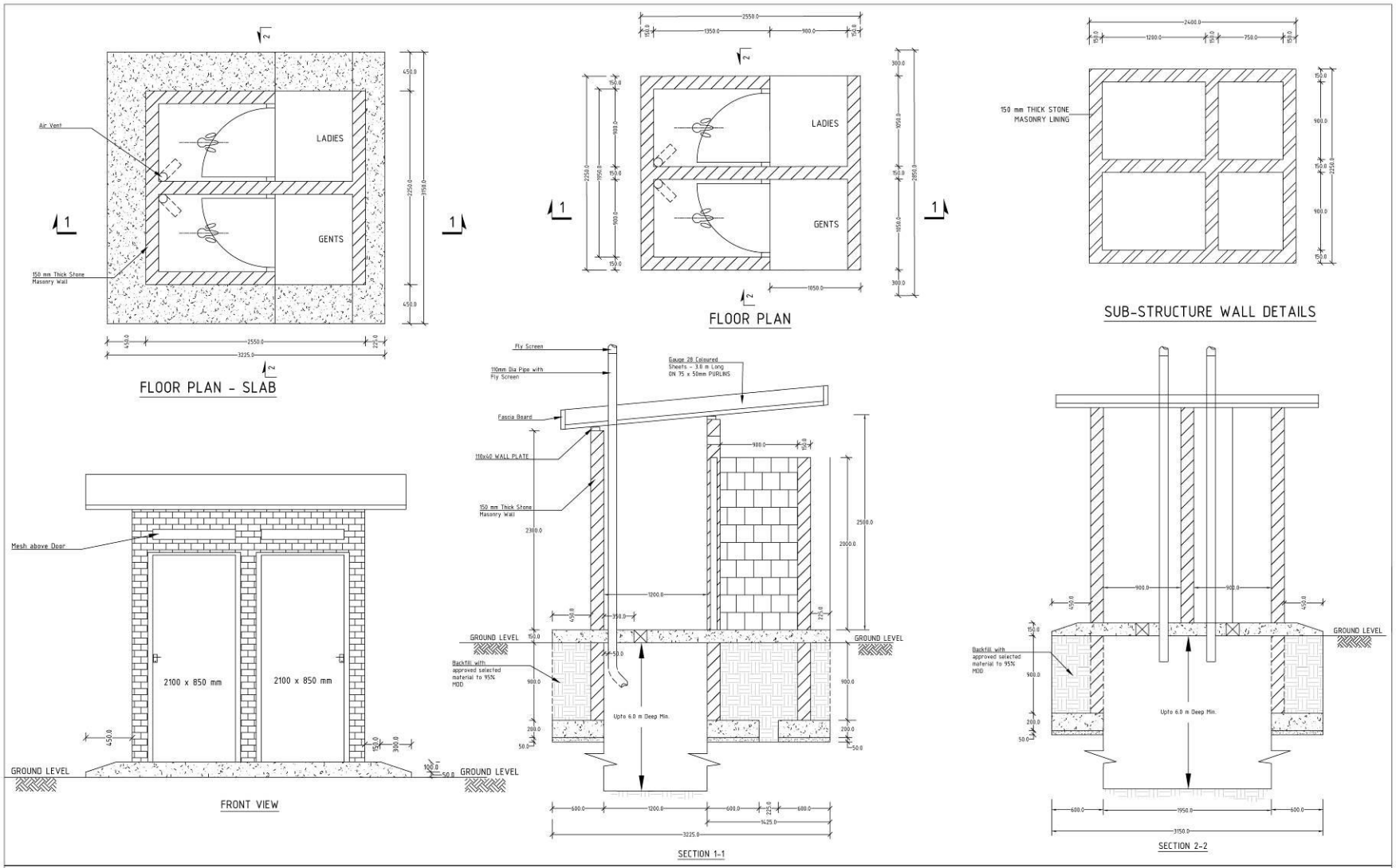
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 201267301 (DRPNK)

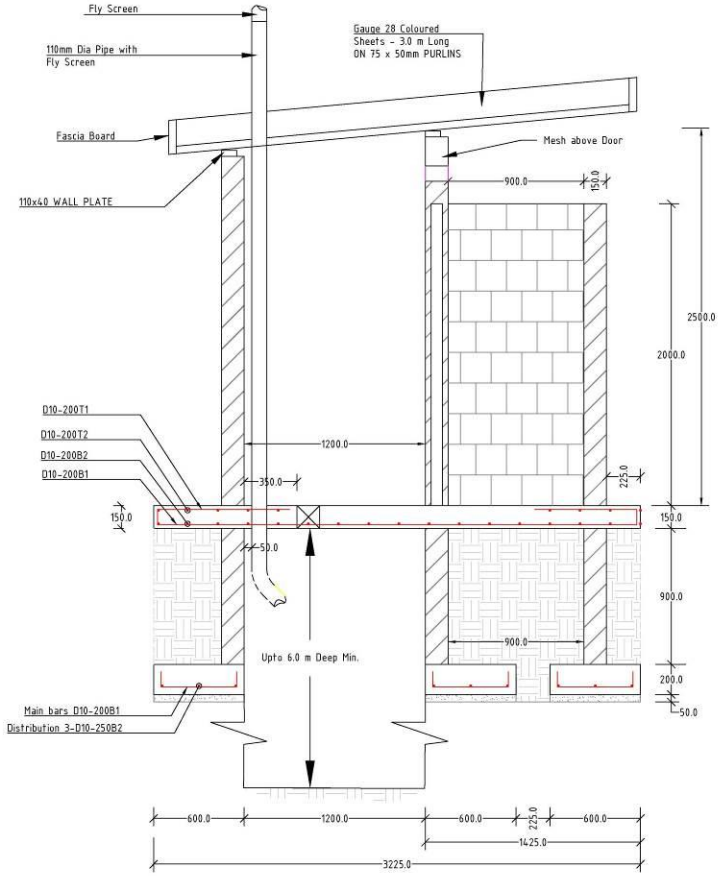
PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT. (NAPAK DISPENSARY & SCHOOL)

DRG TITLE: **CATTLE TROUGH SECTION DETAILS STRUCTURAL DETAILS**

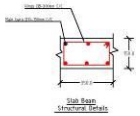
SHEET 3 OF 3

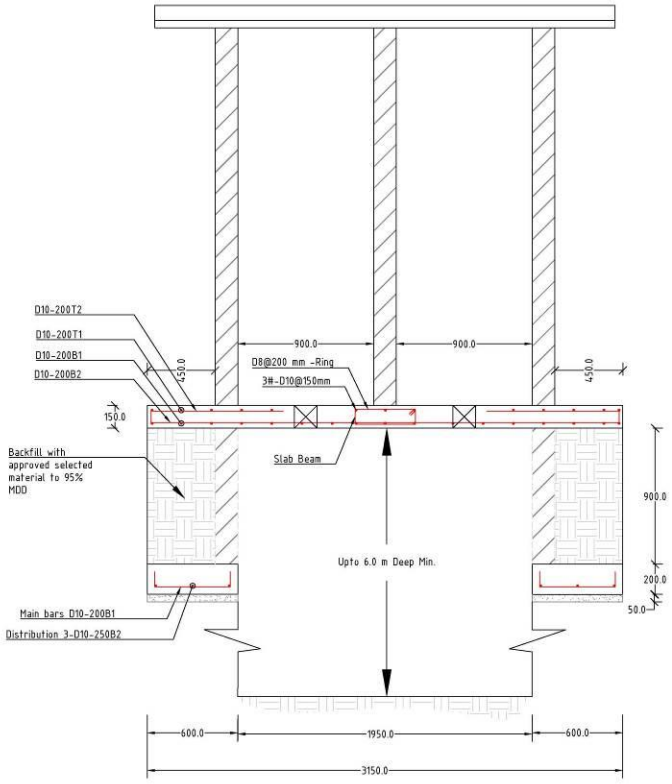
Date:	MARCH 2026	JOB No.
Designed:	ENG. DKN	
Drawn:	ENG. DKN	Cad Filename
Checked:	CK	
Approved:	PMU	ORG. No. / REV
Scale:	As shown	NBWRP/TD/CT/601 / 0


LADIES
GENTS
Air Vent
150 mm Thick Stone Masonry Wall
FLOOR PLAN - SLAB
FLOOR PLAN
150 mm THICK STONE MASONRY LINING
SUB-STRUCTURE WALL DETAILS
Fly Screen
110mm Dia Pipe with Fly Screen
Gauge 28 Coloured Sheets - 3.0 m Long ON 75 x 50mm PURLINS
Fascia Board
110x60 WALL PLATE
150 mm Thick Stone Masonry Wall
Mesh above Door
2100 x 850 mm
2100 x 850 mm
GROUND LEVEL
Backfill with approved selected material to 95% MDD
Upto 6.0 m Deep Min.
FRONT VIEW
SECTION 1-1
SECTION 2-2
REV. No.
DESCRIPTION
DATE
CLIENT
german cooperation
KFW
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 20126701 (DRPNK)
PROJECT
NAPAK BOREHOLE AND WATER RETICULATION PROJECT.
(NAPAK DISPENSARY & SCHOOL)
DRG TITLE
VIP TOILET PLAN & SECTIONS
SHEET 1 OF 2
Date: MARCH 2026
Designed: ENG. DKN
Drawn: DKN
Checked: CK
Approved: PMU
Scale: As shown
JOB No.
Cad Filename
DRG. No.
NBWRP/TD/VIPT/701
REV
0



STRUCTURAL FOR SECTION 1-1





STRUCTURAL FOR SECTION 2 - 2

REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

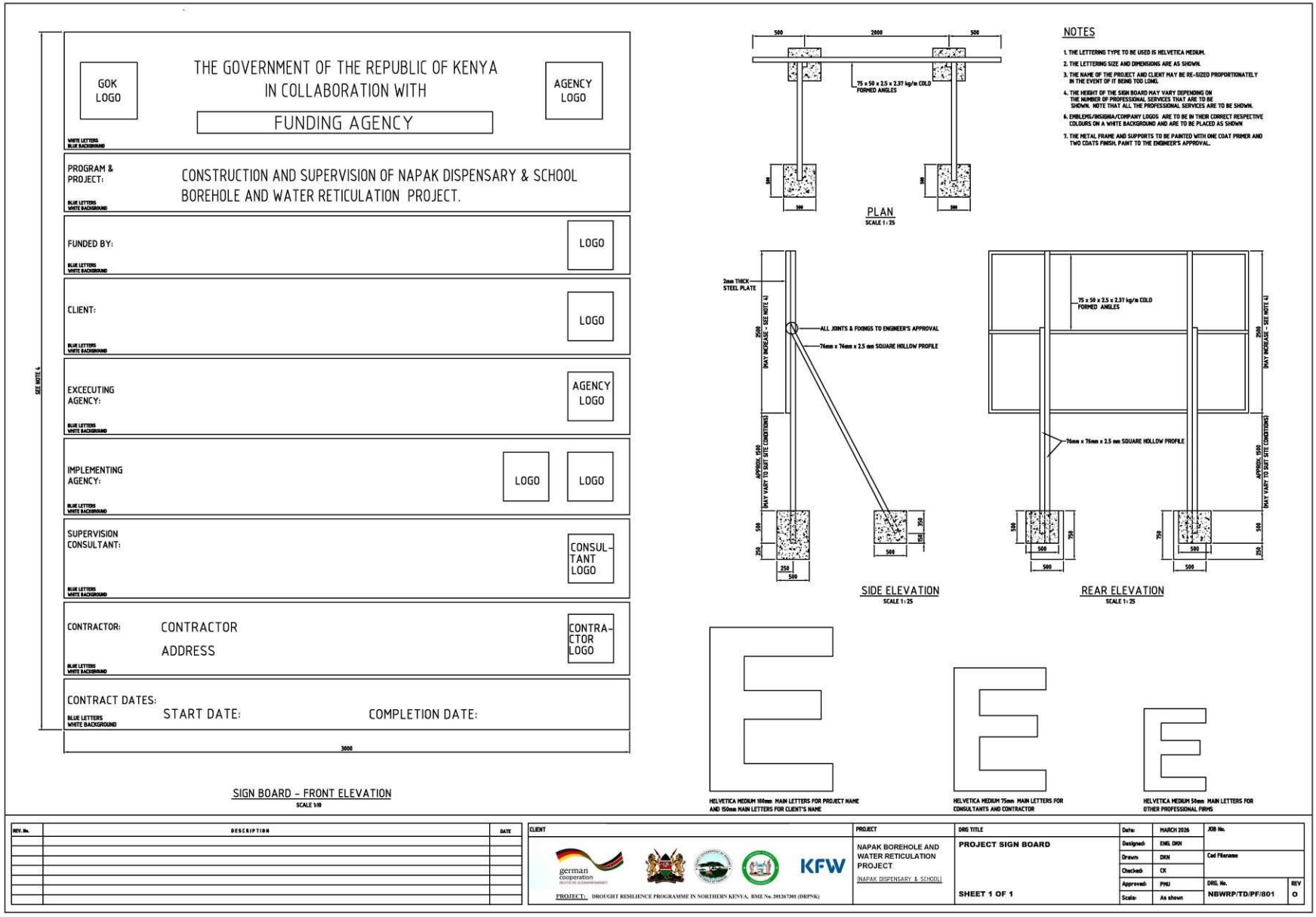
PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT. (NAPAK DISPENSARY & SCHOOL)

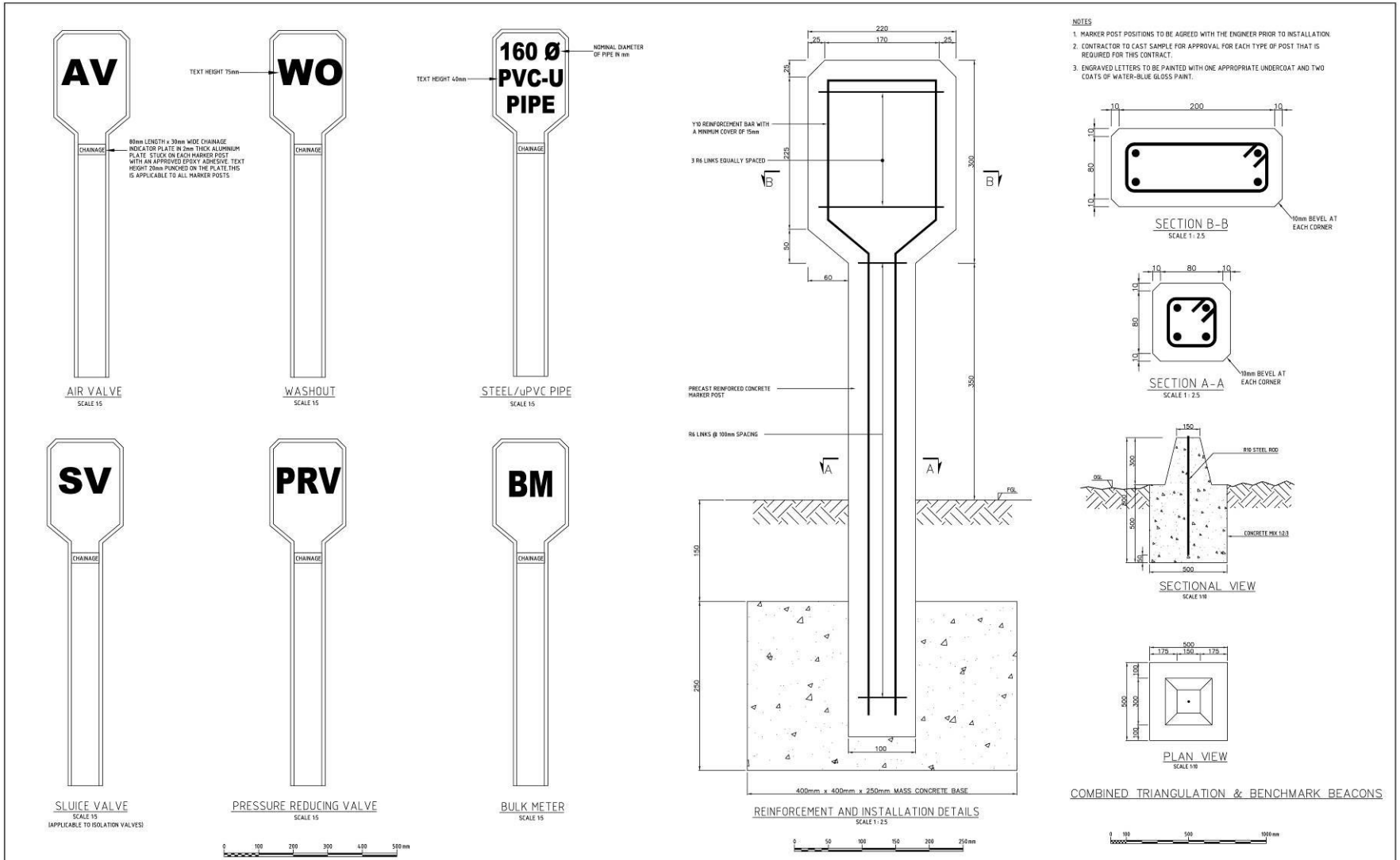
DRG TITLE: **FLOOR BEAMS, SOAK PIT AND F. SLAB REINFORCEMENT DETAILS**

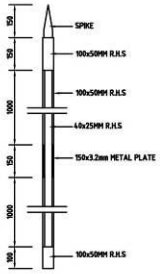
SHEET 2 OF 2

Date:	MARCH 2026	JOB No.
Designed:	ENG. DKN	
Drawn:	DKN	Cad Filename
Checked:	DK	
Approved:	PNU	DRG No. NBWRP/TD/VIPT/701 REV. 0
Scale:	As shown	

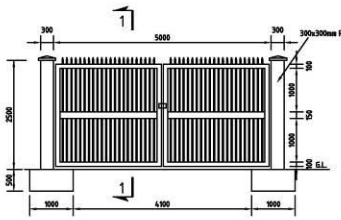
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 2012673 01 (DRPNK)


GOK LOGO
THE GOVERNMENT OF THE REPUBLIC OF KENYA
IN COLLABORATION WITH
FUNDING AGENCY
AGENCY LOGO
WHITE LETTERS BLUE BACKGROUND
PROGRAM & PROJECT:
CONSTRUCTION AND SUPERVISION OF NAPAK DISPENSARY & SCHOOL BOREHOLE AND WATER RETICULATION PROJECT.
BLUE LETTERS WHITE BACKGROUND
FUNDED BY:
LOGO
CLIENT:
LOGO
EXCECUTING AGENCY:
AGENCY LOGO
IMPLEMENTING AGENCY:
LOGO
LOGO
SUPERVISION CONSULTANT:
CONSUL-TANT LOGO
CONTRACTOR:
CONTRACTOR
ADDRESS
CONTRA-CTOR LOGO
CONTRACT DATES:
START DATE:
COMPLETION DATE:
SEE NOTE 6
3000
SIGN BOARD – FRONT ELEVATION
SCALE 1:10
500
2000
500
75 x 50 x 2.5 x 2.37 kg/m COLD FORMED ANGLES
PLAN
SCALE 1:25
2mm THICK STEEL PLATE
2560
(MAY INCREASE - SEE NOTE 4)
ALL JOINTS & FIXINGS TO ENGINEER'S APPROVAL
76mm x 76mm x 2.5 mm SQUARE HOLLOW PROFILE
APPROX. 1500
(MAY VARY TO SUIT SITE CONDITIONS)
590
250
500
SIDE ELEVATION
SCALE 1:25
REAR ELEVATION
SCALE 1:25
NOTES
1. THE LETTERING TYPE TO BE USED IS HELVETICA MEDIUM.
2. THE LETTERING SIZE AND DIMENSIONS ARE AS SHOWN.
3. THE NAME OF THE PROJECT AND CLIENT MAY BE RE-SIZED PROPORTIONATELY IN THE EVENT OF IT BEING TOO LONG.
4. THE HEIGHT OF THE SIGN BOARD MAY VARY DEPENDING ON THE NUMBER OF PROFESSIONAL SERVICES THAT ARE TO BE SHOWN. NOTE THAT ALL THE PROFESSIONAL SERVICES ARE TO BE SHOWN.
6. EMBLEMS/INSIGNIA/COMPANY LOGOS ARE TO BE IN THEIR CORRECT RESPECTIVE COLOURS ON A WHITE BACKGROUND AND ARE TO BE PLACED AS SHOWN
7. THE METAL FRAME AND SUPPORTS TO BE PAINTED WITH ONE COAT PRIMER AND TWO COATS FINISH. PAINT TO THE ENGINEER'S APPROVAL.
HELVETICA MEDIUM 100mm MAIN LETTERS FOR PROJECT NAME AND 150mm MAIN LETTERS FOR CLIENT'S NAME
HELVETICA MEDIUM 75mm MAIN LETTERS FOR CONSULTANTS AND CONTRACTOR
HELVETICA MEDIUM 50mm MAIN LETTERS FOR OTHER PROFESSIONAL FIRMS
REV. No.
DESCRIPTION
DATE
CLIENT
german cooperation
KFW
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 201267301 (DRPNK)
PROJECT
NAPAK BOREHOLE AND WATER RETICULATION PROJECT
(NAPAK DISPENSARY & SCHOOL)
DRG TITLE
PROJECT SIGN BOARD
SHEET 1 OF 1
Date: MARCH 2026
Designed: EME, DKN
Drawn: DKN
Checked: CK
Approved: PHU
Scale: As shown
JOB No.
Cad Filename
DRG. No. NBWRP/TD/PF/801
REV O

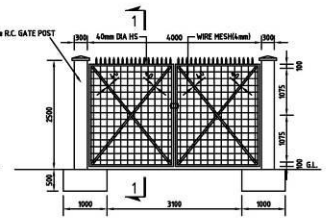

AV
CHAINAGE
80mm LENGTH x 30mm WIDE CHAINAGE INDICATOR PLATE IN 2mm THICK ALUMINIUM PLATE STUCK ON EACH MARKER POST WITH AN APPROVED EPOXY ADHESIVE. TEXT HEIGHT 20mm PUNCHED ON THE PLATE.THIS IS APPLICABLE TO ALL MARKER POSTS
AIR VALVE
SCALE 1:5
TEXT HEIGHT 75mm
WO
CHAINAGE
WASHOUT
SCALE 1:5
TEXT HEIGHT 40mm
160 Ø
PVC-U
PIPE
NOMINAL DIAMETER OF PIPE IN mm
CHAINAGE
STEEL/uPVC PIPE
SCALE 1:5
SV
CHAINAGE
SLUICE VALVE
SCALE 1:5
(APPLICABLE TO ISOLATION VALVES)
PRV
CHAINAGE
PRESSURE REDUCING VALVE
SCALE 1:5
BM
CHAINAGE
BULK METER
SCALE 1:5
0 100 200 300 400 500mm
220
25
170
25
Y10 REINFORCEMENT BAR WITH A MINIMUM COVER OF 15mm
3 R6 LINKS EQUALLY SPACED
PRECAST REINFORCED CONCRETE MARKER POST
R6 LINKS @ 100mm SPACING
B
A
FGL
60
100
400mm x 400mm x 250mm MASS CONCRETE BASE
REINFORCEMENT AND INSTALLATION DETAILS
SCALE 1:25
0 50 100 150 200 250mm
NOTES
1. MARKER POST POSITIONS TO BE AGREED WITH THE ENGINEER PRIOR TO INSTALLATION.
2. CONTRACTOR TO CAST SAMPLE FOR APPROVAL FOR EACH TYPE OF POST THAT IS REQUIRED FOR THIS CONTRACT.
3. ENGRAVED LETTERS TO BE PAINTED WITH ONE APPROPRIATE UNDERCOAT AND TWO COATS OF WATER-BLUE GLOSS PAINT.
SECTION B-B
SCALE 1:2.5
10mm BEVEL AT EACH CORNER
SECTION A-A
SCALE 1:2.5
10mm BEVEL AT EACH CORNER
R10 STEEL ROD
CONCRETE MIX 1:2:3
SECTIONAL VIEW
SCALE 1:10
PLAN VIEW
SCALE 1:10
COMBINED TRIANGULATION & BENCHMARK BEACONS
0 100 500 1000mm
REV. No.
DESCRIPTION
DATE
CLIENT
german cooperation
KFW
PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 2012673001 (DRPNK)
PROJECT
NAPAK BOREHOLE AND WATER RETICULATION PROJECT.
(NAPAK DISPENSARY & SCHOOL)
DRG TITLE
PIPELINE MARKER POSTS AND BENCHMARKS DETAILS
SHEET 1 OF 1
Date: MARCH 2026
Designed: ENG. DKN
Drawn: DKN
Checked: CK
Approved: PMU
Scale: As shown
JOB No.
Cad Filename
DRG. No. NBWRP/TD/PF/802
REV 0



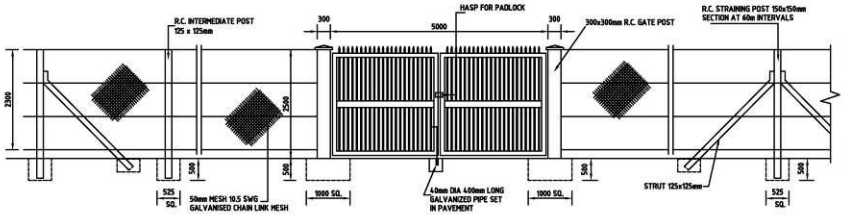
SECTION 1-1
Scale 1 : 10



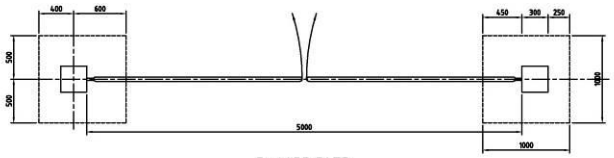
FRONT ELEVATION ENTRANCE GATE DETAIL - TYPE 1
Scale 1:50



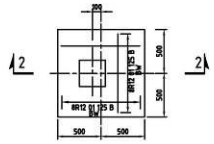
FRONT ELEVATION ENTRANCE GATE DETAIL - TYPE 2
Scale 1:50



DETAIL OF SECURITY FENCE AND ENTRANCE GATE
Scale 1:50



5m WIDE GATE
Scale 1:25



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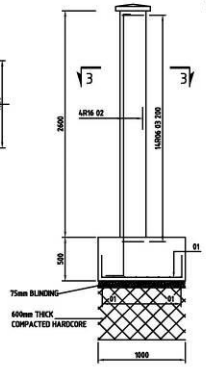
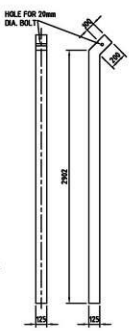
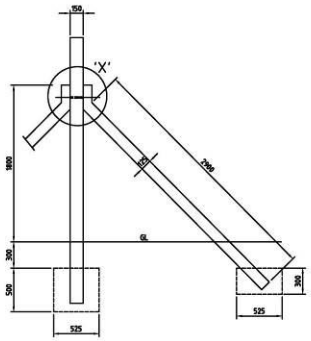


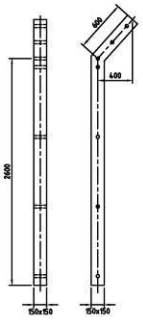
SECTION 2-2
1 : 25 (AT A1)



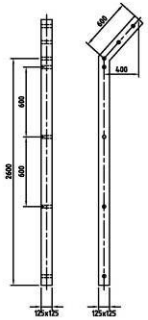
STRAINING STRUT
Scale 1:25



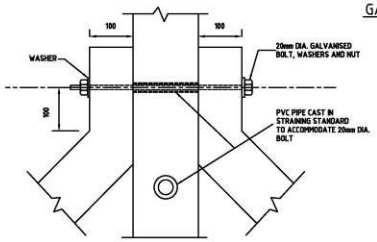
STRAINING POST AND STRUTS ARRANGEMENT
Scale 1:25



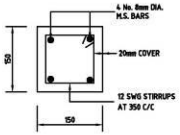
STRAINING POST
Scale 1:25



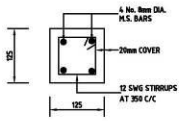
INTERMEDIATE POST
Scale 1:25



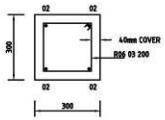
DETAIL 'X'
Scale 1:5



TYPICAL SECTION THROUGH STRAINING POST
Scale 1:5



TYPICAL SECTION THROUGH INTERMEDIATE POST
Scale 1:5



SECTION 3-3
Scale 1:10

2No GATE POSTS BAR BENDING SCHEDULE

MEMBER	BAR MARK	TYPE AND SIZE	NUMBER IN EACH	TOTAL NUMBER	CUT LENGTH (m)	TOTAL LENGTH (m)	SHAPE CODE	A	B	WEIGHT (KG)
GATE POSTS 2 No.	01	Y12	16	32	1.40	44.80	38	0.25	0.90	39.78
	02	Y16	4	8	3.35	26.80	37	0.30	3.00	42.32
	03	R06	14	28	1.00	28.00	60	0.20	0.20	6.22

FENCING NOTES:

1. PRECAST POSTS ARE OF CONCRETE CLASS 20/10/C.
2. REINFORCEMENT FOR P.C. POSTS ARE 8mm DIA. M.S. BARS WITH 12 SWG STIRRUPS AT 350mm CENTRES.
3. MINIMUM COVER TO REINFORCEMENT TO BE 25mm UNLESS OTHERWISE SHOWN.
4. JOINTS IN CHAIN LINK FENCING ARE AT EITHER STRAINING OR INTERMEDIATE POSTS AND ARE FORMED WITH CONTINUOS GALVANISED M.S. STRETCHER BARS 25x5mm BOLTED TO THE POST AT 500mm CENTRES WITH 8mm GALVANISED STEEL BOLTS.
5. ALL WELDS ARE 6mm FILLET WELD.
6. ALL TENSIONERS, BOLTS, NUTS, WASHERS, STAPLES AND WIRES ARE GALVANISED.
7. MASS CONCRETE BASE IS CLASS 15/40/C.

REV. No.	DESCRIPTION	DATE

CLIENT

german cooperation

KFW

PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA, BMZ No. 201267301 (DRPNK)

PROJECT

NAPAK BOREHOLE AND WATER RETICULATION PROJECT.

(NAPAK DISPENSARY & SCHOOL)

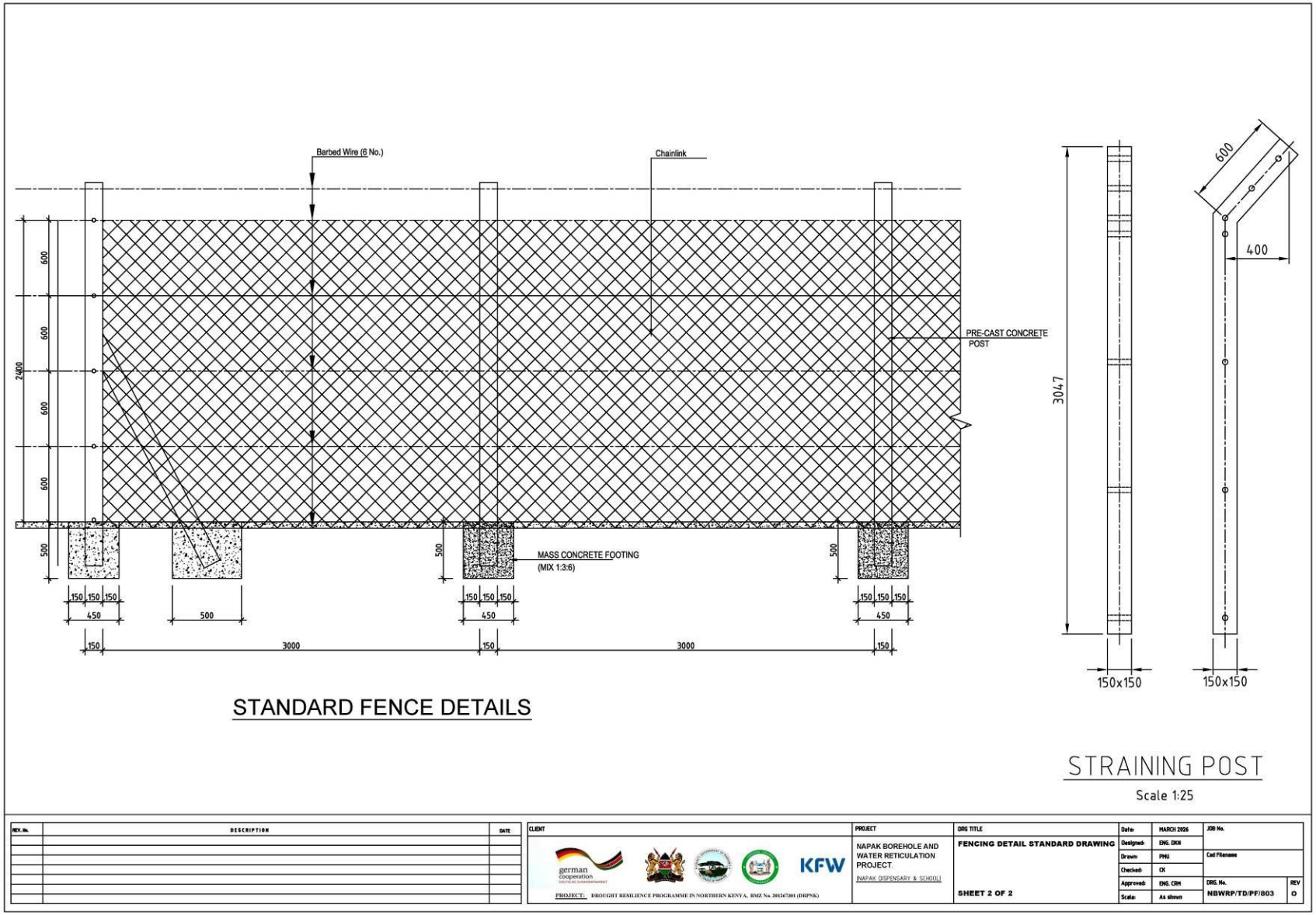
DRG TITLE

GATE AND FENCING DETAIL

STANDARD DRAWING

SHEET 1 OF 2

Date:	MARCH 2026	JOB No.	
Designed:	ENG. DKN		
Drawn:	ENG. DKN	Cad Filename	
Checked:	CK		
Approved:	PHJ	DRG. No.	REV
Scale:	As shown	NBWRP/TD/PF/803	O



STANDARD FENCE DETAILS

STRAINING POST

Scale 1:25

REV. No.	DESCRIPTION	DATE

CLIENT: german cooperation; KFW

PROJECT: DROUGHT RESILIENCE PROGRAMME IN NORTHERN KENYA. BMZ No. 2012670.01 (DRPNK)

PROJECT: NAPAK BOREHOLE AND WATER RETICULATION PROJECT.
(NAPAK DISPENSARY & SCHOOL)

DRG TITLE: FENCING DETAIL STANDARD DRAWING

SHEET 2 OF 2

Date:	MARCH 2026	JOB No.	
Designed:	ENG. DKN		
Drawn:	PMU	Cad Filename	
Checked:	CK		
Approved:	ENG. CRM	DRG. No.	REV
Scale:	As shown	NBWRP/TD/PF/B03	0

Section IX: BILL OF QUANTITIES

PREAMBLE AND NOTES TO BILLS OF QUANTITIES

Preamble to Bills of Quantities

1. This Preamble is deemed to form part of the Bill of Quantities.
2. Contractor's rates shall be inclusive of costs for;
    a. Works insurances and performance security,
    b. Preparation and implementation of health & safety plan
    c. Preparation and implementation of Environmental Monitoring & Management Plan,
    d. Local taxes,
    e. Preparation and submission of 'as-built' drawings and operation & maintenance manuals,
    f. Training of operations staff,
    g. Commissioning and testing of works before hand over,
    h. any other overhead costs and profits
3. The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the priced Bill of Quantities, and where no Items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.
4. The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, Conditions of Contract, Technical Specifications and Drawings.
5. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Engineer and valued at the rates and prices bid in the priced Bill of Quantities.
6. A rate or price shall be entered against each item in the priced Bill of Quantities, whether quantities are stated or not. The cost of Items against which the Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.
7. During construction, the unit rate established for an item in one Bill of Quantities may be used as a basis for establishing a unit rate for similar work in another Bill of Quantities which contains no unit rate for the said item. No additional cost will be considered for such an eventuality.
8. The Contractor will be provided free of charge, by the Employer, with all that land to be occupied by the Permanent Works including the specified working width for pipe laying and other permanent construction works. All other costs for additional working space shall be borne by the Contractor.
9. It shall be the responsibility of the Contractor to arrange for the removal of, or alteration to, existing services, where necessitated by the Works. Costs incurred will be borne by the Contractor.
10. The rates for excavation items shall be deemed to include inter alia for setting aside spoil for reuse in the Works or disposing to approved tips, except where otherwise provided for in the Bills of Quantities.
11. Measurement of volume of excavation for structures shall be calculated from the plan dimensions of the structure without allowance for working space.
12. The rates for concrete shall include for making and testing concrete cubes and forwarding the results to the Engineer. Testing is to be carried out by a Test Laboratory approved by the Engineer.
13. The rates for metalwork shall include for bolts, nuts, washers and ragbolts, fixing as specified or in accordance with the manufacturer's instructions and rectifying as specified any parts of the painted, coated or galvanized surface that may be damaged either before or after erection.
14. The rates for reinforcement shall include for cost of providing, cutting to length, splice lengths additional to those shown on the drawings, laps, bending, hooking, waste incurred by cutting, cleaning, spacer blocks, provision and fixing of chairs or other types of supports, welding, fixing the reinforcement in position including the provision of wire or other material for supporting and tying the reinforcement in place, being reinforcement aside temporarily and straightening, placing and compacting concrete around reinforcement.
15. The rates for the supply of any mechanical and electrical equipment shall include for the submission of factory test results.

BILL No. 1 - PRELIMINARY AND GENERALS

ITEM	ITEM DESCRIPTION	UNIT	QTY	RATE (KShs)	AMOUNT (KShs)
1.1	**Conditions of Contract**				
1.1.1	Allow provisional sum of **Kshs. 150,000.00** for **General Insurances** to cover works, Material, staff, plant & Machinery, third parties and to be in the joint name of the employer and the contractor. Insurances to be valid until successful remedy of all defects.	LS	1.00	150,000.00	**150,000.00**
1.2	**Mobilization and Demobilization.**				
1.2.1	Mobilizing and demobilization of Materials, Equipment and personnel to and from site, erecting and securing camp, provision of facilities to run the camp and maintaining the camp throughout the construction period and demobilizing after the completion of the works. Include for temporary access and land required by contractor to site **excluding for the borehole.**	LS	1.00		
1.3	**Temporally Works (Project Signboard)**				
1.3.1	Provide, install and maintain in good condition project signboard(s) at location(s) shown by the Project Manager / Resident Engineer (PM/RE) and in accordance with the drawings and Specifications.	No.	2.00		
1.4	**Community / PMCs Sensitization / Training**				
1.4.1	Allow a provisional sum of **Kshs. 300,000.00** only for community sensitization and training of plumbers on water management as shall be directed by the project supervisor.	LS	1.00	300,000.00	**300,000.00**
1.4.2	% Adjustment to costs on items 1.4.1	%			
1.5	**Monthly Site Meetings**				
1.5.1	Allow a Provisional sum of **Kshs 80,000.00** per month for meeting related expenses on site as directed by the Engineer.	Monthly	6.00	80,000.00	**480,000.00**
1.5.2	% Adjustment to costs on items 1.5.1	%			
1.6	**Survey**				
1.6.1	Allow a Provisional Sum of **Kshs 50,000.00** for provision of survey equipment as directed by the R.E	LS	1.00	50,000.00	**50,000.00**
1.6.2	% Adjustment to costs on items 1.6.1	%			
1.7	**Environmental Compliance**				
1.7.1	Allow a Provisional sum of Kshs. **600,000.00** for Environmental Review & Approvals and ESHS cost to mitigate ESIA negative effects as captured in the ESMP.	LS	1.00	600,000.00	**600,000.00**
1.7.2	Allow provisional Sum of Kshs. **200,000.00** for NEMA licensing as directed by Project manager.	LS	1.00	200,000.00	**200,000.00**
1.7.3	% Adjustment to costs on items 1.7.1 and 1.7.2	%		800,000.00	
1.8	**Material Testing**				
1.8.1	Allow Provisional Sum of **Kshs. 50,000.00** for testing material strength.	LS	1.00	50,000.00	**50,000.00**
1.8.2	% Adjustment to costs on items 1.8.1	%			

	TOTAL CARRIED OVER TO GRAND SUMMARY				

BILL No. 2 - BOREHOLE

ITEM	DESCRIPTION	UNIT	QTY	RATE (KSh)	AMOUNT (KSh)
2.1	**GENERAL**				
2.1.1	Allow for mobilization and de-mobilization of plant, drilling rig and personnel to and from site.	LS	1.00		
2.1.2	Allow for erecting and dismantling of whole drilling unit and related equipment at site. Rate to include site and access road clearance.	LS	1.00		
2.1.3	Allow for upon completion of works, the removal and clearing away of all surplus material, plant and rubbish and leave the whole of the site and works in a clean and tidy state to the satisfaction of the PM and/or RE.	LS	1.00		
2.1.4	**Hydrogeological Confirmatory survey / Test:** Allow Provisional Sum **Kshs 200,000.00** for undertaking confirmatory geophysical / hydrogeological surveys for the borehole 1 No. Rate to include production of hydrogeology survey report by an independent, qualified and registered hydrogeologist as directed/approved by the PM/RE.	PC	1.00	200,000.00	**200,000.00**
2.1.5	**Permits**: Allow a provisional sum of **Kshs 75,000.00** to Acquire Water Resource Authority (WRA) permits as instructed by the Engineer	PC	1.00	75,000.00	**75,000.00**
2.1.6	% Adjustment to costs on items 2.1.4 and 2.1.5	%		275,000.00	
	Sub-total carried forward to Borehole Summary Page				

2.2	**BOREHOLE DRILLING AND DEVELOPMENT**				
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
	Drilling one borehole with finished internal minimum diameter of 203 mm (8”) to the required maximum depth through all types of strata including disposal of excavated materials, taking any remedial measures to overcome caving-in, or over drilling to accommodate sloughed material and keeping drilling records as specified.				
2.2.1	i) From ground level down to 100 m	m	100.00		
2.2.2	ii) Ditto item above from 101 to 200m	m	100.00		
2.2.3	iii) Ditto item above from 201 to 350m	m	150.00		
2.2.4	Allow provision for Reaming and boring 10” diameter bit if necessary, as directed by the Resident Engineer - **(Unit Rate Only)**	m	0.00		
2.2.5	Supply and installation of plain steel 6" (152mm) Class B steel casing - 4.5 mm thickness	m	318.00		
2.2.6	Supply and installation of screened steel casings 6" (152mm) Class B diameter - 4.5 mm thickness. Depth provisional as instructed by the Engineer.	m	36.00		
2.2.7	Supply and Installation of 254 mm (8") surface casing *(To be Retained)*	m	10.00		
2.2.8	Insert and remove 8" Temporary casing temporarily **- (Unit Rate Only)**	m	0.00		
2.2.9	Allow for taking samples of drilling cuttings at two (2) metres intervals	No.	176.00		
2.2.10	Installation of gravel pack (24mm) (not laterite) to at least 3 m above top screen.	Ton.	23.00		
2.2.11	Grout between the casing and the borehole for top ten metres	LS	1.00		
	Physical and chemical development of the borehole minimum 4 Hrs including inserting and removal of development equipment:				
2.2.12	Physical development	HR	9.00		
2.2.13	Chemical development	HR	4.00		
2.2.14	Undertake constant discharge test specified 24 hours for actual test pumping and 8 hours for insertion removal of test pumping equipment.	HR	24.00		
2.2.15	Undertake water level observation and record recovery.	HR	24.00		
2.2.16	Carry out borehole sterilization.	LS	1.00		
2.2.17	Collect water samples and carry out full water quality analysis (chemical and bacteriological analysis) in a reputable laboratory acceptable to the Project Manager and submit water quality test report. A second sample may be carried out as directed by the Resident Engineer	No.	2.00		
2.2.18	Install 6" well head steel cap and cement slab around the well head with dimension 1.0 m x 1.0 m x 1.0 m	LS	1.00		

2.2	BOREHOLE DRILLING AND DEVELOPMENT				
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
2.2.19	Complete the prescribe WRA Borehole drilling completion report and submit to WRA	LS	1.00		
2.2.20	Allow costs for providing water for all requirements of the contract, field camp, drilling works and making good and surface reinstatement at the borehole location to the Project Managers satisfaction	LS	1.00		
2.2.21	Construct a standard 1500 x 1500 x 1500 mm borehole protection chamber with lockable flaps, water tight chequered steel top lid of dimensions 1200 x 1200 x 2 mm thickness to fit borehole protection chamber. (To include *GS frame c/w heavy-duty stainless-steel padlock)*	LS	1.00		
	Sub-total carried forward to Borehole Summary Page				

2.3	**BOREHOLE EQUIPPING (SOLAR WATER PUMP AND ELECTRICAL ACCESSORIES)**				
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
	Borehole equipping upon completion of Borehole drilling and pump design. From Hydrogeological ***Borehole Survey Estimated Depth - 270 - 350m****,* ***Pump Head*** *estimated at* ***400m*** *with* ***Discharge of 6 -7m^3/Hr*** *(actual yield to be determined after drilling work). The equipping to include installation of solar pump-set, sufficient solar, support structure and all other necessary associated items. Rate to include Provision, installation and commissioning of all electro-mechanical appurtenances. Note:****(PRELIMINARY - ACTUAL PUMP TO BE SELECTED AFTER TEST PUMPING BY THE ENGINEER)*				
2.3.1	Submersible pump as VARUNA VSS80H, 18.5_kW; motor - 25_HP or equivalent as approved by engineer **(Discharge upto 6 - 7m^3/hr and Head 400 m)**	LS	1.00		
2.3.2	Ditto item 2.3.1 For submersible pump as VARUNA 6VP 18-37, 22_kW; motor - 30_HP or equivalent. (**Unit Rate Only**)	LS	0.00		
2.3.3	Submersible pump as Pedrollo 6SR12/28, 15_Kw; Motor - 20_HP or equivalent ***(Discharge upto 6 - 7m^3/hr and Head 300 - 350 m).*** (**Unit Rate Only**)	LS	0.00		
2.3.4	Ditto item 2.3.1 For submersible pump as Pedrollo 6SR27/27, 30_Kw; Motor - 40_HP or equivalent. (**Unit Rate Only**)	LS	0.00		
2.3.5	Supply and splice to pump cable a 4-Core x 10mm^2 rubber--sheathed submersible motor power supply cable	m	450.00		
2.3.6	Adaptor set 1.5	Pc(s)	1.00		
2.3.7	Supply and install monocrystalline solar modules (at least 500W (+) each) with cumulative power output to power selected motor or as directed by the resident engineer. (Provisional)	Pc(s)	52.00		
2.3.8	Electrode / Sensor cable	m	450.00		
2.3.9	Well Probe Sensor	Pc(s)	1.00		
2.3.10	Junction Box and Accessories	Pc(s)	1.00		
2.3.11	22 kW 3ph Hybrid Solar Inverter - inverter with soft start and frequency drive for the above pump	Pc(s)	1.00		
2.3.12	Earthing accessories	Pc(s)	1.00		
2.3.13	Construct and erect a suitable solar structure to accommodate all installed solar arrays. The structure shall be at least 4 metres height above ground level on lowest side complete with lockable enclosure to house the inverter, pv disconnect and mounted below the solar arrays at a level free from interference. The enclosure shall be fabricated from heavy gauge swg folded, spangled, galvanized and rust protected sheet steel of minimum thickness of 1.5mm finished with a two -tone heat resistant non-peeling off staved grey enamel paint or epoxy powder coating.	LS	1.00		
2.3.14	Appropriately sized cable joint to splice the motor lead to the submersible cable	Pc(s)	1.00		

2.3	BOREHOLE EQUIPPING (SOLAR WATER PUMP AND ELECTRICAL ACCESSORIES)				
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
2.3.15	Metallic Enclosure for housing the controls	Pc(s)	1.00		
2.3.16	Equipment & tool set for scheme operators	Set	1.00		
2.3.17	25mm airline PVC pipe (piezometric pipe) - 6m Long	Pc(s)	59.00		
2.3.18	10mm^2, 4-core underground armoured cable.	m	30.00		
2.3.19	1.5mm^2 - 2 core PVC /SWA 99% copper armoured cable from control panel to well head for well sensor	m	30.00		
2.3.20	Well sensor kit for dry run protection and which must be compatible with the supplied controller	Pc(s)	1.00		
2.3.21	Lightning arrestor with copper strips of not less than 25mm x 4mm	Pc(s)	1.00		
2.3.22	35mm^2 - 4 core PVC/SWA 99% copper armoured cable from controller to well head (Underground Cable)	m	24.00		
2.3.23	Auxillary PV lighting system 40W solar powered street light, complete with battery, PV module and charge controller c/w pole, battery box and PV mounting.	Set	1.00		
2.3.24	Design and Production of Maintenance charts	Pc(s)	1.00		
2.3.25	Water reticulation 300m PPR pipes + Joints connectors	Pc(s)	1.00		
2.3.26	Alarm system set with siren for intrusion and safety protection of solar modules, where intrusion detection is based on mechanical vibrations/tampering of the solar array structure, wired and integrated within the installation; complete with all accessories	Pc(s)	1.00		
2.3.27	Transport, Installations and Commissioning Cost	LS	1.00		
	Sub-total carried forward to Borehole Summary Page				

2.4	**BOREHOLE EQUIPPING (PLUMBING WORKS)**				
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
2.4.1	20mm Ø Dipper tube complete - 350 m Long	LS	1.00		
2.4.2	Supply and install a 2” bulk flow meter (type and make to be approved by the Project Manager/Engineer). Rate to include all pipe and fittings at the well head	Pc(s)	1.00		
2.4.3	Supply and install a 2” Non - Return Valve 2". Rate to include all pipe and fittings at the well head	Pc(s)	1.00		
2.4.4	Supply and install 2" flanged sluice valve PN16 type AVK or equivalent	Pc(s)	1.00		
2.4.5	Supply and install 2" Threaded flanges and rubber gasket	Pc(s)	4.00		
2.4.6	2" GI Class "B" - Drop Pipe	m	150.00		
2.4.7	2" GI Class "C" - Drop Pipe	m	204.00		
	Sub-total carried forward to Borehole Summary Page				

2.5	FENCING AND GATE				
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
	Provide materials and fence off the borehole Solar Module areas: Rates to Include excavation for post holes, providing all materials and constructing 2.4 m high x 14 gauge chain-link complete with 12.5 gauge X 6 strand galvanised barbed wire fence on 100 x 100 mm concrete posts at 3m centre to centre and metal gate all as per details on drawings, including straining posts at every 10th post and additional posts at corners. **The perimeter of the fence is estimated to be 90m.** This works will be carried out with close supervision from site engineer.				
2.5.1	Excavate holes sizes 450mm diameter by 500mm deep to receive the anchor posts.	m^3	4.00		
2.5.2	Excavation for anchoring the bottom of the Chain-link on ground 100mm X 100 mm along the entire Perimeter fence length	m^3	1.00		
2.5.3	Pre-cast Concrete Fencing Posts - **Cranked**, 150 x 150 mm by 3,040 mm (10ft) spaced at 3.0 m centre to centre.	No.	31.00		
2.5.4	150 x 150mm precast concrete struts 3,040 mm long to corners of the fence and the main gate.	No.	10.00		
2.5.5	Concrete Class 15/20 (1:3:6) for Surround anchoring the posts on ground.	m^3	3.00		
2.5.6	Concrete class 15/20 (1:3:6) for anchoring the bottom of the Chain-link on ground 100mm X 75mm along the entire Perimeter fence length	m^3	1.00		
2.5.7	Supply and fix Chain link gauge 14, 2400mm height (18 m/roll)	Roll	5.00		
2.5.8	12.5-gauge X 6 strand galvanised barbed wire of 610m per roll through concrete posts	Roll	1.00		
2.5.9	Construct and Install Lockable Metal Gate of Average width 4m with 1m width pedestrian gate using SHS sections Installed on 2 No. 300 x 300 x 3m high reinforced concrete columns to Engineer's specification	LS	1.00		
	Sub-total carried forward to Borehole Summary Page				

	SUMMARY OF BILLS OF QUANTITIES				
BILL No.	**DESCRIPTION**				**AMOUNT**
2.1	GENERAL ITEMS				
2.2	BOREHOLE DRILLING AND DEVELOPMENT				
2.3	BOREHOLE EQUIPPING (SOLAR WATER PUMP AND ELECTRICAL ACCESSORIES)				
2.4	BOREHOLE EQUIPPING (PLUMBING WORKS)				
2.5	FENCING AND GATE				
	Subtotal - 1 (Bill No. 2.1 - 2.5)				
	Total Carried Forward to the Grand Summary Page				

Bill No. 3	PRESSED ELEVATED STEEL TANK, TANK TOWER				
	SECTIONAL MATERIAL SPECIFICATION				
1	1. Hot rolled section to BS 4360 Grade 43A or equivalent				
2	2. Cold formed section to BS 5950 Part 5: 1997 or equivalent				
3	3. Bolt and nuts to BS3692 and BS4190 or equivalent				
4	4. Welding specifications toBS 5135 or equivalent				
5	5. Welding electrodes to BS 635 or equivalent				
6	6. Wind load to CP3 chapter V part 2				
	DESIGN, FABRICATE, DELIVER, ASSEMBLE/ERECT &TEST 12m HIGH, 36 m^3 PRESSED STEEL TANK FOR NAPAK DISPENSARY & SCHOOL WATER SUPPLY				
	Pressed steel tank panels and tower				
	All rates to include mobilization and transportation to the site				
	Item Description	**Unit**	**Qty**	**Rate (Kshs)**	**Amount Kshs)**
3.1	**Provision for Tank Design to Details.**				
3.2.1	Provision of Design, analysis and drawings (by a qualified Professional / Manufacturer) including necessary manufacturer approvals and including submission of fabrication/working drawings for approval by the employer prior to execution of works.	Item	1.00		
	The following items are provisional:				
3.2	**Excavation and Earth Works**				
3.2.1	General site clearance	m^2	56.00		
3.2.2	Cutting of trees, removal of stumps with holes backfilled with excavated materials	Item	1.00		
3.2.3	Excavate in normal soil for tank footings size 1.5m X1.5m X 2.0m, depth in normal soil, ram the floor and straighten sides.	m^3	27.00		
3.2.4	Ditto for excavating in hard rock (Provisional quantity)	m^3	5.00		
3.3	**Steel Tower (12m high)**				
	Foundation as provided in the drawings. The cost to include Supply all materials, deliver to site, mix and vibrate reinforced concrete footings base size 1.5M X 1.5M X 0.5M, sub-Column Size 0.4M X 0.4M X 1.5M High and Plinth Beam 0.45M x 0.25M. Rate to include all formwork, reinforcement bars for concrete footing and foundation bolts for the tower Class 25/20 (1:1.5:3) - ***Minimum 6 No. Columns.***				
3.3.1	Concrete Class 25/20 (1:1.5:3)	m^3	12.00		
3.3.2	Assorted Reinforcement	Kg	720.00		
3.3.3	Formworks	m^2	40.00		
3.3.4	Fabricate to BS449 and supply ex-works **12m** high steel structure tower or the equivalent complete with access cage ladders, walkway platform (1m wide by 1.2 m high) and hand railing, access cover, roof vent and all necessary accessories designed to take sectional steel pressed tank **36m^3** capacity when full of water.	Item	1.00		
3.3	**Steel Tank (36 cubic meters: 3 m x 4 m x 3m Dimensions)**				
3.3.1	Supply, deliver to site, construct/fabricate and erect **36m^3** pressed steel tank complete with roof on the **12m** tower, tank constructed with 6mm thick pressed steel panels of 1m^2 or 1.2m^2 panels. Rate to include sealing compound, Bolts and nuts, struts, stays and cleats.	Item	1		
3.3.2	Provide for Float-operated water level indicator that is visible and can be read from the ground level.	No.	1		

Bill No. 3	PRESSED ELEVATED STEEL TANK, TANK TOWER				
3.3.3	Supply and install 2" Dia including all jointing materials for overflow with bell mouth and 2" Dia drainage (wash out from tank) pipework. The pipework to terminate at the overflow chamber.	Item	1		
3.3.4	Supply 2" Sluice valves and appropriate fitting for the tank wash out.	No.	1		
3.3.5	Supply and install 2" GI inlet pipework and include a ball valve, with flanges to BS4504. The pipework to terminate the connection with the main supply line.	Item	1		
3.3.6	Supply and install 2" GI outlet pipework complete with flanges to BS4504. The pipework to terminate at the connection with inlet pipework.	Item	1		
3.3.7	Supply 2" Sluice valves and appropriate fitting for the Outlet Pipe	No.	1		
3.4	**Painting**				
3.4.1	Inside, Supply and apply three coats of non-toxic black bituminous paint should be applied inside of the tank subject to engineer's direction. Note, borehole water in the area, can cause rust to the tank hence this is a MANDATORY component to mitigate against rusting from within the tank.	Item	1		
3.4.2	Supply and apply two coats of silver aluminium paint to the outside of the tank	Item	1		
3.4.3	Supply and apply two coats of silver aluminium paint to the tank tower, platform, pipes and cage ladder	Item	1		
3.4.4	Allow for Prime cost sum for branding of the elevated steel tank as shall be instructed by the Engineer	PC	1		
3.5	**Site works**				
3.5.1	Overflow reinforced concrete collection chamber complete with covers and depth 1.5 meters to 2 meters	Item	1		
3.5.2	Overflow drain discharge headwall	Item	1		
3.5.3	Excavate for, provide all materials and construct complete lockable masonry valve chamber of internal dimensions 1000 x 1000 x 1000 m. Rates to including thrust blocks, pipe supports and formworks as shown in the drawings and/or directed by the Engineer.	No.	1.00		
3.6	**Testing and sterilization**				
3.6.1	Test for water tightness, cleaning and sterilization recommended disinfectant of the **36m^3** elevated steel pressed tank.	LS	1		
	Total Carried Forward to the Grand Summary Page				

Bill No.4.1 - Rising Main Pipeline					
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
4.1.1	**Site Clearance**				
4.1.1.1	Clear site of all overgrowth grass, trees (less than 500 mm diameter), bushes, shrubs, any deleterious material etc and dispose as specified.	m^2	1,000.00		
4.1.2	**Excavation and Backfilling**				
	Rates for excavation and backfilling in trench shall include for trimming trench bottom and for providing selected bedding and surround materials from the excavations with the specifications. Excavation and backfilling in trench normal material for depth not exceeding 1.0 m unless otherwise specified				
4.1.2.1	Excavation and backfilling in normal material for Dia 63mm dia pipe for depth n.e 1.50m	m^3	300.00		
4.1.2.2	Ditto for excavating in soft rock (Provisional quantity)	m^3	15.00		
4.1.2.3	Ditto for excavating in hard rock (Provisional quantity)	m^3	15.00		
4.1.3	**Pipe Work**				
	Provide, lay, joint and test the following flexible spigot and socket pipe and fittings with rubber ring joints. Rates to include for all jointly materials, cutting wastage and anchorage.				
	Note: The following have been used on the drawings to specify pipe diameters/types/classes. Pipe dimensions/working pressures shall conform to KS-06-149 Part 2:2000.				
	Class Working Pressure (m)				
	PN6 60				
	PN8 80				
	PN10 100				
	PN12.5 125				
	PN16 160				
	PN20 200				
	PN25 250				
	HDPE Rolls - Class: PN 12.5				
4.1.3.1	63 mm dia	m	500.00		
4.1.4	**Fittings (BH Riser Column to Rising Main Pipeline Connection)**				
4.1.4.1	Supply and install of fittings on GI-HDPE interconnection from borehole fittings (2") to HDPE Rising main (63mm) and from HDPE Rising Main (63mm) into the tank Riser GI (2"). To Include HDPE Stub Connection Complete with a Flange.	No.	2.0		

Bill No.4.1 - Rising Main Pipeline					
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
4.1.5	**Marker Post**				
	Provide and place concrete marker posts for the pipeline and appurtenances at locations specified or otherwise instructed by the Engineer as follows: -				
4.1.5.1	at designated places on pipeline (Provisional)	No	3.0		
4.1.6	**Pipe Disinfection**				
4.1.6.1	Disinfection of Pipe lines: flushing with clear water, filling with water containing **0.05 g/l calcium hypochlorite, left for 24 hours**. This includes supply of all necessary equipment, materials, chemicals and water, measurement of residual chlorine, all as specified.	m	500.00		
	TOTAL CARRIED OVER TO PIPELINES SUMMARY PAGE				

Bill No.4.2 - Gravity Main Pipeline					
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
4.2.1	**Site Clearance**				
4.2.1.1	Clear site of all overgrowth grass, trees (less than 500 mm diameter), bushes, shrubs, any deleterious material etc and dispose as specified.	m^2	800.00		
4.2.2	**Excavation and Backfilling**				
	Rates for excavation and backfilling in trench shall include for trimming trench bottom and for providing selected bedding and surround materials from the excavations with the specifications. Excavation and backfilling in trench normal material for depth not exceeding 1.0 m unless otherwise specified				
4.2.2.1	Excavation and backfilling in normal material for Dia 63 mm pipe for depth n.e 1.50m	m^3	240.00		
4.2.2.2	Ditto for excavating in soft rock (Provisional quantity)	m^3	12.00		
4.2.2.3	Ditto for excavating in hard rock (Provisional quantity)	m^3	12.00		
4.2.3	**Pipe Work**				
	Provide, lay, joint and test the following flexible spigot and socket pipe and fittings with rubber ring joints. Rates to include for all jointly materials, cutting wastage and anchorage.				
	Note: The following have been used on the drawings to specify pipe diameters/types/classes. Pipe dimensions/working pressures shall conform to KS-06-149 Part 2:2000.				
	Class Working Pressure (m)				
	PN6 60				
	PN8 80				
	PN10 100				
	PN12.5 125				
	PN16 160				
	PN20 200				
	HDPE Rolls - Class: PN 16				
4.2.3.1	63 mm dia	m	400.00		
	END CAPS				
4.2.3.2	63mm HDPE End cap	No.	1.00		
4.2.4	**PIPELINES FITTINGS AND ACCESSORIES**				
	Provide for all the Distribution Junction fittings and Accessories which include Section Valves, Tees, Saddle Clamps, PRVs and their respective chambers as directed by the Engineer.				
	VALVE CHAMBERS (SECTION VALVE)				

Bill No.4.2 - Gravity Main Pipeline					
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
4.2.4.1	Excavate for, provide all materials and construct complete lockable masonry valve chamber of internal dimensions 1000 x 1000 x 1000 m. Rates to including thrust blocks, pipe supports and formworks as shown in the drawings and/or directed by the Engineer.	No.	3.00		
4.2.4.2	***Water Stand#1 Offtake Fittings:*** *63* x 32 mm offtake fittings To Include Saddle clamp/Tee, Gate Valve and associated fittings.	LS	1.00		
4.2.4.3	***Dispensary Water Stand#2 Offtake Fittings:*** *63* x 32 mm offtake fittings To Include Saddle clamp/Tee, Gate Valve and associated fittings.	LS	1.00		
4.2.4.4	***Natuntun School Water Stand#3 Offtake Fittings:*** *63* x 32 mm offtake fittings To Include Saddle clamp/Tee, Gate Valve and associated fittings.	LS	1.00		
4.2.5	**Marker Post**				
	Provide and place concrete marker posts for the pipeline and appurtenances at locations specified or otherwise instructed by the Engineer as follows: -				
4.2.5.1	at Block Chambers	No	3.0		
4.2.5.2	at designated places on pipeline (Provisional)	No	1.0		
4.2.6	**Pipe Disinfection**				
4.2.6.1	Disinfection of Pipe lines: flushing with clear water, filling with water containing **0.05 g/l calcium hypochlorite, left for 24 hours**. This includes supply of all necessary equipment, materials, chemicals and water, measurement of residual chlorine, all as specified.	m	400.00		
	TOTAL CARRIED OVER TO PIPELINES SUMMARY PAGE				

BILL No.4: PIPELINES COLLECTION SHEET

ITEM	DESCRIPTION	AMOUNT (KSh)
Bill No. 4.1	Rising Main Pipeline	
Bill No. 4.2	Gravity Main Pipeline	
SUB-TOTAL CARRIED OVER TO GRAND SUMMARY		

Bill No.5: Construction of Water Drawing Points					
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
5.1	**WATER STAND POINT (3 TAPS STAND)**				
5.1.1	**Element No.1: Excavation**				
5.1.1.1	General excavation to remove top soil to an average depth of 300mm	m^2	14.00		
5.1.1.2	Cart away surplus excavated material & deposit at recommended area	m^3	2.00		
5.1.1.3	300mm thick approved hard-core, well compacted in layers not exceeding 150mm and blinded using 50mm murrum/quarry dust	m^2	3.00		
5.1.2	**Element No.2: Masonry Work**				
5.1.2.1	150 x 225 x 450mm natural stone to walls to Super structures walling in 1:3 sand/cement mortar. Rate to included mild all reinforcement at every course	m^2	5.00		
5.1.2.2	150mm wide DPM to walls	m	5.00		
5.1.3	**Element No.3: Concrete Work**				
5.1.3.1	Reinforced concrete grade 25/20 - 200mm for floor slab	m^3	1.00		
5.1.4	**Element no. 4: Reinforcement**				
	Steel reinforcement cut, bend & placed in position, unit price to include cutting, bending & placing in position with binding wire and concrete seats				
5.1.4.1	10mm diameter high tensile steel in floor slab	Kg	60.00		
5.1.5	**Element No.5: Pipes and Fittings**				
	All pipes to be Galvanized Iron with Screw with adequate jute hemp thread for fixation of fittings				
5.1.5.1	32mm to 3/4" HDPE/GI Coupling	No.	1.00		
5.1.5.2	3/4" mm union	No.	2.00		
5.1.5.3	3/4" short nipple	No.	5.00		
5.1.5.4	3/4" pegler gate valve	No.	1.00		
5.1.5.5	3/4" GI pipe - 1m Long	No.	4.00		
5.1.5.6	3/4" GI Socket	No.	4.00		
5.1.5.7	3/4" GI Equal Tee	No.	2.00		
5.1.5.8	3/4" x 1/2" GI Reducing Bush	No.	1.00		
5.1.5.9	3/4" x 1/2" GI Reducing Socket	No.	2.00		
5.1.5.10	1/2" GI pipe - 0.5m Long	No.	3.00		
5.1.5.11	90-degree 1/2" GI Elbow	No.	6.00		
5.1.5.12	1/2" GI pipe Stand - 1.0m Long	No.	3.00		
5.1.5.13	1/2" long thread nipple	No.	6.00		
5.1.5.14	1/2" short nipple	No.	2.00		
5.1.5.15	1/2" GI Socket	No.	6.00		
5.1.5.16	1/2" dia. taps as Peglar	No.	3.00		
5.1.6	**Element No.6: Finishes**				
5.1.5.1	Apply plastering to all wall faces	m^2	10.00		
5.1.7	**Element No.7: VALVE CHAMBERS**				

Bill No.5: Construction of Water Drawing Points					
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
5.1.7.1	Excavate for, provide all materials and construct complete lockable masonry valve chamber of internal dimensions 1000 x 1000 x 1000 m. Rates to including thrust blocks, pipe supports and formworks as shown in the drawings and/or directed by the Engineer.	No.	1.00		
5.1.8	**Sub-Total for 1 No. Water Stand**				
5.1.9	**No. of Water Stands**	**No.**	**3.00**		
	Total for Water Stands Carried to Summary Page				

Bill No.5.2: Type 1 - Normal Water Kiosk					
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
	WATER KIOSK (OF UP TO 2.6m BY 2.6m AND UP TO 300mm ABOVE THE GROUND LEVEL)				
5.2.1	**Excavations**				
5.2.1.1	General excavation to remove top soil to an average depth of 250mm	m^2	24.00		
5.2.1.2	Excavation for column footing depth to a minimum depth 1000mm	m^3	11.00		
5.2.1.3	Excavation for front area depth not exceeding 250mm	m^3	5.00		
5.2.1.4	Cart away surplus excavated material & deposit at recommended area	m^3	8.00		
5.2.1.5	300mm thick approved hard-core, well compacted in layers not exceeding 150mm and blinded using 50mm murrum/quarry dust	m^2	11.70		
5.2.2	**Masonry Work**				
5.2.2.1	150 x 225 x 450mm natural stone to walls to Sub-structures walling in 1:3 sand/cement mortar finished with steel finished on one side. Rate to included mild all reinforcement at every course	m^2	14.00		
5.2.2.2	150 x 225 x 2300 natural stone to walls to Super-structures walling in 1:3 sand/cement mortar. Rate to included mild all reinforcement at every course	m^2	25.00		
5.2.2.3	150mm wide DPM to walls	m	12.00		
5.2.2.4	500mm Gauge polythene damp-proof membrane laid on blinded hardcore with 100mm folded side and end laps (measured net-allow for laps)	SM	18.00		
5.2.2.5	**Anti-Termite Treatment**				
5.2.2.6	Chemical anti-termite treatment executed by Rentokil Laboratories Limited or equal and approved pest control firm under a ten-year guarantee, applied to surface of excavation and floor	LS	1.00		
5.2.3	**Concrete Work**				
5.2.3.1	Concrete grade 15/20 - 50 mm thick Blinding Concrete	m^3	0.60		
5.2.3.2	Concrete grade 15/20 - 100-150mm thick slanting front area	m^3	0.90		
5.2.3.3	Reinforced concrete grade 25/20 - 150mm thick floor slab	m^3	1.40		
5.2.3.4	Reinforced concrete grade 25/20 - 250mm footing	m^3	2.70		
5.2.3.5	Reinforced concrete grade 25/20 - columns	m^3	0.80		
5.2.3.6	Reinforced concrete grade 25/20 - beams	m^3	1.30		
5.2.3.7	Reinforced concrete grade 25/20 in roof slab	m^3	2.30		
5.2.3.8	Reinforced concrete grade 25/20 in Parapet Wall	m^3	0.40		

Bill No.5.2: Type 1 - Normal Water Kiosk					
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
5.2.4	**Concrete Ancillaries**				
5.2.4.1	Provide, cut and fix in position sawn timber formwork and probs or equivalent for all concrete works	LS	1.00		
5.2.5	**Reinforcement: Steel reinforcement cut, bend & placed in position, unit price to include cutting, bending & placing in position with binding wire and concrete seats**				
5.2.5.1	Assorted reinforcement as shown in the drawing	Kg	780.00		
5.2.6	**Fittings and Fixtures**				
5.2.5.1	2000 X 1000 steel door including locks and hinges to details	No	1.00		
5.2.5.2	1200 X 600 (2No.) steel swing window including locks and hinges to details	No	2.00		
5.2.5.3	Handle and fix well supported 3 Nr. shelves of length 2000 long at a spacing of 400mm c/c	No.	3.00		
	SUB-TOTAL CARRIED FORWARD TO NEXT PAGE				

ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSh)	AMOUNT (KSh)
	SUB-TOTAL CARRIED FORWARD FROM PREVIOUS PAGE				
5.2.7	**Pipes and Fittings: All pipes to be Galvanised Iron with Screw with adequate jute hemp thread for fixation of fittings**				
5.2.7.1	50mm to 25mm reducing bush	No.	1.00		
5.2.7.2	25mm inlet pipe	m	18.00		
5.2.7.3	25mm dia. Elbows	No.	4.00		
5.2.7.4	25mm dia. Valve sockets	No.	2.00		
5.2.7.5	25mm dia. Gate Valve as Peglar	No.	2.00		
5.2.7.6	25 X 25 mm/Equal Reducing Tee	No.	5.00		
5.2.7.7	25mm end plug	No.	1.00		
5.2.7.8	25mm long thread nipple	No.	2.00		
5.2.7.9	25mm union	No.	4.00		
5.2.7.10	25mm short nipple	No.	11.00		
5.2.7.11	25mm heavy duty Globe Valve	No.	3.00		
5.2.7.12	25mm Peglar Water Meter	No.	1.00		
5.2.7.13	1" GI Pipe Class B	m	6.00		
5.2.7.14	1/2" dia. taps as Peglar	No.	2.00		
5.2.7.15	400mm x 1" HDPE/GI Adaptor	No.	1.00		
5.2.7.16	Concrete Class 25/20 Support for GI Upstand Pipe as shown in the drawing.	m^3	0.20		
5.2.8	**Finishes**				
5.2.8.1	Painting to all External wall surfaces with cement sand mortar 1:2	m^2	16.00		
5.2.8.2	Apply plastering to lintel surfaces	m^2	1.00		
5.2.8.3	Apply plastering to all internal wall faces	m^2	16.00		
5.2.8.4	Provide three coats of gloss paint to all plastered wall faces	m^2	16.00		
5.2.8.5	Provide 3 coats of bituminous paint to all exposed concreted faces	m^2	1.00		
5.2.8.6	**Drainage**				
5.2.8.7	Excavate for 1200mm diameter x 2000mm soak pit as detailed	No.	1.00		
5.2.8.8	4" x 8" x 18" lining block to the site of the catch pit	m	2.00		
5.2.8.9	100mm thick mass concrete grade 15/20 for catch pit base slab and cover	m^2	1.00		
5.2.8.10	100mm thick mass concrete grade 15/20 to the soak pit cover slab	m^3	1.00		
5.2.8.11	Provide 150mm perforated waste pipe to soak pit	No	2.00		
5.2.8.12	Graded approved free draining hard-core/rubble stone filling the soak pit	m^3	2.00		
5.2.9	**Sub-Total for 1 No. Type - 1 Water Kiosk**				
5.2.9.1	**No. of Type - 1 Water Kiosks**	**No.**	**1.00**		
	Total for Type - 1 Water Kiosks Carried to Summary Page				

	SUMMARY OF BILLS OF QUANTITIES				
BILL NO.	**DESCRIPTION**				**AMOUNT**
5.1	Water Stand (3 No.)				
5.2	Water Kiosk - Type 1 (1 No)				
	Subtotal - 1 (Bill No. 5.1 - 5.2)				
	Total Carried Forward to the Summary Page				

Bill No. 6 - Livestock Water trough					
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
	Construct standard Livestock Water trough(s) of size 0.6m internal width x 0.44m internal depth, 10m long and of 200mm thickness class 25/20 concrete wall with smooth finish.				
	For 1 No. Livestock Water trough				
6.1	**SITE CLEARANCE AND SETTING OUT**				
6.1.1	Clear site of all trees (less than 500 mm girth), bushes, shrubs, etc and dispose as specified	m^2	96.00		
6.1.2	E.O for stumps removal	No	2.00		
6.2	**EXCAVATION/EARTHWORKS**				
	To include for all trimming to levels, backfilling with approved selected spoil, compacting, disposal of surplus material and reinstatement for Cattle trough walls, chambers, protection sections, etc.				
6.2.1	In normal soil to a depth not exceeding 0.5 m.	m^3	62.00		
6.2.2	In murram/soft rock to a depth not exceeding 0.5 m.	m^3	3.00		
6.2.3	In hard rock to a depth not exceeding 1 m.	m^3	3.00		
6.2.4	250mm thick filling: deposit, spread, level and compact: to receive blinding	m^2	15.00		
6.3	**Anti-Termite Treatment**				
6.3.1	Chemical anti-termite treatment executed by Rentokil Laboratories Limited or equal and approved pest control firm under a ten-year guarantee, applied to surface of excavation and floor	LS	1.00		
6.4	**Damp-Proof Membrane**				
6.4.1	500mm Gauge polythene damp-proof membrane laid on blinded hardcore with 100mm folded side and end laps (measured net-allow for laps)	m^2	15.00		
6.5	**CONCRETE WORKS**				
	Provide and place the following concrete mixes including all form-work.				
6.5.1	Blinding concrete Class 15/40 of minimum 50mm thickness around the foundation	m^3	0.70		
6.5.2	Reinforced concrete Class 25/20 for Base - 150mm Thick	m^3	2.10		
6.5.3	Ditto for Base beam across the trough - 150mm deep by 100mm thick	m^3	0.50		
6.5.4	Ditto Trough walls - 200mm thick	m^3	2.00		
6.5.5	Ditto Inlet and ball valve chambers walls - 200mm thick	m^3	0.80		
6.5.6	Ditto Inlet and ball valve chambers Top Slab - 100mm thick	m^3	0.20		
	Reinforcement				
	Provide support and fix the following reinforcement, including all cutting, bending and support for piers				
6.5.7	Assorted High yield reinforcement bars as specified in the drawings	Kg	315.00		

Bill No. 6 - Livestock Water trough					
ITEM	**DESCRIPTION**	**UNIT**	**QTY**	**RATE (KSh)**	**AMOUNT (KSh)**
6.6	**METALWORKS**				
6.6.1	Supply and install Lockable mild steel cover Plates (800x600mm) complete will all fixing iron mongery including frames/hinges/locks to Cattle trough as shown on drawings	No	2.00		
6.7	**PROTECTION WORKS**				
6.7.1	Provide all materials, lay and place grouted rip rap (mortared stone pitching) 250- 300 mm around the cattle trough as shown in the drawings	m^2	70.00		
6.8	**Delivery Pipe Connecting Livestock Trough to the Main Pipe**				
	HDPE Rolls - Class: PN 16				
6.8.1	32 mm dia	m	200.00		
	Excavation/Earthworks				
6.8.2	Excavate and backfill a trench measuring 0.3 m wide by 0.45 m deep for the above delivery pipeline	m^3	27.00		
	Delivery Pipe Off-take Fittings				
6.8.3	50 x 25 mm dia saddle clamp	No.	1.0		
6.8.4	32 / 25 mm dia HDPE/GI adaptor	No.	1.0		
6.9	**Livestock Trough Inlet & Float Valve Fittings**				
6.9.1	32 / 25 mm dia HDPE/GI adaptor	No.	1.0		
6.9.2	25mm dia 90 Degree GI elbow	No.	2.0		
6.9.3	25 mm dia GI straight threaded on both sides 1000 mm long	No.	1.0		
6.9.4	25 mm, 0.5m long threaded steel pipe	No	2.0		
6.9.5	25 mm dia gate valve (Pegler Type)	No.	1.0		
6.9.6	25 mm dia GI nipple	No	1.0		
6.9.7	25 mm dia GI union	No	1.0		
6.9.8	Floats Ball Valve 1" (25mm) with all fittings	No	1.0		
6.10	**Cattle Trough Scour Pipe**				
6.10.1	50 mm dia gate valve (Pegler Type)	No	1.0		
6.10.2	50 mm dia, 0.5m long threaded Steel Pipe	No	1.0		
6.11	**Sub-Total for 1 No. Livestock Water trough**				
	No. of Livestock Water trough(s)	**No.**	**1.00**		
	Total for Livestock Water trough(s) Carried to Grand Summary Page				

Bill No 7	SANITATION BLOCK (LATRINE-VIP)				
	Item Description	**Unit**	**Qty**	**Rate (Kshs)**	**Amount (Kshs)**
7.1	**Sub-structure**				
	Excavation, including maintaining and supporting sides and keeping bottoms free from water and mud or other fallen material				
7.1.1	Clear site of turf, grasses etc and cart away. Excavate over site to remove top vegetable soil.	m^2	25.00		
7.1.2	Excavate for strip footing not exceeding 1.50m deep.	m^3	8.00		
7.1.3	Back filling selected excavated materials around foundation.	m^3	5.00		
7.2	**Earthworks**				
7.2.1	Excavate for pit latrine not exceeding 1.50m deep.	m^3	4.00		
7.2.1	Ditto 1.50m-3.0m deep	m^3	4.00		
7.2.1	Ditto 3.0m-6.0m deep	m^3	8.00		
7.2.1	Extra over excavation for excavating in rock class 1	m^3	4.00		
7.3	**Hardcore**	m^3			
7.3.1	250mm thick filling: deposit, spread, level and compact: to receive blinding	m^3	5.00		
7.3.2	50mm quarry dust blinding to surface of hardcore.	m^2	6.00		
7.4	**Anti-Termite Treatment**				
7.4.1	Chemical anti-termite treatment executed by Rentokil Laboratories Limited or equal and approved pest control firm under a ten-year guarantee, applied to surface of excavation and floor	LS	1.00		
7.5	**Blinding Concrete Class 15/20 (1:3:6) mix in:**				
7.5.1	50 mm blinding bed under strip footing	m^3	0.50		
7.6	**Reinforced Concrete 25/40 (1:1.5:3) mix in**				
7.6.2	Strip Footing	m^3	2.00		
7.6.1	Ground floor slab/beam	m^3	2.00		
7.6.3	Lintel beam	m^3	0.10		
7.7	**Reinforcement**				
	High Tensile Steel Reinforcement to B.S. 4483				
	Provide support and fix the following reinforcement, including all cutting, bending and support for piers				
7.7.1	Assorted High yield reinforcement bars as specified in the drawings	Kg	205.00		
7.8	**Sawn formwork to**				
7.8.1	Sides and soffits of beams	m^2	7.00		
7.8.2	Horizontal soffits of suspended slab	m^2	5.00		
7.9	**Walling**				
	Medium quarry dressed stone walling in cement and sand (1:3) mortar: 20-gauge x 25mm wide hoop iron reinforcement and column-wall ties in every alternate course: to				
7.9.1	150 mm walling	m^2	42.00		
7.10	**ROOFING AND RAINWATER DISPOSAL**				
7.10.1	**Sawn Treated Cypress**				
7.10.2	75mm x 50mm Braces, ties, strut, and posts	m	20.00		
7.10.3	100 x 50mm wall plate	m	12.00		
7.10.4	**Wrought Treated Cypress**				
7.10.5	200mm x 75mm Fascia or barge board	m	12.00		

Bill No 7	SANITATION BLOCK (LATRINE-VIP)				
	Item Description	**Unit**	**Qty**	**Rate (Kshs)**	**Amount (Kshs)**
	Roof Covering 28 Gauge box profile Iron Sheeting and Accessories				
7.10.6	Roofing Covering with 1 ½ Corrugation side laps nailed to timber Purlins with galvanized roofing nails with rubber washers (Measured out and allow for laps)	m^2	12.00		
7.11	**VENT PIPES**				
7.11.1	100 mm Diameters Upvc pipes	No.	2.00		
7.11.2	Fly Screen	No.	2.00		
7.12	**FINISHES**				
	Door				
7.12.1	Single door; 50 mm thick; 820 x 2100 mm high: mahogany veneered both sides. Rate to include Mesh screen above the door.	No.	2.00		
	Floor				
7.12.2	Cement and sand (1:4) paving: steel trowelled: on concrete				
7.12.3	40mm thick floors to receive tiles	m^2	17.00		
	Walling				
	12mm lime plaster: steel trowelled finish: on blockwork: to				
7.12.4	Walls(internals)	m^2	30.00		
	12mm Cement and sand (1:4) backing: wood float finish: to received wall tiles and cladding.				
7.12.5	Walls(internals).	m^2	30.00		
7.12.6	walls tiles (terrazzo including grouting and all other materials and laying to completions)	m^2	13.00		
	Prepare and apply three coats approved emulsion paint to:				
7.12.7	Plastered walls	m^2	30.00		
7.13	**Sub-Total for 1 No. Sanitation Block/Latrine**				
	No. of Latrines	**No.**	**2.00**		
	Total for Latrine(s) Carried to Grand Summary Page				

NAPAK DISPENSARY & SCHOOL BOREHOLE AND WATER RETICULATION PROJECT

PROJECT GRAND SUMMARY COST

ITEM	**DESCRIPTION**	**AMOUNT**
		KShs
1	Preliminaries and General	
2	Borehole and Associated Works	
3	36 m^3 Pressed Steel Tank	
4	Water Pipelines	
5	Community Water Points	
6	Animal Water Point (2No.Troughs)	
7	Sanitation block (1No. Latrine)	
8	**Sub-Total - 1 (Bill No. 2 to No.7)**	
9	**Add Contingencies (5%) of Bill No.8**	
	GRAND SUMMARY TOTAL (Bill 1+8+9)	

Section X. Environmental and Social Management Plan of the Work

[Instructions to the Employer as to the use of the ESMP:

The requirements stipulated in the ESMP attached (Annex 3) shall be acknowledged by the bidder through signature and stamp.

Prior to commencement of works, the bidder is obliged to review the ESMP and, if necessary, adjust it to the specific site conditions and hence creating a construction Environmental and Social Management Plan (C-ESMP). The adjustments shall be notified to the PEA and have to be in line with applicable national laws and regulations as well as the World Bank Environmental and Social Standards (WB ESS).

PART 3 – CONDITIONS OF CONTRACT (CC) AND CONTRACT FORMS

Section XI. General Conditions of Contract (GCC)

General

Definitions

1.1 Boldface type is used to identify defined terms.

The **Adjudicator** is the person appointed jointly by the Procuring Entity and the Contractor to resolve disputes in the first instance, as provided for in Clauses 27 and 28 hereunder.

Bill of Quantities means the priced and completed Bill of Quantities forming part of the Tender.

Compensation Events are those defined in Clause 47 hereunder.

The **Completion Date** is the date of completion of the Works as certified by the Project Manager, in accordance with Sub-Clause 58.1.

The **Contract** is the Contract between the Procuring Entity and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in Clause 2.3 below.

The **Contractor** is a person or corporate body whose Tender to carry out the Works has been accepted by the Procuring Entity.

The **Contractor's Tender** is the completed Tendering document submitted by the Contractor to the Procuring Entity.

The **Contract Price** is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Days are calendar days; months are calendar months.

Dayworks are varied work inputs subject to payment on a time basis for the Contractor's employees and Equipment, in addition to payments for associated Materials and Plant.

A **Defect** is any part of the Works not completed in accordance with the Contract.

The **Defects Liability Certificate** is the certificate issued by the Project Manager upon correction of defects by the Contractor.

The **Defects Liability Period** is the period named in the **Contract Data Sheet** and calculated from the Completion Date.

Drawings include calculations and other information provided or approved by the Project Manager for the execution of the Contract.

The **Procuring Entity** is the party who employs the Contractor to carry out the Works.

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

The **Initial Contract Price** is the Contract Price listed in the Procuring Entity's Letter of Acceptance.

The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the **Contract Data Sheet**. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order.

Materials are all supplies, including consumables, used by the Contractor for incorporation in the Works.

Plant is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.

The **Project Manager** is the person named in the **Contract Data Sheet** (or any other competent person appointed by the Procuring Entity and notified to the Contractor, to act in replacement of the Project Manager) who is responsible for supervising the execution of the Works and administering the Contract and shall be an "Architect" or a "Quantity Surveyor" registered under the Architects and Quantity Surveyors Act Cap 525 or an "Engineer" registered under Engineers Registration Act Cap 530.

The **Site** is the area defined as such in the **Contract Data Sheet**.

Site Investigation Reports are those that were included in the Tendering documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Project Manager.

The **Start Date** is given in the **Contract Data Sheet**. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.

Temporary Works are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.

A **Variation** is an instruction given by the Project Manager that varies the Works.

The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Procuring Entity, as defined in the **Contract Data Sheet**.

"**Force Majeure**" means an event which is beyond the reasonable control of a Party and which makes a Party's performance of its obligations under the Contract impossible or so impractical as to be considered impossible under the circumstances.

Interpretation

2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way round. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Project Manager will provide instructions clarifying queries about these Conditions of Contract.

2.2 If sectional completion is specified in the **Contract Data Sheet**, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

2.3 The documents forming the Contract shall be interpreted in the order of priority given in the **Contract Data Sheet**:

(1) Agreement;

(2) Letter of Acceptance;

(3) Contract Data Sheet;

(4) Conditions of Contract;

(5) Technical Specifications;

(6) Contractor's Tender;

(7) Drawings;

(8) Bill of Quantities; and

(9) Any other document listed in the **Contract Data Sheet** as forming part of the Contract.

Language, Law, Fraud and Corruption

3.1 The language of the Contract and the law governing the Contract are stated in the **Contract Data Sheet**.

3.2 The Funding Entities require that Procuring Entities (including beneficiaries of Funding Entities funded projects) as well as Tenderers/Suppliers/Contractors under Funding Entities financed contracts, observe the highest standard of ethics during the procurement and execution of such contracts. It is the responsibility of the Procuring Entity to ensure that Tenderers, suppliers, and contractors and their subcontractors observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy:

For the purpose of this provision, the following definitions are provided:

"**Corruption**" has the meaning assigned to it in the Anti-Corruption and Economic Crime Act 2003 and includes the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement or disposal process or in contract execution;

"**Fraudulent Practice**" includes a misrepresentation of fact in order to influence a procurement or disposal process or the execution of a contract to the detriment of the Procuring Entity and includes collusive practices amongst Tenderers prior to or after Tender submission designed to establish Tender prices at artificial non-competitive levels and deprive the Procuring Entity of the benefits of free and open competition;

"Collusive Practice" means an arrangement between two or more suppliers, contractors and subcontractors designed to achieve an improper purpose, including to influence improperly the actions of the Procuring Entity prior to or after Tender submission, designed to establish Tender prices at artificial non-competitive levels and to deprive the Procuring Entity of the benefit of free and open competition;

"Coercive Practice" means impairing or harming, or threatening to impair or harm, directly or indirectly a supplier, contractor or subcontractor or the property of any of them to influence improperly the actions of a Procuring Entity;

"Obstructive Practice" means deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede an investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and /or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation.

	The Procuring Entity will reject a proposal for award if it determines that the Tenderer recommended for award has engaged in corrupt, fraudulent practices or others stated under Clause 44.1.a in competing for the contract;
	3.4 Any communication between the Tenderers and the Procuring Entity related to matters of alleged fraud or corruption must be made in writing.
Confidentiality	4.1 The Service Providers, their Subcontractors, and the Personnel of either of them shall not disclose any proprietary or confidential information relating to the Project, the Services, this Contract, or the Procuring Entity's business or operations without the prior written consent of the Procuring Entity.
Project Manager's Decisions	5.1 Except where otherwise specifically stated, the Project Manager will decide contractual matters between the Procuring Entity and the Contractor in the role representing the Procuring Entity.
Delegation	6.1 The Project Manager may delegate any of his duties and responsibilities to other people except to the Adjudicator, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.
Communications	7.1 Communications between parties that are referred to in the Conditions shall be effective only when in writing. A notice shall be effective only when it is delivered.
Subcontracting	8.1 The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Procuring Entity in writing. Subcontracting shall not alter the Contractor's obligations.
Other Contractors	9.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Procuring Entity between the dates given in the Schedule of Other Contractors, as referred to in the **Contract Data Sheet**. The Contractor shall also provide facilities and services for them as described in the Schedule. The Procuring Entity may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification
Personnel	10.1 The Contractor shall employ the key personnel named in the Schedule of Key Personnel, as referred to in the **Contract Data Sheet**, who shall be appropriately qualified and registered with the appropriate bodies to carry out the functions stated in the Schedule or other personnel approved by the Project Manager. The Project Manager will approve any proposed replacement of key personnel only if their relevant qualifications and abilities are substantially equal to or better than those of the personnel listed in the Schedule.
	If the Project Manager asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.
Procuring Entity's and Contractor's Risks	11.1 The Procuring Entity carries the risks which this Contract states are Procuring Entity's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.
Procuring Entity's Risks	12.1 From the Start Date until the Defects Correction Certificate has been issued, the following are Procuring Entity's risks:

The risk of personal injury, death, or loss of or damage to property (excluding the Works, Plant, Materials, and Equipment), which are due to:

(i) Use or occupation of the Site by the Works or for the purpose of the Works, which is the unavoidable result of the Works; or

(ii) Negligence, breach of statutory duty, or interference with any legal right by the Procuring Entity or by any person employed by or contracted to him except the Contractor.

The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Procuring Entity or in the Procuring Entity's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.

12.2 From the Completion Date until the Defects Correction Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Procuring Entity's risk except loss or damage due to:

(a) A Defect which existed on the Completion Date;

(b) An event occurring before the Completion Date, which was not itself an Procuring Entity's risk; or

(c) The activities of the Contractor on the Site after the Completion Date.

Contractor's Risks

13.1 From the Starting Date until the Defects Correction Certificate has been issued, the risks of personal injury, death, and loss of or damage to property (including, without limitation, the Works, Plant, Materials, and Equipment) which are not Procuring Entity's risks are Contractor's risks.

Insurance

14.1 The Contractor shall provide, in the joint names of the Procuring Entity and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and deductibles stated in the **Contract Data Sheet** for the following events which are due to the Contractor's risks:

(a) Loss of or damage to the Works, Plant, and Materials;

(b) Loss of or damage to Equipment;

(c) Loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and

(d) Personal injury or death.

14.2 Policies and certificates for insurance shall be delivered by the Contractor to the Project Manager for the Project Manager's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

14.3 If the Contractor does not provide any of the policies and certificates required, the Procuring Entity may effect the insurance which the Contractor should have provided and recover the premiums the Procuring Entity has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.

14.4 Alterations to the terms of insurance shall not be made without the approval of the Project Manager.

14.5 Both parties shall comply with any conditions of the insurance policies.

Site Investigation Reports

15.1 The Contractor, in preparing the Tender, shall rely on any Site Investigation Reports referred to in the **Contract Data Sheet**, supplemented by any information available to the Tenderers.

Queries about the Contract Data Sheet

16.1 The Project Manager will clarify queries on the **Contract Data Sheet**.

Contractor to Construct the Works

17.1 The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.

Commencement and Completion

18.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Programme submitted by the Contractor, as updated with the approval of the Project Manager, and complete them by the Intended Completion Date.

Approval by the Project Manager

19.1 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Project Manager, who is to approve them if they comply with the Specifications and Drawings.

19.2 The Contractor shall be responsible for the design of Temporary Works.

19.3 The Project Manager's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

19.4 The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.

19.5 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Project Manager before their use.

Protection of the Environment

20.1 The Contractors shall take all reasonable steps to protect the environment and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations.

20.2 The Contractors shall ensure that emissions, surface discharges and effluent from his activities shall not exceed prescribed values in the environmental laws.

Labour Laws

The Contractor shall comply with all the relevant labour laws applicable in the Country, including laws relating to workers employment, working hours, health, safety, welfare, and immigration, and shall allow them all their legal rights.

The Contractor shall require his employees to obey all applicable laws, including those concerning safety at work.

Health and Safety

22.1 The Contractor shall at all times take all reasonable precautions to maintain the health and safety of his personnel.

22.2 The Contractor shall ensure that first aid facilities are available at all times at the site and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.

22.3 The Contractor shall notify the Procuring Entity details of any accident as soon as practicable after its occurrence. The Contractor shall maintain records and make

reports concerning health, safety, and welfare of persons, and damage to the property, as the Procuring Entity may reasonably require.

22.4 The Contractor shall conduct an HIV-Aids awareness programme, and shall take other such measures as specified in the **Contract Data Sheet** to reduce the risk of transfer of HIV virus between and among Contractor personnel, the Procuring Entity's Staff and the surrounding community.

Discoveries

23.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the Procuring Entity. The Contractor shall notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them.

Possession of the Site

24.1 The Procuring Entity shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the **Contract Data Sheet**, the Procuring Entity will be deemed to have delayed the start of the relevant activities, and this will be a Compensation Event.

Access to the Site

25.1 The Contractor shall allow the Project Manager and any person authorized by the Project Manager access to the Site and to any place where work in connection with the Contract is being carried out or is intended to be carried out.

Instructions, Inspections and Audits

26.1 The Contractor shall carry out all instructions of the Project Manager which comply with the applicable laws where the Site is located.

26

Disputes

27. 1 If the Contractor believes that a decision taken by the Project Manager was either outside the authority given to the Project Manager by the Contract or that the decision was wrongly taken, the decision shall be referred to the Adjudicator within 14 days of the notification of the Project Manager's decision.

Procedure for Disputes

28.1 The Adjudicator shall give a decision in writing within 28 days of receipt of a notification of a dispute.

28.2 The Adjudicator shall be paid by the hour at the rate specified in the **Tender Data Sheet** and **Contract Data Sheet**, together with reimbursable expenses of the types specified in the **Contract Data Sheet**, and the cost shall be divided equally between the Procuring Entity and the Contractor, whatever decision is reached by the Adjudicator. Either party may refer a decision of the Adjudicator to an Arbitrator within 28 days of the Adjudicator's written decision. If neither party refers the dispute to arbitration within the above 28 days, the Adjudicator's decision will be final and binding.

28.3 The arbitration shall be conducted in accordance with the arbitration procedure published by the institution named and in the place shown in the **Contract Data Sheet**.

Replacement of Adjudicator

29.1 Should the Adjudicator resign or die, or should the Procuring Entity and the Contractor agree that the Adjudicator is not functioning in accordance with the provisions of the Contract, a new Adjudicator will be jointly appointed by the Procuring Entity and the Contractor. In case of disagreement between the Procuring Entity and the Contractor, within 30 days, the Adjudicator shall be designated by the Appointing Authority designated in the **Contract Data Sheet** at the request of either party, within 14 days of receipt of such request.

Time Control

Programme

30.1 Within the time stated in the **Contract Data Sheet**, the Contractor shall submit to the Project Manager for approval a Programme showing the general methods, arrangements, order, and timing for all the activities in the Works.

An update of the Programme shall be a programme showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work, including any changes to the sequence of the activities.

30.3 The Contractor shall submit to the Project Manager for approval an updated Programme at intervals no longer than the period stated in the **Contract Data Sheet**. If the Contractor does not submit an updated Programme within this period, the Project Manager may withhold the amount stated in the **Contract Data Sheet** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Programme has been submitted.

30.4 The Project Manager's approval of the Programme shall not alter the Contractor's obligations. The Contractor may revise the Programme and submit it to the Project Manager again at any time. A revised Programme shall show the effect of Variations and Compensation Events

Extension of the Intended Completion Date

31.1 The Project Manager shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work, which would cause the Contractor to incur additional cost.

31.2 The Project Manager shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Project Manager for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

Acceleration

32.1 When the Procuring Entity wants the Contractor to finish before the Intended Completion Date, the Project Manager will obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Procuring Entity accepts these proposals, the Intended Completion Date will be adjusted accordingly and confirmed by both the Procuring Entity and the Contractor.

32.2 If the Contractor's priced proposals for acceleration are accepted by the Procuring Entity, they shall be incorporated in the Contract Price and treated as a Variation.

Delays Ordered by the Project Manager

33.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.

Management Meetings

34.1 Either the Project Manager or the Contractor may require the other to attend a management meeting. The business of a management meeting shall be to review the plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

34.2 The Project Manager shall record the business of management meetings and provide copies of the record to those attending the meeting and to the Procuring Entity. The responsibility of the parties for actions to be taken shall be decided by the Project Manager either at the management meeting or after the management meeting and stated in writing to all who attended the meeting.

Early Warning

35.1 The Contractor shall warn the Project Manager at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price or delay the execution of the Works. The Project Manager may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate shall be provided by the Contractor as soon as reasonably possible.

35.2 The Contractor shall cooperate with the Project Manager in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by anyone involved in the work and in carrying out any resulting instruction of the Project Manager.

Quality Control

Identifying Defects

36.1 The Project Manager shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Project Manager may instruct the Contractor to search for a Defect and to uncover and test any work that the Project Manager considers may have a Defect.

Tests

37.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect, the test shall be a Compensation Event.

Correction of Defects

The Project Manager shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion, and is defined in the **Contract Data Sheet**. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Project Manager's notice.

If the Contractor has not corrected a defect within the time specified in the Procuring Entity's notice, a penalty for lack of performance will be paid by the Contractor. The amount to be paid will be calculated as a percentage of the cost of having the defect correct, assessed as described in Clause 39.

Uncorrected Defects

39.1 If the Contractor has not corrected a Defect within the time specified in the Project Manager's notice, the Project Manager will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

Cost Control

Bill of Quantities

40.1 The Bill of Quantities shall contain items for the construction, installation, testing, and commissioning work to be done by the Contractor.

40.2 The Bill of Quantities is used to calculate the Contract Price. The Contractor shall be paid for the quantity of the work done at the rate in the Bill of Quantities for each item.

Changes in the Quantities

41.1 If the final quantity of the work done differs from the quantity in the Bill of Quantities for the particular item by more than 25 percent, provided the change exceeds 1 percent of the Initial Contract Price, the Project Manager shall adjust the rate to allow for the change.

41.2 The Project Manager shall not adjust rates from changes in quantities if thereby the Initial Contract Price is exceeded by more than 15 percent, except with the prior approval of the Procuring Entity.

41.3 If requested by the Project Manager, the Contractor shall provide the Project Manager with a detailed cost breakdown of any rate in the Bill of Quantities.

Variations

42.1 All Variations shall be included in the updated Programmes produced by the Contractor.

Payments for Variations

43.1 The Contractor shall provide the Project Manager with a quotation for carrying out the Variation when requested to do so by the Project Manager. The Project Manager shall assess the quotation, which shall be given within seven days of the request or within any longer period stated by the Project Manager and before the Variation is ordered.

43.2 If the work in the Variation corresponds with an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work is above the limit stated in Sub-Clause 41.1 or the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in the form of new rates for the relevant items of work.

43.3 If the Contractor's quotation is unreasonable, the Project Manager may order the Variation and make a change to the Contract Price, which shall be based on the Project Manager's own forecast of the effects of the Variation on the Contractor's costs.

43.4 If the Project Manager decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given and the Variation shall be treated as a Compensation Event.

43.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

Cash Flow Forecasts

44.1 When the Programme is updated, the Contractor shall provide the Project Manager with an updated cash flow forecast. The cash flow forecast shall include different currencies, as defined in the Contract, converted as necessary using the Contract exchange rates.

Payment Certificates

45.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously.

45.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor within twenty eight 28 days of receipt of the certificate from the contractor.

45.3 The value of work executed shall be determined by the Project Manager.

45.4 The value of work executed shall comprise the value of the quantities of the items in the Bill of Quantities completed.

45.5 The value of work executed shall include the valuation of Variations and Compensation Events.

45.6 The Project Manager may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

45.7 The Project Manager shall not be bound to certify any payment, if the net amount, after all retentions and deductions would be less than minimum amount of Interim Payment Certificate stated in the **Contract Data Sheet.**

Payments

46.1 Payments shall be adjusted for deductions for advance payments and retention. The Procuring Entity shall pay the Contractor the amounts certified by the Project Manager within 28 days of the date of each certificate. If the Procuring Entity makes a late payment, the Contractor shall be paid interest on the late payment in the next payment Interest shall be calculated from the date by which the payment should have been made up to the date when the late payment is made at the prevailing rate of interest for commercial borrowing for each of the currencies in which payments are made as indicated in the **Contract Data Sheet.**.

If an amount certified is increased in a later certificate or as a result of an award by the Adjudicator or an Arbitrator, the Contractor shall be paid interest upon the delayed payment as set out in this clause. Interest shall be calculated from the date upon which the increased amount would have been certified in the absence of dispute.

46.3 Unless otherwise stated, all payments and deductions will be paid or charged in the proportions of currencies comprising the Contract Price.

46.4 Items of the Works for which no rate or price has been entered in will not be paid for by the Procuring Entity and shall be deemed covered by other rates and prices in the Contract.

Compensation Events

47.1 The following shall be Compensation Events:

(a) The Procuring Entity does not give access to a part of the Site by the Site Possession Date stated in the **Contract Data Sheet**.

(b) The Procuring Entity modifies the Schedule of Other Contractors in a way that affects the work of the Contractor under the Contract.

(c) The Project Manager orders a delay or does not issue Drawings, Specifications, or instructions required for execution of the Works on time.

(d) The Project Manager instructs the Contractor to uncover or to carry out additional tests upon work, which is then found to have no Defects.

(e) The Project Manager unreasonably does not approve a subcontract to be let.

(f) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of the Letter of Acceptance from the information issued to Tenderers (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.

(g) The Project Manager gives an instruction for dealing with an unforeseen condition, caused by the Procuring Entity, or additional work required for safety or other reasons.

(h) Other contractors, public authorities, utilities, or the Procuring Entity does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.

(i) The advance payment is delayed.

(j) The effects on the Contractor of any of the Procuring Entity's Risks.

(k) The Project Manager unreasonably delays issuing a Certificate of Completion.

(l) Other Compensation Events described in the Contract or determined by the Project Manager shall apply.

47.2 If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date shall be extended. The Project Manager shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended.

47.3 As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast cost has been provided by the Contractor, it shall be assessed by the Project Manager, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Project Manager shall adjust the Contract Price based on the Project Manager's own forecast. The Project Manager will assume that the Contractor will react competently and promptly to the event.

47.4 The Contractor shall not be entitled to compensation to the extent that the Procuring Entity's interests are adversely affected by the Contractor's not having given early warning or not having cooperated with the Project Manager.

Taxes

48.1 The Project Manager shall adjust the Contract Price if taxes, duties, and other levies are changed between the date 28 days before the submission of Tenders for the Contract and the date of the last Completion certificate. The adjustment shall be the change in the amount of tax payable by the Contractor, provided such changes are not already reflected in the Contract Price or are a result of Clause 50.

Currencies

49.1 Where payments are made in currencies other than the Kenya Shillings, the exchange rates used for calculating the amounts to be paid shall be the exchange rates stated in the Contractor's Tender.

Price Adjustment

50.1 The amounts payable to the Contractor, in various currencies pursuant to Sub-Clause 45.1, shall be adjusted in respect of the rise or fall in the cost of labour, Contractor's Equipment, Plant, materials, and other inputs to the Works, by applying to such amounts the formulae prescribed in this clause based on the prevailing consumer price index obtained from the Central Bureau of Statistics or the monthly inflation rate issued by the Central Bank of Kenya.

50.2 To the extent that full compensation for any rise or fall in costs to the Contractor is not covered by the provisions of this or other clauses in the Contract, the unit rates and prices included in the Contract shall be deemed to include amounts to cover the contingency of such other rise or fall of costs.

50.3 The adjustment to be applied to amount payable to the Contractor as certified in Payment Certificates shall be determined formulae for each of the currencies in which the Contract Price is payable. No adjustment is to be applied to work valued on the basis of Cost or current prices. The formulae shall be as follows;

$$Pn = a + b\frac{Ln - Lo}{Lo} + c\frac{Mn - Mo}{Mo} + d\frac{En - Eo}{Eo} + etc.$$

where;

Pn is a price adjustment factor to be applied to the amount in each specific currency for the payment of the work carried out in the subject month, where such variations and daywork are not otherwise subject to adjustment;

a is a constant, specified in the **Appendix to Tender**, representing the nonadjustable portion in contractual payments;

b, c, d, etc., are weightings or coefficients representing the estimated proportion of each cost element (labour, materials, equipment usage, etc.) in the Works or sections thereof, net of Provisional Sums, as specified in the **Appendix to Tender**; the sum of a, b, c, d, etc., shall be one;

Ln, Mn, En, etc., are the current cost indices or reference prices of the cost elements in the specific currency of origin for month "**n,**" determined pursuant to Sub-Clause 50.5, applicable to each cost element; and

Lo, Mo, Eo, etc., are the base cost indices or reference prices corresponding to the above cost elements at the date specified in Sub-Clause 50.5

The value of net work done, certified by the Project Manager, in any monthly Interim or Final Certificate as payable by the Procuring Entity to the Contractor before deduction of any retention money shall be increased or decreased by an amount of **'F'.**

$$F = PnxPc$$

where;

The effective value **Pc** of work done which is to be subjected to increase or decrease shall be the difference between:

the amount which, in the opinion of the Project Manager, is due to the Contractor under Clause 45 (before deduction of retention money and before deducting sums previously paid on account) less:

any amount for payment or repayment of any advance payment;

any amount for materials on site (if any);

any amounts for nominated sub-contractors (if any)

any amounts for any other items based on actual cost or current prices; or

any sums for increase or decreases in the Contract Price paid under this Sub-Clause

and

the amount calculated in accordance with (i) above of this Sub-clause and included in the last preceding statement.

50.4 The sources of indices shall be those listed in the **Appendix to Tender**, as approved by the Engineer. Indices shall be appropriate for their purpose and shall relate to the Contractor's proposed source of supply of inputs on the basis of which his Contract Price and expected foreign currency requirements shall have been computed. As the proposed basis for price adjustment, the Contractor shall have submitted with his Tender the tabulation of Weightings and Source of Indices in the **Appendix to Tender**, which shall be subject to approval by the Engineer.

50.5 The base cost indices or prices shall be those prevailing on the day 28 days prior to the latest date for submission of Tenders. Current indices or prices shall be those prevailing on the day 28 days prior to the last day of the period to which a particular Interim Payment Certificate is related. If at any time the current indices are not available, provisional indices as determined by the Engineer will be used, subject to subsequent correction of the amounts paid to the Contractor when the current indices become available.

50.6 If the Contractor fails to complete the Works within the time for completion prescribed under Clause 58 adjustment of prices thereafter until the date of completion of the Works shall be made using either the indices or prices relating to the prescribed time for completion, or the current indices or prices, whichever is more favourable to the Procuring Entity, provided that if an extension of time is granted pursuant to Clause 28, the above provision

shall apply only to adjustments made after the expiry of such extension of time.

50.7 The weightings for each of the factors of cost given in the **Appendix to Tender** shall be adjusted if, in the opinion of the Engineer, they have been rendered unreasonable, unbalanced, or inapplicable as a result of varied or additional work already executed or instructed under Clause 43 or for any other reason.

Retention

51.1 The Procuring Entity shall retain from each payment due to the Contractor the proportion stated in the **Contract Data Sheet** until Completion of the whole of the Works.

51.2 On completion of the whole of the Works, half the total amount retained shall be repaid to the Contractor and the other half when the Defects Liability Period has passed and the Project Manager has certified that all Defects notified by the Project Manager to the Contractor before the end of this period have been corrected.

51.3 On completion of the whole Works, the Contractor may substitute retention money with an "on demand" Bank guarantee.

Liquidated Damages

52.1 The Contractor shall pay liquidated damages to the Procuring Entity at the rate per day stated in the **Contract Data Sheet** for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount defined in the **Contract Data Sheet**. The Procuring Entity may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's liabilities.

If the Intended Completion Date is extended after liquidated damages have been paid, the Project Manager shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment certificate. The Contractor shall be paid interest on the overpayment, calculated from the date of payment to the date of repayment, at the rates specified in Sub-Clause 46.1.

If the Contractor has not corrected defects within the time specified in the Procuring Entity's notice, the Procuring Entity will assess the cost of having the defect corrected, the Contractor will pay this amount, and a penalty for lack of performance calculated as described in Clause 38.

Bonus

53.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day stated in the **Contract Data Sheet** for each day (less any days for which the Contractor is paid for acceleration) that the Completion is earlier than the Intended Completion Date. The Project Manager shall certify that the Works are complete, although they may not be due to be complete.

Advance Payment

54.1 The Procuring Entity shall make advance payment to the Contractor of the amounts stated in the **Contract Data Sheet** by the date stated in the **Contract Data Sheet**, against provision by the Contractor of an Unconditional Bank Guarantee in a form and by a bank acceptable to the Procuring Entity in amounts and currencies equal to the advance payment.

The Guarantee shall remain effective until the advance payment has been repaid, but the amount of the Guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest will not be charged on the advance payment.

54.2 The Contractor is to use the advance payment only to pay for Equipment, Plant, Materials, and mobilization expenses required specifically for execution of the Contract. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Project Manager.

54.3 The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuations of work done, Variations, price adjustments, Compensation Events, Bonuses, or Liquidated Damages.

Performance Securities

55.1 The Performance Security shall be provided to the Procuring Entity no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form and by a bank or surety acceptable to the Procuring Entity, and denominated in the types and proportions of the currencies in which the Contract Price is payable. The Performance Security shall be valid until a date 28 days from the date of issue of the Certificate of Completion in the case of a Bank Guarantee, and until one year from the date of issue of the Completion Certificate in the case of a Performance Bond.

Dayworks

56.1 If applicable, the Dayworks rates in the Contractor's Tender shall be used for small additional amounts of work only when the Project Manager has given written instructions in advance for additional work to be paid for in that way.

56.2 All work to be paid for as Dayworks shall be recorded by the Contractor on forms approved by the Project Manager. Each completed form shall be verified and signed by the Project Manager within two days of the work being done.

56.3 The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.

Cost of Repairs

57.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

Finishing the Contract

Completion Certificate

58.1 The Contractor shall request the Project Manager to issue a certificate of Completion of the Works, and the Project Manager will do so upon deciding that the work is completed.

Taking Over

59.1 The Procuring Entity shall take over the Site and the Works within seven days of the Project Manager's issuing a certificate of Completion.

Final Account

60.1 The Contractor shall supply the Project Manager with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Project Manager shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Project Manager shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Project Manager shall decide on the amount payable to the Contractor and issue a payment certificate.

Operating and Maintenance Manuals

61.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the **Contract Data Sheet**.

61.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the **Contract Data Sheet**, or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount stated in the **Contract Data Sheet** from payments due to the Contractor.

Termination

62.1 The Procuring Entity or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

62.2 Fundamental breaches of Contract shall include, but shall not be limited to, the following:

(a) The Contractor stops work for 28 days when no stoppage of work is shown on the current Programme and the stoppage has not been authorized by the Project Manager;

(b) The Project Manager instructs the Contractor to delay the progress of the Works, and the instruction is not withdrawn within 28 days;

(c) The Procuring Entity or the Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;

(d) A payment certified by the Project Manager is not paid by the Procuring Entity to the Contractor within 84 days of the date of the Project Manager's certificate;

(e) The Project Manager gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Project Manager;

(f) The Contractor does not maintain a Security, which is required; and

(g) The Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in the **Contract Data Sheet**.

(h) If the Contractor, in the judgment of the Procuring Entity has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

For the purpose of this paragraph:

"corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution and includes inter alia, bribery and extortion or coercion which involves threats of injury to person, property or reputation, and.

"Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Procuring Entity, and includes collusive practice among Tenderers (prior to or after Tender submission) designed to establish Tender prices at artificial non-competitive levels and to deprive the Procuring Entity of the benefits of free and open competition.

62.3 When either party to the Contract gives notice of a breach of Contract to the Project Manager for a cause other than those listed under Sub-Clause 62.2 above, the Project Manager shall decide whether the breach is fundamental or not.

62.4 Notwithstanding the above, the Procuring Entity may terminate the Contract for convenience.

62.5 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.

Payment upon Termination

63.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Project Manager shall issue a certificate for the value of the work done and Materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work

not completed, as indicated in the **Contract Data Sheet**. Additional Liquidated Damages shall not apply. If the total amount due to the Procuring Entity exceeds any payment due to the Contractor, the difference shall be a debt payable to the Procuring Entity.

63.2 If the Contract is terminated for the Procuring Entity's convenience or because of a fundamental breach of Contract by the Procuring Entity, the Project Manager shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works, and less advance payments received up to the date of the certificate.

Property

64.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Procuring Entity if the Contract is terminated because of the Contractor's default.

Release from Performance

65.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Procuring Entity or the Contractor, the Project Manager shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which a commitment was made.

Suspension of Financing

66.1 In the event that the source of financing is suspended to the Procuring Entity, from which part of the payments to the Contractor are being made:

(a) The Procuring Entity is obligated to notify the Contractor of such suspension within 7 days of having received the financing agency's suspension notice.

(b) If the Contractor has not received sums due it within the 28 days for payment provided for in Sub-Clause 46.1, the Contractor may immediately issue a 14-day termination notice.

Section XII. Special Conditions of Contract (SCC)

Contract Data Sheet

Instructions for completing the Contract Data Sheet

CDS Clause	GCC Clause	Description
1	1.1	**A. General** **(Itemize Definitions to take the same numbering as per the General Conditions)** The Procuring Entity is **Turkana County Government,** **Drought Resilience Programme in Northern Kenya** **Along Robert Kijana – Marble – Nabulon Road,** **Kanamkemer Ward, Turkana Central Sub County.** The name and identification number of the Contract is Construction and Commissioning of Water Supply infrastructure for **Napak Dispensary & School Borehole and Water Reticulation Project –** **TCG/MoALDF/AL/DRPNK/W/045/2026 – 2027** The scope of works proposed to be undertaken include: *i) Drilling, testing, equipping and solarization 1 No. borehole – approximately 270 - 350 m Deep;* *ii) Design, Fabrication, assemble/erect & testing of the pressed steel tank at least 36 m^3 including a 12 high Steel Tower;* *iii) Construction and commissioning of the following pipelines and associated appurtenance Structures:* *a. Rising Main Pipeline (OD63 — PN 12.5 – 460 m long);* *b. 1 No. Gravity Main Pipeline (OD63 — PN 12.5 – 380 m long);* *iv) Construction of Water Drawing Points* *a. Water Kiosk — Type 1 (1 No);*

<table>
<tr><td></td><td></td><td>
b. Water Stand (3 No);

v) Construction of Animal Water Point (Troughs) – (1 No.)

vi) Construction of Sanitation block (Latrine) – (2 No.)

The objective of the project is to Construct and Commission of Water Supply infrastructure for

Napak Dispensary & School Borehole and Water Reticulation Project in Napak Village, Turkwel Sub-Location, Turkwel Location, Turkwel Ward, Loima Sub-County, Turkana County, Kenya.

The Start Date shall be …….

The Intended Completion Period for the whole of the Works shall be 4 months and DLP of 6 months.

The following documents shall also form part of the Contract:
• Invitation to Bid
• Form of Bid
• Appendix to form of Bid
• Instructions to Bidders
• Schedules of Supplementary Information
• Articles of Agreement

The Site is located in Lokichar Sub-location, Lokichar Location, Lokichar Ward Within Turkana-South Sub-County, Turkana County, Kenya and is defined in the drawings
</td></tr>
<tr><td>2.</td><td>2.2</td><td>Indicate whether there is sectional completion: N/A</td></tr>
<tr><td>3.</td><td>2.3(9)</td><td>List other documents that form part of the contract if any: N/A</td></tr>
<tr><td>4.</td><td>3.1</td><td>The language of the Contract documents is English

The law that applies to the Contract is the Kenyan Law.</td></tr>
<tr><td>5.</td><td>9.1</td><td>Include the Schedule of Other Contractors, if any: N/A</td></tr>
<tr><td>6.</td><td>10.1</td><td>Include the Schedule of Key Personnel.
<table>
<tr><th>Key Personnel</th><th>Minimum Academic/professional qualification</th><th>General Experience (Years)</th><th>Specific Experience (Years)</th></tr>
<tr><td>Project Manager (Key Partner/Director)</td><td>Holder of Bachelor’s degree</td><td>8</td><td>5</td></tr>
</table>
</td></tr>
</table>

		Site Agent (Civil Engineer)	BSc. Civil Engineering or equivalent, Registered with EBK as a graduate Engineer or equivalent	5	3
		Environmentalist	Holder of a degree in Environmental Science or Social Sciences equivalent, NEMA License (Lead / Associate EIA/EA Expert)	5	3
		Surveyor	Holder of Ordinary National Diploma in surveying – Minimum requirement	5	3
		Electrician with ability to undertake Solar Stands fabrication and PV Panels installation	Must have T3 License from EPRA and/or NCA licensed	5	3
		Clerk of Works/Foreman	Must have Diploma in Civil Engineering –, Has proficiency in CAD software.	3	3
		Plumber	Trade Test Grade 1 with experience in construction of water works	3	3
		Mason	Trade Test Grade 1 with experience in construction of water works	3	3
		The bidder must include curriculum vitae of all the key staff above including their certificates.			
7.	**14.1**	The minimum insurance covers shall be: (a) loss of or damage to the Works, Plant, and Materials (KShs.10 million) (b) loss of or damage to Equipment (KShs.2 million)			

		(c) loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract and (KShs.200,000) (d) personal injury or death (KShs.400,000)
8.	**15.1**	Site Investigation Reports available to the Tenderers are: • **Book of Drawings** • **Hydrogeological Report**
9.	**22.4**	The other measures *Refer to PQ9: ESHS Management section in the Tender document.*
10.	**24.1 & 47.1**	The Site Possession Date shall be **14 days** after **award.**

11.	**28.2**	Hourly rate of Fees payable to the Adjudicator is: **N/A**
12.	**28.3**	Arbitration will take place in ***Kenya*** in accordance with rules and regulations published by **Engineers Board of Kenya.**
13.	**29.1**	Appointing Authority for the Adjudicator: **Chairman Engineers' Board of Kenya**
		B. Time Control
14.	**30.1**	The Contractor shall Submit a Programme for the Works **within 7 days** of delivery of the Letter of Acceptance.
15.	**30.3**	The period between Programme updates is **30** days.
16.	**30.3**	N/A
		C. Quality Control
17.	**38.1**	The Defects Liability Period is **180** days.
		D. Cost Control
18.	**45.7**	Minimum Amount of Interim Payment Certificate will be **10%**
19.	**46.1**	N/A
20.	**47.1(a)**	The Site Possession Date shall be **Not more than 7 days after commencement date.**
21.	**50**	The contract **is not** subject to price adjustment.
22.	**51.1**	The amount of retention is **10%** of value of works of Interim Payment Certificate'.
23.	**52.1**	The rate of liquidated damages is **0.1% of contract price per day.**

	52.1 **62.2 (g)**	The maximum amount of liquidated damages is **10%** of Contract Price.
24.	**53.1**	The bonus for early completion is **N/A**
25.	**54.1**	The amount of advance payment shall be **N/A**
		Monthly Recovery of Advance Payment: **N/A**
26.	**55.1**	The Performance Security shall be **10 percent of the contract price**.
		E. Finishing the Contract
27.	**61.1**	As built drawings shall be supplied by the contractor by**: Fourteen (14) days after completion** Operating manual shall be supplied by the contractor by**: Fourteen (14) days after completion**
28.	**61.2**	The amount to be withheld by the Project Manager in the case the contractor does not submit as built drawings is: **Kshs. 50,000** The amount to be withheld by the Project Manager in the case the contractor does not submit operating manual is: **Kshs. 50,000**
29.	**63.1**	The percentage to apply to the value of the work not completed, representing the Procuring Entity's additional cost for completing the Works, is **20%.**

Appendix 1 to Particular Conditions of Contract

KfW Policy – Sanctionable Practice – Social and Environmental Responsibility

1) Sanctionable Practice

The PEA and the Contractors (including all members of a Joint Venture and proposed or engaged Subcontractors) must observe the highest standard of ethics during the Tender Process and performance of the Contract.

By signing the Declaration of Undertaking the Contractors declare that (i) they did not and will not engage in any Sanctionable Practice likely to influence the Tender Process and the corresponding Award of Contract to the PEA's detriment, and that (ii) in case of being awarded a Contract they will not engage in any Sanctionable Practice.

Moreover, KfW requires to include in the Contracts a provision pursuant to which Contractors must permit KfW and in case of financing by the European Union also to European institutions having competence under European law to inspect the respective accounts, records and documents relating to the Tender Process and the performance of the Contract , and to have them audited by auditors appointed by KfW.

KfW reserves the right to take any action it deems appropriate to check that these ethics rules are observed and reserves, in particular, the rights to:

(a) reject an Offer for Award of Contract if during the Tender Process the Bidder who is recommended for the Award of Contract has engaged in Sanctionable Practice, directly or by means of an agent in view of being awarded the Contract;

(b) declare misprocurement and exercise its rights on the ground of the Funding Agreement with the PEA relating to suspension of disbursements, early repayment and termination if, at any time, the PEA, Contractors or their legal representatives or Subcontractors have engaged in Sanctionable Practice during the Tender Process or performance of the Contract without the PEA having taken appropriate action in due time satisfactory to KfW to remedy the situation, including by failing to inform KfW at the time they knew of such practices.

KfW defines, for the purposes of this provision, the terms set forth below as follows:

Coercive Practice	The impairing or harming, or threatening to impair or harm, directly or indirectly, any person or the property of the person with a view to influencing improperly the actions of a person.
Collusive Practice	An arrangement between two or more persons designed to achieve an improper purpose, including influencing improperly the actions of another person.
Corrupt Practice	The promising, offering, giving, making, insisting on, receiving, accepting or soliciting, directly or indirectly, of any illegal payment or undue advantage of any nature, to or by any person, with the intention of influencing the actions of any person or causing any person to refrain from any action.

Fraudulent Practice	Any action or omission, including misrepresentation that knowingly or recklessly misleads, or attempts to mislead, a person to obtain a financial benefit or to avoid an obligation.
Obstructive Practice	Means (i) deliberately destroying, falsifying, altering or concealing evidence material to the investigation or the making of false statements to investigators, in order to materially impede an official investigation into allegations of a Corrupt Practice, Fraudulent Practice, Coercive Practice or Collusive Practice, or threatening, harassing or intimidating any Person to prevent them from disclosing their knowledge of matters relevant to the investigation or from pursuing the investigation, or (ii) any act intended to materially impede the exercise of KfW's access to contractually required information in connection with an official investigation into allegations of a Corrupt Practice, Fraudulent Practice, Coercive Practice or Collusive Practice.
Sanctionable Practice	Any Coercive Practice, Collusive Practice, Corrupt Practice, Fraudulent Practice or Obstructive Practice (as such terms are defined herein) which is unlawful under the Financing Agreement.

2) Social and Environmental Responsibility

Projects financed in whole or partly in the framework of Financial Cooperation have to ensure compliance with international Environmental, Social, Health and Safety (ESHS) standards (including issues of sexual exploitation and abuse and gender based violence) Contractors in KfW-financed projects shall consequently undertake in the respective Contracts to:

(a) comply with and ensure that all their Subcontractors and major suppliers, i.e. for major supply items comply with international environmental and labour standards, consistent with applicable law and regulations in the country of implementation of the respective Contract and the fundamental conventions of the International Labour Organisation[5] (ILO) and international environmental treaties and;

(b) implement any environmental and social risks mitigation measures, as identified in the environmental and social impact assessment (ESIA) and further detailed in the environmental and social management plan (ESMP) as far as these measures are relevant to the Contract and implement measures for the prevention of sexual exploitation and abuse and gender-based violence.

[5]In case ILO conventions have not been fully ratified or implemented in the Employer's country the Applicant/Bidder/Contractor shall, to the satisfaction of the Employer and KfW, propose and implement appropriate measures in the spirit of the said ILO conventions with respect to a) workers grievances on working conditions and terms of employment, b) child labour, c) forced labour, d) worker's organisations and e) non-discrimination.

PROCEDURE AND ELIGIBILITY CRITERIA

The qualified interested bidders shall submit the information to enable the County Government of Turkana, Department of Agriculture and Land Reclamation, to evaluate their capability to undertake the works. For these works, it is required that the bidders should provide the following: -

PRELIMINARY EVALUATION CRITERIA

Eligibility and Qualification Criteria			**Compliance Requirements**			
No.	Subject	Submission Requirement	Single Entity	Joint Venture (existing or intended)		
				All Members Combined	Each Member	One Member
1.	Form of Tender	Attach duly filled, signed and stamped form of tender	Must meet requirement	N/A	N/A	N/A
2.	Serialization and number of copies	As advised in the instructions to bidders	Must meet requirement	N/A	N/A	N/A
3.	Letter to Bid	Attach duly filled, signed and stamped Letter to Bid form	Must meet requirement	N/A	N/A	N/A
4.	Appendix to Bid	Attach duly filled, signed and stamped Appendix to Bid form	Must meet requirement	N/A	N/A	N/A
5.	Certificate of Incorporation	Attach a certificate of incorporation	Must meet requirement	N/A	N/A	N/A
6.	KRA PIN Certificate	Attach KRA PIN certificate	Must meet requirement	N/A	N/A	N/A
7.	Tax compliance	Attach a valid KRA tax compliance	Must meet requirement	N/A	N/A	N/A
8.	ESMP Compliance	Attach duly signed ESMP	Must meet requirement	N / A	N / A	N / A
9.	Certificate of Confirmation of Directors and Shareholding (CR 12) for Limited company	Attach CR12 valid for the last 6 months from the date of tender opening	Must meet requirement	N / A	N / A	N / A
10.	Single business permit from any County in Kenya	Attach single business permit valid for the year 2026	Must meet requirement	N / A	N / A	N / A
11.	Confidential Business Questionnaire	Attach a duly filled, signed and stamped confidential business questionnaire	Must meet requirement	N / A	N / A	N / A
12.	Tender security	Attach duly filled signed and stamped tender	Must meet requirement	N / A	N / A	N / A

Eligibility and Qualification Criteria			Compliance Requirements			
No.	Subject	Submission Requirement	Single Entity	Joint Venture (existing or intended)		
				All Members Combined	Each Member	One Member
		securing declaration form (Form 9)				
13.	KfW Declaration of undertaking	Attach a duly filled and signed and stamped KfW declaration of undertaking	Must meet requirement	N / A	N / A	N / A
14.	Form SD 1	Attach a duly filled and signed and stamped Form SD 1	Must meet requirement	N / A	N / A	N / A
15.	Form SD 2	Attach a duly filled and signed and stamped Form SD 2	Must meet requirement	N / A	N / A	N / A
16.	Power of Attorney	Attach Power of Attorney signed and stamped by commissioner of oaths	Must meet requirement	N / A	N / A	N / A
17.	Bill of Quantities (BoQ)	Attach duly filled signed and stamped Bill of Quantities	Must meet requirement	N / A	N / A	N / A
18.	Certificate of Registration with National Construction Authority in the relevant category.	Attach relevant Minimum of NCA 6.	Must meet requirement	N / A	N / A	N / A
19.	Code of Conduct	Attach a duly filled and signed and stamped Code of Conduct	Must meet requirement	N / A	N / A	N / A

NOTE: Failure by the bidder to attach any of the above information shall constitute grounds for **automatic disqualification** for being **non-responsive**.

TECHNICAL EVALUATION CRITERIA

The Criteria, sub-criteria, and point system for the evaluation of the Technical Proposals

	CRITERIA	EVALUATION DOCUMENTS	KEY
i.	**Bidder's general and specific experience (as a firm)**		**30Marks**
	Bidders general experience of not less than 5 years (specify number of Projects) it has been in operational in that line business (Max Score = 15%)	Attach Completion certificates and Local Service Order or Contract agreement This sub-criterion is evaluated on the basis of the number of years the company has been operational.	1 year = **1 Mark** 2 years = **2 Marks** 3 years = **3 Marks** 4 years= **4 Marks** 5 years above = **5 marks**
		Attach Completion certificates. This sub-criterion is evaluated on the basis of the number of contracts completed in the last five years (min. 5 projects)	1 Project **= 2 marks** 2 Projects **= 4 marks** 3 Projects **= 6 marks** 4 Projects **= 8 marks** 5 and above Projects **= 10 marks**
	Bidder's specific and similar ongoing contracts (similar in nature, magnitude and complexity)	Attach Local Service Order or Contract agreement. This sub-criterion is evaluated on the basis of number of projects ongoing (similar in nature, magnitude and complexity) – Min. 5 projects.	1 Project **= 2 marks** 2 Projects **= 4 marks** 3 Projects **= 6 marks** 4 Projects **= 8 marks** 5 and above Projects **= 10 marks**
	Bidder's Experience in the ASAL regions of Kenya under similar conditions to the Procuring Entity's area (Max Score = 5%) "	Attach Local Service Order or Contract agreement or Completion Certificates; (in ASAL regions of Kenya – Turkana, Marsabit, Wajir, Mandera, Isiolo, Samburu etc.) This sub-criterion is evaluated on the basis of the number of projects completed in ASAL regions of Kenya.	1 Project **= 1 marks** 2 Projects **= 2 marks** 3 Projects **= 3 marks** 4 Projects **= 4 marks** 5 and above Projects **= 5 marks**
ii.	**Site organization and construction schedule**		**5 Marks**
	Construction schedule (Attach work schedule showing description, charts, drawings e.t.c)	Attach construction schedule showing descriptions, charts etc. This sub-criterion is evaluated on the basis of Realistic and Implementable work schedule.	Non – Realistic and Non – implementable **= 0 marks** Realistic and Implementable **= 2 marks**

	Site Organization and method statement	Attach organogram of the company; This sub-criterion is evaluated on the basis of team composition and skills mix appropriateness.	Team composition is balanced and appropriate skills mix or vice versa **= 1 Mark**
		Attach method statement; This sub-criterion is evaluated on the basis of sound and most appropriate method statement.	Methodology is sound and appropriate =**2 Marks**
	Total points for criteria (i) and (ii)		**35 Marks**
	***Notes to Bidders**: The Procuring Entity will assess whether the proposed construction schedule, site organization and method statement are clear, realistic and implementable;*		
iii.	**Proposed Key Personnel**		***20 Marks***
	Key Experts' qualifications and competence for the assignment: (***Notes to Bidders: Each position number corresponds to the same for the Key Experts in Forms TECH-6A (Team Composition) and TECH-6B (CV) to be prepared by the Bidder**). Overall team composition should be balanced and has an appropriate skills mix; and the Workplan has right input of Experts.* *The bidder must include their certificates.*		
	Position K-1: Project Manager (Key Partner/Director) The Project Manager must possess the following minimum requirement(s); • A minimum of Bachelor's Degree from a recognized institution; • Minimum specific experience of Five (5) years; • Minimum specific experience of Three (3) similar assignment;	i. At least a Bachelor's degree – **1 mark** ii. Minimum specific experience of Five (5) years in a similar assignment– **1 mark** iii. Minimum number of 3 similar projects– **1 mark**	3 marks
	Position K-2: Site Agent (Civil Engineer) The Site Agent must possess the following minimum requirement(s); • At least a Bachelor's degree in Civil Engineering or relevant field, • Registered with EBK • Minimum specific experience of Five (5) years; • Minimum specific experience of Three (3) similar assignment;	i. At least a Bachelor's degree in Civil Engineering or relevant field – **1 mark** ii. Minimum specific experience of Five (5) years in a similar assignment– **1.5 mark** iii. Minimum number of 3 similar projects– **1.5 mark** iv. Must be Registered with EBK – **1 mark**	5 marks

	Position K-3: Surveyor The surveyor must possess the following minimum requirement(s); • At least holder of Ordinary National Diploma in surveying or related field; • Minimum general experience of Five (5) years; • Minimum specific experience of Three (3) years in a similar assignment delivered within time and cost; • Must be conversant with leveling and topographic surveys (number of assignments undertaken in Water sector).	i. At least a Diploma in relevant field – **1 mark** ii. Minimum general experience of Five (5) years – **1 mark** iii. Minimum specific experience of Three (3) years in a similar assignment delivered within time and cost – **0.5 mark** iv. At least three (3) number of water related assignments undertaken by Surveyor – **0.5 mark**	3 marks
	Position K-4: Licensed Electrician Electrician with ability to undertake Solar Stands fabrication and PV Panels installation for the project. The Licensed Electrician must possess the following minimum requirements; • At least a certificate in Electrical Engineering or relevant field; • Must have a T3 License from Energy and Petroleum Regulatory Authority (EPRA); • NCA License • Minimum general experience of Three (3) years; • Minimum specific experience of Three (3) similar assignment;	i. At least a certificate in Electrical Engineering or relevant field;– **0.5 mark** ii. Minimum general experience of Three (3) years **– 0.5 mark** iii. Minimum number of 3 similar projects– **0.5 mark** iv. Must have a T3 License from Energy and Petroleum Regulatory Authority (EPRA) and/or NCA License **– 0.5 mark**	2 marks

	Position K-5: Clerk of Works The Clerk of Works must possess the following minimum requirement(s); • At least a Diploma in Civil Engineering; • Proficiency in CAD software • Minimum relevant experience of Three (3) years; • Must have held a similar position for at least three (3) projects.	i. At least a Diploma in Civil Engineering – **1 mark** ii. Minimum relevant experience of three (3) years – **1.0 mark** iii. Must have held a similar position for at least three (3) similar assignments – **0.5 mark** **iv.** Proficiency in CAD software – **0.50 mark**	3.0 marks
	Position K-6: Plumber The plumber must possess following minimum requirement(s); • Trade Test Grade 1 • Minimum relevant experience of Three (3) years in construction of water works; • Must have held a similar position for at least three (3) projects.	**i.** At least a Trade Test Grade 1 **– 1.0 mark** ii. Minimum relevant experience of three (3) years – **0.50 mark** iii. Must have held a similar position for at least three (3) similar assignments – **0.5 mark**	2.0 mark
	Position K-7: Mason The Clerk of Works must possess the following minimum requirement(s); • Trade Test Grade 1 • Minimum relevant experience of Three (3) years in construction of water works; • Must have held a similar position for at least three (3) projects.	• At least a Trade Test Grade 1 – **1.0 mark** • Minimum relevant experience of three (3) years – **0.5 mark** • Must have held a similar position for at least three (3) similar assignments – **0.5 mark**	2 mark
	Total points for criterion (iii)		**20 marks**
iv.	**Proposed machinery and Equipment** (***Notes to Bidders: Each machinery or equipment to be recorded in Form PQ8 by the Bidder***)		**10 marks**
1	1No. Drilling Rig	i. Attach document of evidence of ownership or lease or hire of the equipment – **1 mk** ii. No Attached document of evidence of ownership or lease or hire of the equipment – **0 mk**	1 mark
2	1No. 7 tonne Lorries/ Tippers	iii. Attach document of evidence of ownership or lease or hire of the	

		equipment (minimum 7tonne Lorry or Tipper) – **1 mk** iv. No Attached document of evidence of ownership or lease or hire of the equipment (minimum 7tonne Lorry or Tipper)– **0 mk**	1 mark
3	1No. 1 m^3 concrete mixer	i. Attach document of evidence of ownership or lease or hire of the equipment (minimum 1 m^3 Concrete mixer) – **1 mk** ii. No Attached document of evidence of ownership or lease or hire of the equipment (minimum 1 m^3 Concrete mixer) – **0 mk**	1 mark
4	1No. Concrete poker vibrators (40mm)	i. Attach document of evidence of ownership or lease or hire of the equipment (minimum 40mm Concrete Poker vibrator) – **1 mk** ii. No Attached document of evidence of ownership or lease or hire of the equipment (minimum 40mm Concrete Poker vibrator) – **0 mk**	1 mark
5	1No. Air compressor (with > 8 Jack hammers)	i. Attach document of evidence of ownership or lease or hire of the Air compressor equipment (with > 8 Jack hammers) – **1 mk** ii. No Attached document of evidence of ownership or lease or hire of the Air compressor equipment (with > 8 Jack hammers) – **0 mk**	1 mark
6	1No. 1 tonne pickup truck	i. Attach document of evidence of ownership or lease or hire of the equipment (minimum 1tonne pickup truck) – **1 mk** ii. No Attached document of evidence of ownership or lease or hire of the equipment (minimum 1tonne pickup truck) – **0 mk**	1 mark
7	1No. Generator (5 kVA)	i. Attach document of evidence of ownership or lease or hire of the equipment (minimum 1No. Generator (5kVA)) – **1 mk** ii. No Attached document of evidence of ownership or lease or hire of the equipment (minimum 1No. Generator (5kVA)) – **0 mk**	1 mark
8	1No. Survey equipment / Total Station	i. Attach document of evidence of ownership or lease or hire of the equipment (minimum 1No. survey equipment/Total Station) – **1 mk**	1 mark

		ii. No Attached document of evidence of ownership or lease or hire of the equipment (minimum 1No. survey equipment/Total Station) – **0 mk**	
9	Light Duty Truck (Pick-up or similar)	**i.** Attach document of evidence of ownership or lease or hire of the equipment (minimum 1No. Light Duty Truck (Pick-up or similar)) – **0.5 mk** **ii.** No Attached document of evidence of ownership or lease or hire of the equipment (minimum 1No. Light Duty Truck (Pick-up or similar)) – **0 mk**	0.5 mark
10	Water Pump	i. Attach document of evidence of ownership or lease or hire of the equipment – **0.5 mk** ii. No Attached document of evidence of ownership or lease or hire of the equipment – 0 mk	0.5 mark
11	HDPE Butt Machine	i. Attach document of evidence of ownership or lease or hire of the equipment) – **1 mk** ii. No Attached document of evidence of ownership or lease or hire of the equipment (minimum 1No. Light Duty Truck (Pick-up or similar)) – **0 mk**	1 mark
1	**Environmental, Social, Health and Safety (ESHS)**		**10marks**
	Bidder's experience in Environmental, Social, Health and Safety (**ESHS).**	No. of assignments undertaken by the company in Environmental, Social, Health and Safety. This sub-criterion is evaluated on the basis of the number of projects undertaken by the company with ESHS component (min. 5 projects). Attach evidence e.g NEMA EIA license, Occupational Health certificates, Safeguards, Compliance certificates, etc 1 projects = **1 mark** 2 projects **= 2marks** 3 projects = **3marks** 4 projects **= 4marks** 5 projects and above **= 5 marks**	5 marks
	Position K-8: Environmentalist Must possess the following minimum requirement(s):	i. At least a Bachelor's degree in Environmental Science or relevant field – **1 mark**	5 marks

	• Holder of a degree in Environmental Science or relevant field, • Registered and licensed by NEMA as Lead / Associate EIA/EA Expert • Minimum specific experience of Five (5) years; • Must have held a similar position for at least three (3) projects.	ii. Minimum specific experience of Five (5) years **– 1 mark** iii. Must have held a similar position for at least three (3) similar assignments – **2 mark** iv. Must be Registered and Licensed by NEMA as Lead/Associate EIA/EA Expert **– 1 mark**	
2	**Financial reports**		**25marks**
	Balance sheets	Provided **– 3mks** Not Provided **– 0mks**	**3marks**
	Profit and loss statements	Provided **– 3mks** Not Provided **– 0mks**	**3marks**
	Audited Accounts Reports (2022, 2023, 2024) – PQ3 Form to be filled.	Attach copies of support documents (certified by accredited Auditor or firm) Turn over greater or equal to 2 times the cost of the project **– 10mks** Turn over greater or equal to the cost of the project **– 5mks** Turn over below the cost of the project **– 2mks**	**10marks**
	Evidence of access to financial resources (Cash in hand, Lines of credit, overdraft etc.)	Has financial resources equal to 20% of the cost of the project **– 5mks** Has financial resources below 20% of the cost of the project **– 2mks** Has not indicated sources of financial resources **– 0mk**	**5marks**
	Name, Address, email address and Telephone of Banks (Contractor to provide)	Provided **– 1mk** Not Provided **– 0mks**	**1mark**
	Litigation History	Filled **– 1mk** Not Filled **– 0mks**	**1mark**
	Sanctity of the Tender Document	Having the document intact (not tempered with in any way) **– 1mk** Having mutilated or modified the tender document **– 0mks**	**1mark**
	Pre-bid site visit (attach site visit certificate issued by the client)	Certificate provided **– 1mk** Not Provided **– 0mks**	**1mark**
	GRAND TOTAL	**100**	

Any bidder who scores 70 points and above shall be considered for further evaluation.

FINANCIAL EVALUATION CRITERIA

The financial evaluation shall be undertaken in two sections:

1. Preliminary examinations and
2. Tender sum Comparisons

A. PRELIMINARY EXAMINATIONS

The preliminary examination in the Financial Evaluation shall be in accordance with clause 26 of Instruction to Tenderers.

The parameters to be considered under this section includes the following:

a. Arithmetic errors and Comparison of rates

1. Arithmetic Errors (Stage 1)

The bid shall be checked for arithmetic errors based on the rates and the total sums indicated in the bills of quantities.

a) Confirmation shall be sought in writing from the tenderers whose tender sums will be determined to have a significant arithmetic error to their disadvantage, to confirm whether they stand by their tender sums. The error shall be treated as per clause 24 of Instructions to Tenderers. Non compliance with the above shall lead to **automatic disqualification** from further evaluation.

b) Arithmetical errors will be rectified or corrected on the following basis.

   i. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected.

   ii. If the candidate does not accept the correction of errors, its tenders will be **rejected**, and its tender security **forfeited**.

   iii. If there is a discrepancy between words and figures, the amount in words will prevail.

   iv. The arithmetic checks shall be undertaken horizontally noting any corrections.

c) The rates of every quantity shall then be checked against the Engineer's rates if it is realistic as per every itemized bill.

2. Comparison of rates (Stage 2)

The evaluation committee will compare rates from different bidders and note consistency of rates and front loading. The evaluation committee will judge and make an appropriate decision giving evidence.

B. TENDER SUMS COMPARISONS

In this section, tender sums will be compared to the average of all sums for bidders who have qualified from comparison of Rates stage and score awarded to a maximum of 30 as shown below.

1) Preliminary Average (Stage 3)

i. The tender sums of various bidders, who qualify at Comparison of Rates Stage and the engineer's estimates, shall be reduced by omitting PC sums, provisional sums and contingency from the respectful amounts. The average of the adjusted tender sums so obtained shall be calculated.

ii. Any tenderer whose tender percentage deviation is 20% higher or lower than the average obtained above, will be deemed to be unreasonably high or low and shall not be included in determining the mean in table 3, However their bids will still be evaluated further. The Engineer's estimate will also be subjected to the same treatment.

Working Mean

The detailed scoring plan shall be as shown in table 3 below:

Table 3

Item	Description	Score	Max. Score
	Tender Sums: (The tender sums of bidders, who qualify at Comparison of Rates Stage and the engineer's estimates, shall be reduced by omitting PC sums, provisional sums and contingency from the respectful amounts. The average of the adjusted tender sums so obtained shall be calculated. The deviation of the reduced amounts in respect of each bidder from the average shall then be worked out as a percentage of the average (Rounded off to one (1) decimal point) and scores allocated as follows :-) o Deviation of between 0% and 1% ---------- 30 o Deviation of between 1.1% and 2% ---------- 28.5 o Deviation of between 2.1% and 3% ---------- 27 o Deviation of between 3.1% and 4% ---------- 25.5 o Deviation of between 4.1% and 5% ---------- 24 o Deviation of between 5.1% and 6% ---------- 22.5 o Deviation of between 6.1% and 7% ---------- 21 o Deviation of between 7.1% and 8% ---------- 19.5 o Deviation of between 8.1% and 9% ---------- 18 o Deviation of between 9.1% and 10% ---------- 16.5		30

	o Deviation of between 10.1% and 11% ---------- 15 o Deviation of between 11.1% and 12% ---------- 13.5 o Deviation of between 12.1% and 13% ---------- 12 o Deviation of between 13.1% and 14% ---------- 10.5 o Deviation of between 14.1% and 15% ---------- 9 o Deviation of between 15.1% and 16% ---------- 7.5 o Deviation of between 16.1% and 17% ---------- 6 o Deviation of between 17.1% and 18% ---------- 4.5 o Deviation of between 18.1% and 19% ---------- 3 o Deviation of between 19.1% and 20% ----------1.5 o Deviation of 20.1% and above ---------- 0		
	Total		**30**
	The Tender sum score will be carried forward to STAGE 4		

C. FINANCIAL SCORE

The financial score (Fs) will be determined by comparing tender sums from all responsive bidders using the formulae below. The financial score will be allocated a maximum of 20%.

Fs = 20 x Fm/F

Where Fs is the financial score, Fm is the lowest priced responsive financial bid and F is the price of the bid under consideration

STAGE 4 – FINAL SCORE

The total score will be combined sums of Technical, Tender Sums Comparison and Financial marks as below:

Technical (Ts) + Tender Sums Comparison (TSC) +Financial (Fs)

= Ts+TSC+Fs

D. RECOMMENDATION

The **lowest responsive bidder** who scores 75% and above may be recommended for award.

STAGE 5 – POST – QUALIFICATION

An evaluation committee may, after tender evaluation, but prior to the award of the tender, conduct **due diligence** and present the report in **writing** to confirm and **verify** the qualifications of the tenderer who submitted the lowest evaluated responsive tender to be awarded the contract in accordance with Public Procurement and Asset Disposal Act 2015.

The conduct of due diligence may include obtaining confidential references from persons with whom the tenderer has had prior engagement.

To acknowledge that the report is a true reflection of the proceedings held, each member who was part of the due diligence by the evaluation committee shall-

a. initialize each page of the report; and

b. append his or her signature as well as their full name and designation.

Section XIII. Tender and Contract Forms

PQ2 – KEY PERSONNEL FORM

KEY PERSONNEL

1. Access to Expertise Required for the Assignment

Complete the list below to demonstrate the extent to which you have access (internally / externally) to expertise required for this assignment / for the project team profiles. Include home-office project management / administration and backs-stopping personnel. The Applicant shall not present a potential project team. The focus is on access and availability to project relevant expertise. It is understood that prequalified Applicants are not required to include staff named below into the Proposal.

Name	Project team profile / areas of required expertise	Education/ Degree	Years of Professional Experience	Role in the firm/ Years within the Firm	Country/Regional Experience	Relevant Project References (Description of project-related experience)	Languages

PQ3 – FINANCIAL POSITION FORM

Attach copies of Firm's certified and Audited financial statements for the last three years

Financial data	**2 years before last year[6] 2023 KES**	**Year before last year 2024 KES**	**Last year 2025 KES**	**Average[7] KES**
Annual turnover[8]				
Current assets[9]				
Current liabilities[10]				
Current ratio (current assets/current liabilities)				

If annual accounts are not yet available for the last year, please provide latest estimates or provisional figures. Figures in all columns must be calculated on the same basis to allow a direct, year-on-year comparison to be made (or, if the basis has changed, please provide an explanation of the change as a footnote to the table).

[6] Last year = last accounting year for which the entity's accounts have been closed.

[7] Amounts entered in the 'Average' column must be the mathematical average of the amounts entered in the three preceding columns of the same row.

[8] The gross inflow of economic benefits (cash, receivables, other assets) generated from the ordinary operating activities of the enterprise (such as sales of goods, sales of Services, interest, royalties, and dividends) during the year.

[9] A balance sheet account, that represents the value of all assets that are reasonably expected to be converted into cash within one year in the normal course of business. Current assets include cash, accounts receivable, inventory, marketable securities, prepaid expenses and other liquid assets that can be readily converted to cash.

[10] A company's debts or obligations that are due within one year. Current liabilities appear on the company's balance sheet and include short term debt, accounts payable, accrued liabilities and other debts.

PQ4 – PAST WORK EXPERIENCE FORM

Our Ref No:	**BMZ 2012 67301**		Project Title:	**Drought Resilience Programme in Northern Kenya (DRPNK)**				
Name of legal entity	Project Country	Overall project value (KES)	Provided staff input (person months)	Name of client/Address/contact	Origin of funding	Start Date	End Date	Status (complete, Underway or Committed)

PQ5 – SWORN STATEMENT

Having studied the tender document for the above Project we/I hereby state:

a. The information furnished in our application is accurate to the best of our knowledge.

b. That in case of being pre-qualified we acknowledge that this grants us the right to participate in due time in the submission of a tender or quotation on the basis of provisions in the tender or quotation documents to follow.

c. When the call for Tenders/Quotations is issued the legal technical or financial conditions or the contractual capacity of the firm changes we come ourselves to inform you and acknowledge your right to review the pre-qualification made.

d. We enclose all the required documents and information required for the prequalification evaluation.

e. The firm has not been debarred from participating in any public procurement by PPRA.

f. No person related to the firm has any spouse or children working at the County Government of Turkana.

g. The firm has not been engaged in any unethical, corrupt, collusive or fraudulent activities in public procurement matters.

h. The firm has not been declared bankrupt/insolvent/under receivership.

Date……

Applicant's Name……..

Address……

Mobile No……

Represented by……

Signature……

(Full name and designation of the person signing and stamp or seal).

PQ6 – CONFIDENTIAL BUSINESS QUESTIONNAIRE

You are requested to give the particulars indicated in Part 1 and either Part 2 (a), 2 (b) or 2 (c) whichever applies in your type of business.
You are advised that it is a serious offence to give false information on this Form

PART 1 GENERAL

Business Name……
Location of Business premises…….
Plot No……Street/Road……..
Postal Address……Tel No……Mobile No……
Nature of business……
Current Trade License No……..Expiring date……..
Maximum value of business which you can handle at any one time Ksh.....
Name of your bankers……Branch……..
Functioning e-mail address(es)……..

PART 2 (a) – Sole Proprietor

Your name in full……Age……
Nationality…….Country of origin…….
Citizenship details……...

PART 2 (b) – Partnership

Name .....
Nationality .....
Citizenship Details .....
Shares .....

1. ……
2. ……
3. ……
4. ……

PART 2 (c) - Registered Company

Private or Public (Select one where applicable)

State the nominal and issue capital of the company
Nominal Kshs…….....
Issued Kshs.……
Give details of all directors as follows:

(If Kenyan Citizen indicate under Citizenship Details whether by Birth, naturalization or Registration**)**

S/No.	Name	Nationality	Citizenship Details	Shares

Date…….……..

Signature & Stamp of Tenderer……

PQ7 – LITIGATION HISTORY

Consultants should provide information on any history litigation or arbitration resulting from contracts executed in the last five years or currently under execution.

Year	Award for or against	Name of client cause of Litigation and matter in dispute	Disputed Amount (current value, Kshs. Equivalent

PQ8 – CONTRACTOR'S EQUIPMENT AND MACHINERY (Attach Evidence of ownership, lease or hire)

S/No.	Item of equipment	Description, make, and age (years)			Condition (new, good, poor) and number available		Owned, leased (from whom?), or to be purchased (from whom?)	
		Description	Make	Age (years)	Condition	Number available	Owned, leased or to be purchased	From whom?

FORM TECH-5: WORK SCHEDULE AND PLANNING FOR DELIVERABLES

N°	Deliverables [1] (D-..)	Weeks											
		1	2	3	4	5	6	7	8	9	.....	n	TOTAL
D-1	{e.g., Deliverable #1: Report A												
	1) data collection												
	2) drafting												
	3) inception report												
	4) incorporating comments												
	5)												
	6) delivery of final report to Procuring Entity}												
D-2	{e.g., Deliverable #2:.....}												
N													

1 List the deliverables with the breakdown for activities required to produce them and other benchmarks such as the Procuring Entity's approvals. For phased assignments, indicate the activities, delivery of reports, and benchmarks separately for each phase.

2 Duration of activities shall be indicated in a form of a bar chart.

3. Include a legend, if necessary, to help read the chart.

FORM TECH- 6A: TEAM COMPOSITION, ASSIGNMENT, AND KEY EXPERTS' INPUTS

N°	Name	Expert's input (in person/month) per each Deliverable (listed in TECH-5)							Total time-input (in Months)		
		Position		D-1	D-2	D-3	.....	D-...	Home	Field	Total
KEY EXPERTS											
K-1	{e.g., Mr. Abbbb}	[Team Leader]	[*Home]*	[2 month]	[1.0]	[1.0]					
			[*Field*]	[0.5 m]	[2.5]	[0]					
K-2											
K-3											
N											
								Subtotal			
NON-KEY											
N-1			[*Home*]								
			[*Field*]								
N-2											
N											
								Subtotal			
								Total			

1.For Key Experts, the input should be indicated individually for the same positions as required under the ITC Data Sheet 21.2

2.Months are counted from the start of the assignment/mobilization. One (1) month equals twenty-two (22) working (billable) days. One working (billable) day shall be not less than eight (8) working (billable) hours.

3“Home” means work in the office in the expert’s country of residence. “Field” work means work carried out in Kenya, or outside the normal residence of the Expert in Kenya or any other country outside the expert’s country of residence.

 Full time input  Part time input

FORM TECH-6B: CURRICULUM VITAE (CV)

Position Title and No.	*{e.g., K-1, Team Leader}*
Name of Expert:	*{Insert full name}*
Date of Birth:	*{day/month/year}*
Country of Citizenship	

Education: *{List college/university or other specialized education, giving names of educational institutions, dates attended, degree(s)/diploma(s) obtained}*

Employment record relevant to the assignment: *{Starting with present position, list in reverse order. Please provide dates, name of employing organization, titles of positions held, types of activities performed and location of the assignment, and contact information of previous Procuring Entity's and employing organization(s) who can be contacted for references. Past employment that is not relevant to the assignment does not need to be included.}*

Period	**Employing organization and your title/position. Contact Information for references**	**Country**	**Summary of activities performed relevant to the Assignment**
[e.g., May 2011-present]	[e.g., Ministry of ……, advisor/consultant to… For references: Tel……./e-mail……; Mr. Bbbbbb, deputy manager]		

Membership in Professional Associations and Publications:

Language Skills (indicate only languages in which you can work):

Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant's Team of Experts:	**Reference to Prior Work/Assignments that Best Illustrates Capability to Handle the Assigned Tasks**
{List all deliverables/tasks as in TECH- 5 in which the Expert will be involved)	

Expert's contact information :(e-mail…….....……

phone…….....……) Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and I am available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Procuring Entity, and/or sanctions by the PPRA.

Name of Expert_____Signature_____Date _____

{day / month/year}

Name of authorized _____

Signature._____Date_____

Representative of the Consultant (the same who signs the Proposal

FORM TECH-7: MANDATORY SUPPORT DOCUMENTS

[The Contractor shall use this form to submit all the required support documentary evidence as required in the bid, especially the mandatory and eligibility criteria specified in the Data Sheet ITC 22.1]

a) Valid Single Business Permit

{Insert here a copy of Valid single business permit}

b) Letter to Bid

{Insert here a copy of Letter to Bid}

c) Certified CR12

{Insert here a copy of Certified CR12}

d) Certificate of Incorporation/Certificate of Registration

{Insert here a copy of certificate of incorporation or registration}

e) Tax Compliance Certificate

{Bidder to insert a copy of the tax compliance certificate from Kenya Revenue Authority}

f) KRA PIN Certificate

{Bidder to insert a copy of the tax compliance certificate from Kenya Revenue Authority}

g) Similar Consulting Assignments Experience

{Contractor or bidder to insert here copies of the form of contract, purchase order, service order, and performance certificate or similar evidence of similar assignments carried out by the firm

h) Academic Certificates

{Bidder to insert copies of the required relevant academic certificates relevant to the assignment for all the key experts}

i) Professional Certificates

{Bidder or firm to insert copies of professional certificates, practicing license and relevant short-term trainings to demonstrate professional qualifications for all the key experts}

j) Professional Membership of Key Experts

{Bidder to insert copies of professional membership certificate for its key experts}

k) NCA

{Bidder to insert copies of NCA certificate for its firm}

l) ESHS Specification

{Bidder to insert copies of duly signed ESHS Management form as per Annex 3}

FORM SD1

SELF DECLARATION THAT THE PERSON/TENDERER IS NOT DEBARRED IN THE MATTER OF THE PUBLIC PROCUREMENT AND ASSET DISPOSAL ACT 2015.

I, ……., of Post Office Box ……..……. being a resident of ……... in the Republic of ……. do hereby make a statement as follows: -

1. THAT I am the Company Secretary/Chief Executive/Managing Director/Principal Officer/Director of ……...…….. (Insert name of the Company) who is a Bidder in respect of **Tender No.**
   …… for……. (Insert tender title/description) for……. *(Insert name of the Procuring entity)* and duly authorized and competent to make this statement.

2. THAT the aforesaid Bidder, its Directors and subcontractors have not been debarred from participating in procurement proceeding under Part IV of the Act.

3. THAT what is deponed to here in above is true to the best of my knowledge, information and belief.

……. …….
…… (Title)
(Signature) (Date)

Bidder Official Stamp

FORM SD2

SELF DECLARATION THAT THE PERSON/TENDERER WILL NOT ENGAGE IN ANY CORRUPT OR FRAUDULENT PRACTICE.

I, ... of P. O. Box.....being a resident of ……... in the Republic of ……. do hereby make a statement as follows: -

1. THAT I am the Chief Executive/Managing Director/Principal Officer/Director of……... …… *(insert name of the Company)* who is a Bidder in respect of **Tender No.** ……..... for ……. *(insert tender title/description)* for ……..... *(insert name of the Procuring entity)* and duly authorized and competent to make this statement.

2. THAT the aforesaid Bidder, its servants and/or agents /subcontractors will not engage in any corrupt or fraudulent practice and has not been requested to pay any inducement to any member of the Board, Management, Staff and/or employees and/ or agents of……. *(insert name of the Procuring entity)* which is the procuring entity.

3. THAT the aforesaid Bidder, its servants and/or agents /subcontractors have not offered any inducement to any member of the Board, Management, Staff and/or employees and/or agents of……. *(name of the procuring entity).*

4. THAT the aforesaid Bidder will not engage /has not engaged in any corrosive practice with other bidders participating in the subject tender.

5. THAT what is deponed to herein above is true to the best of my knowledge information and belief.

……. …….
…… (Title)
(Signature) (Date)

Bidder Official Stamp

DECLARATION AND COMMITMENT TO THE CODE OF ETHICS

I …….....…… (person) on behalf of ***(Name of the Business/ Company/Firm***) ……. declare that I have read and fully understood the contents of the Public Procurement & Asset Disposal Act,2015, Regulations and the Code of Ethics for persons participating in Public Procurement and Asset Disposal Activities in Kenya and my responsibilities under the Code.

I do here by commit to abide by the provisions of the Code of Ethics for persons participating in Public Procurement and Asset Disposal.

Name of Authorized signatory.....

Sign…….....

Position…….....

Office address…….

Telephone……....…….

Email…….....

.....

Name of the Firm/Company…….....

Date…….....

(Company Seal/ Rubber Stamp where applicable)

Witness

Name …….....

Sign…….....

Date……

FORM TECH-9: TENDER-SECURING DECLARATION FORM {r 46 and 155(2)}

[The Bidder shall complete this Form in accordance with the instructions indicated]

Date:.....*[insert date (as day, month and year)* of Tender Submission]

Tender No.:.....*[insert number of tendering process]*

To:.....[insert complete name of Purchaser]

I/We, the undersigned, declare that:

1. I / We understand that, according to your conditions, bids must be supported by a Tender-Securing Declaration.

2. I /We accept that I/we will automatically be suspended from being eligible for tendering in any contract with the Purchaser or the period of time of[insert number of months or years] starting on[insert date],if we are in breach of our obligation (s)under the bid conditions, because we–(a) have withdrawn our tender during the period of tender validity specified by us in the Tendering Data Sheet; or (b) having been notified of the acceptance of our Bid by the Purchaser during the period of bid validity,(i) fail or refuse to execute the Contract, if required, or (ii) fail or refuse to furnish the Performance Security, in accordance with the instructions to tenders.

3. I / We understand that this Tender Securing Declaration shall expire if we are not the successful Tenderer (s), upon the earlier of:

   a) Our receipt of a copy of your notification of the name of the successful Tenderer; or

   b) Thirty days after the expiration of our Tender.

4. I/We understand that if I am /we are/in a Joint Venture, the Tender Securing Declaration must be in the name of the Joint Venture that submits the bid, and the Joint Venture has not been legally constituted at the time of bidding, the Tender Securing Declaration shall be in the names of all future partners as named in the letter of intent.

Signed:

……..…….

Capacity / title (director or partner or sole proprietor, etc.)

…….……. Name:

……

.Duly authorized to sign the bid for and on behalf of: .....*[insert complete name of Tenderer]* Dated on ……. day of ……..……. *[Insert date of signing]*

Seal or stamp

FORM TECH-10: DECLARATION OF UNDERTAKING (KfW)

Reference name of the Application/Offer/Contract: ("**Contract**")[11]

To: TURKANA COUNTY GOVERNMENT ("**Project Executing Agency**")

1. We recognise and accept that KfW only finances projects of the Project Executing Agency ("PEA")[12] subject to its own conditions which are set out in the Funding Agreement it has entered into with the PEA. As a matter of consequence, no legal relationship exists between KfW and our company, our Joint Venture or our Subcontractors under the Contract. The PEA retains exclusive responsibility for the preparation and implementation of the Tender Process and the performance of the Contract.

2. We hereby certify that neither we nor any of our board members or legal representatives nor any other member of our Joint Venture including Subcontractors under the Contract are in any of the following situations:

   2.1) being bankrupt, wound up or ceasing our activities, having our activities administered by courts, having entered into receivership, reorganisation or being in any analogous situation;

   2.2) convicted by a final judgement or a final administrative decision or subject to financial sanctions by the United Nations, the European Union or Germany for involvement in a criminal organisation, money laundering, terrorist-related offences, child labour or trafficking in human beings; this criterion of exclusion is also applicable to legal Persons, whose majority of shares are held or factually controlled by natural or legal Persons which themselves are subject to such convictions or sanctions;

   2.3) having been convicted by a final court decision or a final administrative decision by a court, the European Union, national authorities in the Partner Country or in Germany for Sanctionable Practice in connection with a Tender Process or the performance of a Contract or for an irregularity affecting the EU's financial interests *(in the event of such a conviction, the Applicant or Bidder shall attach to this Declaration of Undertaking supporting information showing that this conviction is not relevant in the context of this Contract and that adequate compliance measures have been taken in reaction)*;

   2.4) having been subject, within the past five years to a Contract termination fully settled against us for significant or persistent failure to comply with our contractual obligations during such Contract performance, unless this termination was challenged and dispute resolution is still pending or has not confirmed a full settlement against us;

   2.5) not having fulfilled the applicable fiscal obligations with regard to the payment of taxes at the respective tax residence and in the country of origin of the PEA (*contractors based in Annex 1 countries (https://www.consilium.europa.eu/de/policies/eu-list-of-non-cooperative-jurisdictions/) must submit a fully completed and legally countersigned declaration of tax conformity (Appendix1 to the Declaration of Undertaking) in addition to the Declaration of Undertaking at the time of award of the contract/contract review. This shall become an integral part of the contract. Failure to submit may result in exclusion from the awarding procedure. For contractors based in countries not listed as Annex I countries, only the Declaration of Undertaking must be submitted, and not the declaration of tax conformity)*;

   2.6) being subject to an exclusion decision of the World Bank or any other multilateral development bank and being listed on the website http://www.worldbank.org/debarr or

[11] Capitalised terms used, but not otherwise defined in this Declaration of Undertaking have the meaning given to such term in KfW's "*Guidelines for the Procurement of Consulting Services, Works, Plant, Goods and Non-Consulting Services in Financial Cooperation with Partner Countries"*.

[12] The PEA means the purchaser, the Employer, the client, as the case may be, for the procurement of Consulting Services, Works, Plant, Goods or Non-Consulting Services.

respectively on the relevant list of any other multilateral development bank *(in the event of such exclusion, the Applicant or Bidder shall attach to this Declaration of Undertaking supporting information showing that this exclusion is not relevant in the context of this Contract and that adequate compliance measures have been taken in reaction)*; or

2.7) being guilty of misrepresentation in supplying the information required as a condition of participation in the Tender.

3. We hereby certify that neither we, nor any of the members of our Joint Venture or any of our Subcontractors under the Contract are in any of the following situations of conflict of interest:

   3.1) being an Affiliate controlled by the PEA or a shareholder controlling the PEA, unless the stemming conflict of interest has been brought to the attention of KfW and resolved to its satisfaction;

   3.2) having a business or family relationship with a PEA's staff involved in the Tender Process or the supervision of the resulting Contract, unless the stemming conflict of interest has been brought to the attention of KfW and resolved to its satisfaction;

   3.3) being controlled by or controlling another Applicant or Bidder, or being under common control with another Applicant or Bidder, or receiving from or granting subsidies directly or indirectly to another Applicant or Bidder, having the same legal representative as another Applicant or Bidder, maintaining direct or indirect contacts with another Applicant or Bidder which allows us to have or give access to information contained in the respective Applications or Offers, influencing them or influencing decisions of the PEA;

   3.4) being engaged in a Consulting Services activity, which, by its nature, may be in conflict with the assignments that we would carry out for the PEA;

   3.5) in the case of procurement of Works, Plant or Goods:

      i. having prepared or having been associated with a Person who prepared specifications, drawings, calculations and other documentation to be used in the Tender Process of this Contract;

      ii. having been recruited (or being proposed to be recruited) ourselves or any of our Affiliates, to carry out works supervision or inspection for this Contract;

4. If we are a state-owned entity, and compete in a Tender Process, we certify that we have legal and financial autonomy and that we operate under commercial laws and regulations.

5. We undertake to bring to the attention of the PEA, which will inform KfW, any change in situation with regard to points 2 to 4 here above.

6. In the context of the Tender Process and performance of the corresponding Contract:

   6.1) neither we nor any of the members of our Joint Venture nor any of our Subcontractors under the Contract have engaged or will engage in any Sanctionable Practice during the Tender Process and in the case of being awarded a Contract will engage in any Sanctionable Practice during the performance of the Contract;

   6.2) neither we nor any of the members of our Joint Venture or any of our Subcontractors under the Contract shall acquire or supply any equipment nor operate in any sectors under an embargo of the United Nations, the European Union or Germany; and

   6.3) we commit ourselves to complying with and ensuring that our Subcontractors and major suppliers under the Contract comply with international environmental and labour standards, consistent with laws and regulations applicable in the country of implementation of the Contract and the fundamental conventions of the International Labour Organisation[13] (ILO) and

[13] In case ILO conventions have not been fully ratified or implemented in the Employer's country the Applicant/Bidder/Contractor shall, to the satisfaction of the Employer and KfW, propose and implement appropriate

international environmental treaties. Moreover, we shall implement environmental and social risks mitigation measures when specified in the relevant environmental and social management plans or other similar documents provided by the PEA and, in any case, implement measures to prevent sexual exploitation and abuse and gender based violence.

7. In the case of being awarded a Contract, we, as well as all members of our Joint Venture partners and Subcontractors under the Contract will, (i) upon request, provide information relating to the Tender Process and the performance of the Contract and (ii) permit the PEA and KfW or an agent appointed by either of them, and in the case of financing by the European Union also to European institutions having competence under European Union law, to inspect the respective accounts, records and documents, to permit on the spot checks and to ensure access to sites and the respective project.

8. In the case of being awarded a Contract, we, as well as all our Joint Venture partners and Subcontractors under the Contract undertake to preserve above mentioned records and documents in accordance with Applicable Law, but in any case, for at least six years from the date of fulfillment or termination of the Contract. Our financial transactions and financial statements shall be subject to auditing procedures in accordance with Applicable Law. Furthermore, we accept that our data (including personal data) generated in connection with the preparation and implementation of the Tender Process and the performance of the Contract are stored and processed according to the Applicable Law by the PEA and KfW.

Name: _____ In the capacity of: _____

Duly empowered to sign in the name and on behalf of[14]: _____

Signature: Dated:

measures in the spirit of the said ILO conventions with respect to a) workers grievances on working conditions and terms of employment, b) child labour, c) forced labour, d) worker's organisations and e) non-discrimination.

[14] In the case of a JV, insert the name of the JV. The person who will sign the application, Bid or Proposal on behalf of the Applicant/Bidder shall attach a power of attorney from the Applicant/Bidder.

FORM TECH-11: PERFORMANCE BOND FORM

Address of guarantor bank:

……

…….

Address of beneficiary (contracting agency):

…….

……..

On ..... you concluded with ..... *("Contractor")*

a contract for ..... *(project, object of contract)* at a price

of .....

In accordance with the provisions of the contract the Contractor is obligated to provide a performance bond for … % of the contract price.

We, the undersigned …….. (Guarantor), waiving all objections and defences under the aforementioned contract, hereby irrevocably and independently guarantee to pay on your first written demand an amount up to a total of

..... (in words:

.....) against your written declaration that the Contractor has failed to duly perform the aforementioned contract.

In the event of any claim under this guarantee, payment shall be effected to The Turkana County Government, for account of ..... *(project-executing agency/purchaser)*.

This guarantee shall expire no later than …….

By this date we must have received any claims for payment by letter or encoded telecommunication.

It is understood that you will return this guarantee to us on expiry or after payment of the total amount to be claimed hereunder.

This guarantee is governed by the laws of Kenya

....

Place, date Guarantor (Seal and signature)

Form of Tender

[date]

To:

……

We offer to execute the …… Tender No. **……** in accordance with the Conditions of Contract accompanying this Tender for the Contract Price of *[amount in numbers], [amount in words] [name of currency]*.

The Contract shall be paid in Kenya Shillings.

We accept the appointment of [*name proposed in Tender Data Sheet] as the* adjudicator.

or

We do not accept the appointment of [*name proposed in* Tender Data Sheet*]* as the Adjudicator, and propose instead that [*name*] be appointed as Adjudicator, whose daily fees and biographical data are attached.

We are not participating, as Tenders, in more than one Tender in this Tendering process other than alternative Tenders in accordance with the Tendering documents.

Our firm, its affiliates or subsidiaries, including any subcontractors or suppliers for any part of the contract has not been declared ineligible by the Kenya Government under Kenya's laws or any other official regulations.

This Tender and your written acceptance of it shall constitute a binding Contract between us.

We understand that you are not bound to accept the lowest or any Tender you receive.

We hereby confirm that this Tender complies with the Tender validity and Tender Security required by the Tendering documents and specified in the Tender Data Sheet.

Authorized Signature:_____

Name and Title of Signatory: _____

Name of Tenderer: _____

Address: _____

Tender-Securing Declaration (Mandatory)

Date: *[insert **date** (as day, month and year)]*

Tender No.: **……**

Alternative No.: *[insert **identification No if this is a Tender for an alternative**]*

To: **……..**

We, the undersigned, declare that:

We understand that, according to your conditions, Tenders must be supported by a Tender-Securing Declaration.

We accept that we will automatically be suspended from being eligible for Tendering in any contract with the Procuring Entity for the period of time of ***5 Years*** starting July 2025 if we are in breach of our obligation(s) under the Tender conditions, because we;

a) Have withdrawn our Tender during the period of Tender validity specified in the Form of Tender; or

b) Having been notified of the acceptance of our Tender by the Procuring Entity during the period of Tender validity,

   (i). Fail or refuse to execute the Contract, if required, or

   (ii). Fail or refuse to furnish the Performance Security, in accordance with the ITT.

We understand this Tender Securing Declaration shall expire if we are not the successful Tenderer, upon the earlier of;

1) Our receipt of your notification to us of the name of the successful Tenderer; or

2) Thirty days after the expiration of our Tender.

Signed: *[insert signature of person whose name and capacity are shown]* In the capacity of *[insert legal capacity of person signing the Tender Securing Declaration]*

Name: *[**insert complete name of person signing the Tender Securing Declaration**]*

Duly authorized to sign the Tender for and on behalf of: *[**insert complete name of Tenderer**]*

Dated on _____ day of _____, _____ *[**insert date of signing**]*

Corporate Seal (where appropriate)

UNDERTAKING BY TENDERER ON ANTI – BRIBERY POLICY / CODE OF CONDUCT AND COMPLIANCE PROGRAMME

1. Each Tenderer must submit a statement, as part of the Tender documents, in either of the two given formats which must be signed personally by the Chief Executive Officer or other appropriate senior corporate officer of the Tendering company and, where relevant, of its subsidiary in the Kenya.
2. Tenderers will also be required to submit similar No-bribery commitments from their subcontractors and consortium partners; the Tenderer may cover the subcontractors and consortium partners in its own statement, provided the Tenderer assumes full responsibility.
3.
    a) Payment to agents and other third parties shall be limited to appropriate compensation for legitimate services.
    b) Each Tenderer will make full disclosure in the Tender documentation of the beneficiaries and amounts of all payments made, or intended to be made, to agents or other third parties (including political parties or electoral candidates) relating to the Tender and, if successful, the implementation of the contract.
    c) The successful Tenderer will also make full disclosure [quarterly or semi-annually] of all payments to agents and other third parties during the execution of the contract.
    d) Within six months of the completion of the performance of the contract, the successful Tenderer will formally certify that no bribes or other illicit commissions have been paid. The final accounting shall include brief details of the goods and services provided that they are sufficient to establish the legitimacy of the payments made.
    e) Statements required according to subparagraphs (b) and (d) of this paragraph will have to be certified by the company's Chief Executive Officer, or other appropriate senior corporate officer.
4. Tenders which do not conform to these requirements shall not be considered.
5. If the successful Tenderer fails to comply with its No-bribery commitment, significant sanctions will apply. The sanctions may include all or any of the following:
    a) Cancellation of the contract;
    b) Liability for damages to the public authority and/or the unsuccessful competitors in the Tendering possibly in the form of a lump sum representing a pre-set percentage of the contract value (liquidated).
6. Tenderers shall make available, as part of their Tender, copies of their anti-Bribery Policy/Code of Conduct, if any, and of their-general or project - specific - Compliance Program.

ANTI-CORRUPTION DECLARATION COMMITMENT / PLEDGE

(Sections39, 40,41,42,43 & of the PPDA Act, 2005)

I/We/Messrs…….

of Street, Building, P O Box……

……..

Contact/Phone/E mail……..

declare that Public Procurement is based on a free and fair competitive Tendering process which should not be open to abuse.

I/We ..……..

declare that I/We will not offer or facilitate, directly or indirectly, any inducement or reward to any public officer, their relations or business associates, in connection with

Tender/Tender No ……..…….

for or in the subsequent performance of the contract if I/We am/are successful.

Authorized Signature.....

Name and Title of Signatory……

Letter of Acceptance

[Letter head paper of the Procuring Entity]

[*date*]

To: *[name and address of the Contractor]*

This is to notify you that your Tender dated [*date*] for execution of the [*name of the Contract and identification number, as given in the Contract Data Sheet*] for the Contract Price of the equivalent of [*amount in numbers and works*] [*name of currency*], as corrected and modified in accordance with the Instructions to Tenderers is hereby accepted by us.

We confirm that [*insert name proposed by the procuring entity]* to be the Adjudicator.

We accept that [*name proposed by Tenderer*] be appointed as Adjudicator.

Or

We do not accept that [*name proposed by Tenderer*] be appointed as adjudicator, and by sending a copy of this letter of acceptance to [*insert the name of the Appointing Authority*], we are hereby requesting [*name*], the Appointing Authority, to appoint the adjudicator in accordance with Clause 44.1 of the Instructions to Tenderers.

You are hereby instructed to proceed with the execution of the said works in accordance with the Contract documents.

Please return the contract dully signed.

Authorized Signature: _____

Name and Title of Signatory: _____

Name of Agency: _____

Attachment: Form of Contract

This Agreement, made the [*day*] day of [*month*], [*year*] between [*name and address of Procuring Entity*] (hereinafter called "the Procuring Entity") and [*name and address of Contractor*] (hereinafter called "the Contractor") of the other part.

Whereas the Procuring Entity is desirous that the Contractor execute [*name and identification number of contract*] (hereinafter called "the Works") with the objectives of *[insert functional objectives of the works]* and the Procuring Entity has accepted the Tender by the Contractor for the execution and completion of such works and the remedying of any defects therein in the sum of *[contract price in words and figures]* (hereinafter called "Contract Price").

NOW THIS AGREEMENT WITNESSES AS FOLLOWS:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement;
2. In consideration of the payments to be made by the Procuring Entity to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Procuring Entity to execute and complete the Works and remedy any defects therein in conformity in all respects with the provisions of the Contract;
3. The Procuring Entity hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

In Witness whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

The Common Seal of _____

Was hereunto affixed in the presence of:_____

Signed, Sealed, and Delivered by the said _____

In the presence of: _____

Tendering Signature of Procuring Entity_____

Binding Signature of Contractor _____

Notification of Award

Letter of Acceptance

[Letterhead paper of the Employer]

[Date]

To: *[name and address of the Contractor]*

This is to notify you that your Bid dated *[date]* for execution of the *[name of the Contract and identification number, as given in the Contract Data]* for the Contract Price *[amount in numbers and words] [name of currency]*, as corrected and modified in accordance with the Instructions to Bidders, is hereby accepted by our institution.

You are requested to furnish the Performance Security within 28 days in accordance with the Conditions of Contract, using for that purpose the Performance Security Form included in Section X, Contract Forms, of the Bidding Documents.

Authorized Signature: _____

Name and Title of Signatory: _____

Name of institution: _____

Attachment: Contract Agreement

Contract Agreement

THIS AGREEMENT made the _____ day of _____, _____, between _____of _____ (hereinafter "the Employer"), of the one part, and _____ of _____ (hereinafter "the Contractor"), of the other part:

WHEREAS the Employer desires that the Works known as _____ should be executed by the Contractor, and has accepted a Bid by the Contractor for the execution and completion of these Works and the remedying of any defects therein, in the sum of [*insert Contract Price or Ceiling in words and figures, expressed in the Contract currency(ies)*] (hereafter called "the Contract Price").

The Employer and the Contractor agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Contract documents referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.

(i) The Letter of Acceptance;

(ii) The Letter of Bid and Appendix to Bid (including the signed Declaration of Undertaking);

(iii) The addenda Nos _____(if any);

(iv) The Particular Conditions (if any);

(v) The General Conditions;

(vi) The Specifications;

(vii) The Drawings;

(viii) The completed Schedules; and

(ix) The Contractor's Bid and any other documents forming part of the contract.

3. In consideration of the payments to be made by the Employer to the Contractor as specified in this Agreement, the Contractor hereby covenants with the Employer to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of _____ on the day, month and year specified above.

Signed by _____ (for the Employer)

Signed by _____ (for the Contractor)

Bid Security

Beneficiary: *[Insert name and Address of Purchaser]*

Date: *[Insert date of issue]*

BID GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[Insert name and address of the bidder, which in the case of a joint venture shall be the name and address of the joint venture]* (hereinafter called "the Applicant") has submitted or will submit to the Beneficiary its bid (hereinafter called "the Bid") for the execution of *[Insert project, object of the contract/brief description of the works]* under Invitation for Bids No. *[Insert National Competitive Bidding number]* ("the NCB").

We, as Guarantor, hereby irrevocably and independently undertake to pay the Beneficiary, waiving all objections and defences, any sum or sums not exceeding in total an amount of *[Insert guarantee amount and currency in words and figures]* upon receipt by us of the Beneficiary's first demand, supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either the Applicant:

(a) Has withdrawn its Bid during the period of bid validity set forth in the Applicant's Bid Submission Form (the Bid Validity Period"); or

(b) Having been notified of the acceptance of its Bid by the Beneficiary during the Bid Validity Period, (i) has failed to sign the contract agreement, or (ii) has failed to furnish the performance security, in accordance with the Instructions to Bidders ("ITB") of the Beneficiary's bidding document.

This guarantee shall expire not later than *[Insert expiry date]*[15].

By this date we must have received any claims for payment by letter or encoded telecommunication.

It is understood that you will return this guarantee to us on expiry or after payment of the total amount to be claimed hereunder.

[As preferred option regarding guarantee rules insert[16]*:* This guarantee is subject to the Uniform Rule for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758.*]*

Place, date

Guarantor's authorized signature(s)

[15]Pursuant to ITB Clause 19.3 the guarantee must be valid for at least 42 days beyond the bid validity.

[16]In the case the issuing bank will not add the preferred option, the following must be added instead: This guarantee is governed by the laws of *[Insert country of jurisdiction]*. Note: the country of jurisdiction shall be the country where the bank's branch issuing the guarantee is physically located.

Performance Security

Beneficiary: *[Insert name and Address of Purchaser]*

Date: *[Insert date of issue]*

PERFORMANCE GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[Insert name and address of contractor, which in the case of a joint venture shall be the name and address of the joint venture]* (hereinafter called "the Applicant") has entered into Contract No. *[Insert reference number of the contract]* dated *[Insert contract date]* with the Beneficiary, for the execution of *[Insert object of the contract and brief description of Works]* (hereinafter called "the Contract"). Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required for *[Insert percentage in words and figures]* % of the contract price.

Waiving all objections and defences, we, as Guarantor, hereby irrevocably and independently undertake to pay the Beneficiary, any sum or sums not exceeding in total an amount of *[Insert guarantee amount and currency in words and figures]*[17] upon receipt by us of the Beneficiary's first demand, supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without the Beneficiary needing to prove or to show grounds for the demand or the sum specified therein.

[For guarantees issued in foreign currency insert the following:

In the event of any claim under this guarantee, payment shall be effected to KfW, Frankfurt am Main (BIC: KFWIDEFF, BLZ 500 204 00), account no. 38 000 000 00 (IBAN: DE53 5002 0400 3800 0000 00), for the account of *[Insert name of the Purchaser and the Purchaser's country]*.

[For guarantees issued in local currency insert the following:

In the event of any claim under this guarantee, payment shall be effected to *[Insert the account on which payments are to be made]*, for the account of *[Insert name of the Purchaser and the Purchaser's country]*.

This guarantee shall expire not later than *[Insert expiry date]*[18].

By this date we must have received any claims for payment by letter or encoded telecommunication.

It is understood that you will return this guarantee to us on expiry or after payment of the total amount to be claimed hereunder.

[As preferred option regarding guarantee rules insert[19]*:* This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.*]*

[17] This guarantee shall be issued in the contract currency only.

[18] The guarantee shall be valid for at least 28 days from the date of contractual contract completion (including warranty obligations).

[19] In the case the issuing bank will not add the preferred option, the following must be added instead: This guarantee is governed by the laws of *[Insert country of jurisdiction]*. Note: the country of jurisdiction shall be the country where the bank's branch issuing the guarantee is physically located.

Place, date

Guarantor's authorized signature(s)

Retention Money Security

Beneficiary: *[Insert name and Address of Purchaser]*

Date: *[Insert date of issue]*

RETENTION MONEY GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

We have been informed that *[Insert name and address of contractor, which in the case of a joint venture shall be the name and address of the joint venture]* (hereinafter called "the Applicant") has entered into Contract No. *[Insert reference number of the contract]* dated *[Insert contract date]* with the Beneficiary, for the execution of *[Insert object of the contract and brief description of Works]* (hereinafter called "the Contract").

Furthermore we understand that, according to the conditions of the Contract, the Beneficiary retains moneys up to the limit set forth in the Contract ("the Retention Money"), and that when the Taking-Over Certificate has been issued under the Contract and the first half of the Retention Money has been certified for payment, payment of *[insert the second half of the Retention Money or if the amount guaranteed under the Performance Guarantee when the Taking-Over Certificate is issued is less than half of the Retention Money, the difference between half of the Retention Money and the amount guaranteed under the Performance Security]* is to be made against a Retention Money guarantee.

Waiving all objections and defences, we, as Guarantor, hereby irrevocably and independently undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert guarantee amount and currency in words and figures]*[20] upon receipt by us of the Beneficiary's first demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without the Beneficiary needing to prove or show grounds for the demand or the sum specified therein.

The retention money guarantee shall come into force and effect as soon as the second half of the Retention Money has been credited to the Applicant on its account. Minor deductions of the above mentioned amount notably due to bank fees shall have no effect on the entry into force.

[For guarantees issued in foreign currency insert the following:

In the event of any claim under this guarantee, payment shall be effected to KfW, Frankfurt am Main (BIC: KFWIDEFF, BLZ 500 204 00), account no. 38 000 000 00 (IBAN: DE53 5002 0400 3800 0000 00), for the account of *[Insert name of the Purchaser and the Purchaser's country]*.

[For guarantees issued in local currency insert the following:

[20]The Guarantor shall insert an amount representing the amount of the second half of the Retention money or if the amount guaranteed under Performance Guarantee when the Taking-Over Certificate is issued, is less than half of the Retention Money, the difference between half of the Retention Money and the amount guaranteed under the Performance Security and denominated in the contract currency(ies) only.

In the event of any claim under this guarantee, payment shall be effected to *[Insert the account on which payments are to be made]*, for the account of *[Insert name of the Purchaser and the Purchaser's country]*.

This guarantee shall expire not later than *[Insert expiry date]*[21].

By this date we must have received any claims for payment by letter or encoded telecommunication.

It is understood that you will return this guarantee to us on expiry or after payment of the total amount to be claimed hereunder.

[As preferred option regarding guarantee rules insert[22]*:* This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.*]*

Place, date	Guarantor's authorized signature(s)

[21]Insert the same expiry date as set forth in the performance security, representing the date twenty-eight days after the completion date described in the Appendix to Bid. The Employer should note that in the event of an extension of this date for completion of the Contract, the Employer would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Employer might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to an one-time extension of this guarantee for a period not to exceed [six months] [one year], in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

[22]In the case the issuing bank will not add the preferred option, the following must be added instead: This guarantee is governed by the laws of *[Insert country of jurisdiction]*. Note: the country of jurisdiction shall be the country where the bank's branch issuing the guarantee is physically located.

ANNEXES

Annex 1: Sample Excavation Permit

To: ……... (Project Manager)

From: …….. (Contractor) Date: …….

Contract No:

Request for Excavation Permit No: ……

Please give approval for excavation to proceed in the following area:

Work to start on:

Existing services have been checked and identified by:

Drawings # Physical Survey #

Catscan # Trial Holes Excavation #

Signed (Contractor): ……

Approval by Project Manager

The above excavation may proceed, subject to the following:

Service to be maintained:

Services to be isolated before work proceeds:

Other matters:

Signed (Project Manager): …….

Date: ……

Annex 2: Sample Contractor's Site Check List[23] [24] [25]

Safe Access:

- arrangements for visitors and new workers to the site
- safe access to working locations
- walkways free from obstructions
- edge protection to walkways over 2m above ground
- holes fenced or protected with fixed covers
- tidy site and safe storage of materials
- waste collection and disposal
- chutes for waste disposal, where applicable
- removal or hammering down of nails in timber
- safe lighting for dark or poor light conditions
- props or shores in place to secure structures, where applicable

Ladders:

- to be used only if appropriate
- good condition and properly positioned
- located on firm, level ground
- secure near top. If not possible, to be secured near bottom, weighted or footed to prevent slipping
- top of ladder minimum 1 metre above landing place

Scaffolding:

- design calculation submitted
- proper access to scaffold platform
- properly founded uprights with base plates
- secured to the building with strong ties to prevent collapse
- braced for stability
- load bearing fittings, where required
- uprights, ledgers, braces and struts not to be removed during use
- fully boarded working platforms, free from defects and arranged to avoid tipping or tripping
- securely fixed boards against strong winds
- adequate guard rails and toe boards where scaffold is 2m above ground
- designed for loading with materials, where appropriate
- evenly distributed materials
- barriers or warning notices for incomplete scaffold (i.e. not fully boarded)
- weekly inspections and after bad weather by competent person
- record of inspections

[23] World Bank ESS 2 – Labour and Working Conditions

[24] Occupational, Health and Safety Act 2007

[25] Environmental Management and Coordination Act 1999, Amended 2015

Excavation:

- underground services to be located and marked, precautions taken to avoid them
- adequate and suitable timber, trench sheets, props and other supporting materials available on site before excavation starts
- safe method for erecting and removal of timber supports
- sloped or battered sides to prevent collapse
- daily inspections after use of explosives or after unexpected falls of materials
- safe access to excavations (e.g. sufficiently long ladder)
- barriers o restrict personnel/plant
- stability of neighboring buildings
- risk of flooding
- materials stacked, spoil and vehicles away from top of excavations to avoid collapse
- secured stop blocks for vehicles tipping into excavations

Roof Work:

- crawling ladders or boards on roofs more than 10 degrees
- if applicable, roof battens to provide a safe handhold and foothold
- barriers or other edge protection
- crawling boards for working on fragile roof materials such as asbestos cement sheets or glass. guard rails and notices to same
- roof lights properly covered or provided with barriers
- during sheeting operations, precautions to stop people falling from edge of sheet
- precautions to stop debris falling onto others working under the roof work

Transport and Mobile Plant:

- in good repair (e.g. steering, handbrake, footbrake)
- trained drivers and operators and safe use of plant
- secured loads on vehicles
- passengers prohibited from riding in dangerous positions
- propping raised bodies for tipping lorries prior to inspections
- control of on-site movements to avoid danger to pedestrians, etc.
- control of reversing vehicles by properly trained banksmen, following safe system of work

Machinery and Equipment:

- adequate secured guards in good repair to dangerous parts, e.g. exposed gears, chain drives, projecting engine shafts

Cranes and Lifting Appliances:

- weekly recorded inspections
- regular inspections by a competent person
- test certificates
- competent and trained drivers over 18 years of age
- clearly marked controls
- checks by driver and banksman on weight of load before lifting
- efficient automatic safe load indicator, inspected weekly, for jib cranes with a capacity of more than one tonne

- firm level base for cranes
- sufficient space for safe operation
- trained banksman/slinger to give signals and to attach loads correctly, with knowledge of lifting limitation of crane
- for cranes with varying operating radius, clearly marked safe working loads and corresponding radii
- regular maintenance
- lifting gear in good condition and regularly examined

Electricity:

- measures to protect portable electric tools and equipment from mechanical damage and wet conditions
- checks for damage to or interference with equipment, wires and cables
- use of correct plugs to connect to power points
- proper connections to plugs; firm cable grips to prevent earth wire from pulling out "permit-to-work" procedures, to ensure safety
- disconnection of supplies to overhead lines or other precautions where cranes, tipper lorries, scaffolding, etc. might touch lines or cause arcing

Cartridge Operated Tools:

- maker's instruction being followed
- properly trained operators, awareness of dangers and ability to deal with misfires
- safety goggles
- regular cleaning of gun
- secure place for gun and cartridges when not in use

Falsework/formwork:

- design calculations submitted method statement dealing with preventing falls of workers
- appointment of falsework coordinator
- checks on design and the supports for shuttering and formwork
- safe erection from steps or proper platforms
- adequate bases and ground conditions for loads
- plumb props on level bases and properly set out
- correct pins used in the props
- timberwork in good condition
- inspection by competent person, against agreed design, before pouring concrete

Risks to the Public:

- identify all risks to members of the public on and off site, e.g. materials falling from scaffold etc., site plant and transport (access/egress) and implement precautions, e.g. scaffold fans/nets, banksmen, warning notices, etc.
- barriers to protect/isolate persons and vehicles
- adequate site perimeter fencing to keep out the public and particularly children. secure the site during non-working periods
- make safe specific dangers in site during non-working periods, e.g. excavations and openings covered or fenced, materials safely stacked, plant immobilized, ladders removed or boarded

Fire – General:

- sufficient number and types of fire extinguishers
- adequate escape routes, kept clear
- worker awareness of what to do in an emergency

Fire – Flammable Liquids:

- proper storage area
- amount of flammable liquid on site kept to a minimum for the day's work
- smoking prohibited; other ignition sources kept away from flammable liquids
- proper safety containers

Fire – Compressed Gases, e.g. Oxygen, LPG, Acetylene:

- properly stored cylinders
- valves fully closed on cylinders when not in use
- adopt "hot work" procedures
- site cylinders in use outside huts

Fire – Other Combustible Materials:

- minimum amount kept on site
- proper waste bins
- regular removal of waste material

Noise:

- assessment of noise risks
- noisy plant and machinery fitted with silencers/muffs
- ear protection for workers if they work in very noisy surroundings

Health:

- identify hazardous substances, e.g. asbestos, lead, solvents, etc., and assess the risks
- use of other substances where possible
- control exposure by means other than by using protective equipment
- safety information sheets available from the supplier
- safety equipment and instructions for use
- keep other workers who are not protected out of danger areas
- testing of atmosphere in confined spaces; provision of fresh air supply if necessary. Emergency procedures for rescue from confined spaces

Manual Handling:

- avoid where risk of injury
- if unavoidable, assess and reduce risks

Protective Clothing:

- suitable equipment to protect head, eyes, hands and feet here appropriate
- enforce wearing of protective equipment

Welfare:

- suitable toilets
- clean wash basin, hot/warm water, soap and towel

- room or area where clothes can be dried
- wet weather gear for those working in wet conditions
- heated site hut where workers can take shelter and have meals with the facility for boiling water
- suitable first aid facilities

Work in Public Areas:

- all risks to the public identified
- method statement approved
- road closures approved
- temporary diversions in place
- safety barriers erected/maintained
- labour, materials, plant and other resources sufficient to meet programme
- temporary reinstatement completed and properly maintained
- permanent reinstatement completed at earliest possible date.

Annex 3 – Environmental Social Management and Monitoring Plan (ESMP)

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
Environmental, Social Health and Safety Management					
1. Responsibilities and liabilities	Ensure that all workers, are familiar and comply with the requirements and specifications of this ESMP.	Induction performed and recorded	Contractor	Report the induction event (participants, information shared etc.)	
2. ESHS Management	Define all organisational and technical provisions to satisfy and follow up the specifications of the ESMP (e.g. resources, documentation)	Requirements for the ESHS management are defined	Contractor	Once prior to finalization of project specific ESMP	
3. Code of Conduct	Establish a Code of Conduct taking into consideration safety rules, substance abuse, environmental sensitivity, communicable diseases, gender issues (sexual harassment), respect for local beliefs and customs, community interactions etc.	Code of Conduct in place and rules shared with personnel	Contractor	Punishable or misconduct behaviours are reported and communicated Check grievance records	
4. ESHS Training	Provide H&S Induction and Training to the workforce regarding H&S risks and mitigation measures (including indirect workers) tailored to project scope.	Training performed and recorded	Contractor/ PEA	Check training records	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
	Awareness raising regarding community health and safety to the local communities through campaigns (e.g. schools, dispensary)	Awareness raising campaigns performed and recorded	Contractor	Check information material produced (once a major change in the project occurs)	
Protection of the Environment and People					
5. Protection of adjacent areas	Restrict excavation (if any) activities during periods of intense rainfall. Use temporary bunding to reduce the risk of sediment, oil or chemical spills to the receiving waters.	No excavation during intense rainfall	Contractor	Site inspection	
	Carry out excavation works in cut off ditches to prevent water from entering excavations.	No water entering excavations	Contractor	Random site inspection	
	Ensure that means of protection are in place to avoid or minimise adverse effects on vegetation, soils, groundwater and surface water, biodiversity, natural drainage and the water quality in areas within the works area.	No impacts identified in the adjacent environment	Contractor	Regular (e.g. monthly) monitoring of adjacent natural resources.	
	Ensure that work site boundaries and limits are in accordance with plans agreed upon in advance. All construction activities should be carried out within boundaries.	Site boundaries and limits on site	Contractor	Site inspections	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
6. Pollution prevention	Ensure all works carried out minimise pollution risk (e.g. liquid effluents; air emissions; noise and vibration management; vehicle and equipment maintenance and selection; fuel, oil and chemical storage and handling.) including the whole duration of the project.	No pollution identified	Contractor	Weekly inspection reports	
7. Atmospheric emissions (machinery and motor vehicle) and dust	Use to the extent possible, vehicles in appropriate technical conditions. Provide emissions control equipment where applicable (e.g. filters).	Technical Specification Sheet	Contractor	Prior to commencement of works and each time new equipment/vehicle is used at the site.	
	Provision of dust masks to workers and ensure their use.	No of PPEs procured/ Proportion of workers with requisite PPEs	Contractor	Regular inspections	
	Ensure that maintenance on all machinery is done regularly to avoid the emission of noxious gases	No of vehicles maintained	Contractor	Regular documentation inspection	
	Ensure vehicles and machineries are switched off when not in use. Sensitise drivers.	Engines switched off	Contractor	Site inspection	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
	Best practice to ensure minimisation of dust emissions (e.g. proper stockpiling, watering to suppress dust etc.) during dry and windy conditions and transportation.	Watering conducted, no dust emissions are observed, no workers' grievances	Contractor	Regular site inspection	
	Ensure speed limits on site. Sensitise drivers.	Speed signs installed	Contractor	Random site inspection	
8. Noise and vibrations	Avoid operations and vehicle movements at night and Sensitise drivers/ Restrict activities that create noise to daytime only.	No work conducted between 10pm and 7 am/ no grievances received	Contractor	Random site inspection, review of filed grievances, interaction with community	
	Avoid idling of machinery or engine when not in use.	Number of vehicles and machinery not on idling when not in use	Contractor	Random site inspection	
	Provide Personal Protective Equipment (PPEs) e.g ear muffles; especially to workers operating heavy machinery such as drilling rig.	No. of PPEs provided	Contractor	Random site inspection	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
	Locate stationary equipment (such as power generators) as far as possible from nearby receptors (e.g. worker resting areas, populated areas and environmentally sensitive areas). Make sure that noise levels don't exceed 120db in case of equipment or vehicle use.	Distances between equipment and receptors are kept	Contractor	Once prior to commencement of works Monitor noise levels in case equipment is used	
9. Waste (solid and liquid)	Provide temporal waste receptacles on-site	No. of waste receptacles on site	Contractor	Random inspection	
	Ensure that all wastes produced are properly collected, segregated, stored, and transported	Waste collection areas existent, waste inventories	Contractor	Random site inspection, Review of waste inventories	
	Minimise the waste production to the extent possible.	Records of waste production are kept Waste Management Plan	Contractor	Monitor monthly the amount of waste produced	
	Document all waste related operations (type of wastes, quantities produced etc.).	Storage, transport and treatment of waste is documented	Contractor	Document inspection	
	Appropriate and safe storage of fuels, construction materials, wastes and any materials that can cause spills (e.g. batteries from energy generators).	Safe storage of materials, Spill remediation equipment in place.	Contractor	Random site inspection Weekly site inspection reports	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
10. Vegetation clearing	Limit vegetation clearing to areas within the site boundary where it is strictly necessary.	Vegetation clearing minimal	Contractor	Random site inspection	
	Describe the methods of vegetation clearance. Ensure that no chemicals/pesticides are used, burning of vegetation is restricted etc.	No use of fires or chemicals on site	Contractor	Site inspection during site clearance	
	Avoid clearing mature trees and endangered species.	No mature trees cleared	Contractor	Visual inspection	
	Avoid off-road vehicle traffic. Use existing roads. Sensitise drivers	No off-road traffic	Contractor	Random site inspection	
	Sensitize Construction workforce on environmental and ecological conservation	No. of sensitization meetings conducted	Contractor/PEA	Sensitization workshops	
	Adopt compensatory tree planting	No. of tree seedlings planted	Contractor/PEA	Tree planting campaings	
11. Biodiversity	Avoid to the extent possible areas of ecological value.	Areas of ecological value avoided	Contractor/ PEA	Site assessment prior to site selection. Ecological value assessment if needed.	
	Avoid natural habitats disturbance.	Disturbance of habitats avoided	Contractor	Inspection of construction practices.	
	Monitor impacts on flora and fauna.	Impacts on flora and fauna avoided	Contractor	Regular inspections	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
12. Erosion and sediment transport	If construction takes place on inclined surfaces/slopes, ensure preventive erosion control measures are applied (e.g. plan to retain trees and other vegetation, use of natural contours for roads and drainage networks, excavated drainage channels).	Preventive erosion control measures in place	Contractor	Random site inspection to check if measures where applied	
	Ensure appropriate storing of topsoil removed. After laying of the pipes, topsoil will be used as backfill for restoration of the area.	Topsoil stored and re-used	Contractor	Monitor if topsoil is properly stored	
	Optimal stockpiling	Stockpile height limited	Contractor	Random site inspection	
	Provide designated routes for transport	Marked routes for vehicles provided	Contractor	Monitor if routes are marked	
13. Site rehabilitation	Ensure revegetation and restoration of cleared areas where possible after construction using native species.	Revegetation completed	Contractor/ PEA	One-time inspection after construction	
	Ensure that rehabilitated areas don't pose health and safety risks (such as holes, ponds).	Reinstatement completed	Contractor/ PEA	One-time inspection after construction	
	Reinstatement of construction working area to the best possible after construction activities are completed.	Reinstatement completed	Contractor/ PEA	One-time inspection after construction	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
	Rehabilitate borrow areas, backfill material stockpile sites and access roads, where applicable.	Rehabilitation completed	Contractor	One-time inspection after construction	
• **Occupational, Health and Safety**					
14. Health and Safety Plan	Develop a Health and Safety Plan.	HS Plan in place	Contractor/ PEA	Monitoring of Contractor's measures	
	Tools and equipment to be placed in a safe place when not in use.	No of tools placed in a safe place	Contractor	Monitoring of Contractor's measures	
	The sites to be protected or fenced off from unauthorized intrusions and warning signs	No of Labels and warning signs installed	Contractor	Monitoring of Contractor's measures	
15. Accident reporting procedure	Ensure Incident and Accident Registers are on site for recording of injuries, or any OHS incidence	Incident recording process in place	Contractors	Check incident/accident records	
16. Personal protective equipment	Ensure the provision of Personal Protective Equipment (PPE) for workers (hardhats, masks, safety glasses, safety boots, ear muffles etc.).	PPE used by everyone on-site	Contractor/Site Manager	Random site inspection	
17. Emergency scenarios prevention	Ensure immediate cleaning of any spills and remediation of contaminated areas after construction.	Workers trained.	Contractor/ PEA	Random site inspection after spill events One-time inspection after construction	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
	Provide necessary prevention equipment on site in line with applicable regulations to respond to emergency scenarios e.g. fire, explosion, floods, natural hazards etc.	Prevention equipment in place	Contractor	Regular site inspection	
	Prepare an emergency management and preparedness plan for accident response & avail Emergency contacts for police, ambulance, etc	Emergency Plans in place	Contractor	Random site inspection	
18. First-aid	Ensure minimum first aid provisions on site. (suitably stocked first-aid kits)	Suitable first aid kits on site	Contractor	Regular monitoring of first aid kits	
	Workers to be trained on first aid & a fully equipped First Aid Kit provided at site.	No of trainings on first aid	Contractor	Regular monitoring	
19. Access to health care and training	Ensure the workforce has access to primary healthcare (personal insurance)	No of staffs insured healthwise	Contractor	Random site inspection	
	In case more than 35 workers are present on site, ensure that a hospital, medical clinic or a health centre can be reached within a period of 45 minutes.	Medical centres in the proximity of the site.	Contractor	Medical centres in the proximity of the site identified once prior the commencement of works	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
20. Hygiene, accommodation and food	Ensure provision of Health and Safety (H&S) and hygienic and sanitary facilities at the site. Install toilets on site.	Appropriate H&S and sanitary facilities provided at site	Contractor	Random site inspection	
	Ensure the provision of adequate space, supply of water and garbage disposal bins, appropriate protection against heat, cold, damp, fire and disease-carrying animals, adequate sanitary and washing facilities, adequate lighting, and basic medical services, in accordance with all applicable health and safety regulations and norms.	Appropriate conditions for workers on site	Contractor	Random site inspection Grievance mechanism log	
	Report any occurrence of any communicable diseases amongst the workforce (STD, HIV/AIDS, TB, malaria and Hepatitis B and C). Sensitise workers.	Communicable Diseases Register	Contractor	Review of diseases register and disease prevention programme if available.	
	Sensitize workers and community members on HIV/AIDS and other communicable diseases.	Number of workers and community sensitized	Contractor	Monitoring regularly	
• **Local labour and relations with local communities**					

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
21. Labour conditions	Ensure minimum legal labour standards as per ILO regulations (child/forced labour, sexual assault, no discrimination, equal opportunities, working hours, minimum wages) are met.	Grievance Mechanism Records, Training recorded	Contractor	Inspection reports (also from labour authorities), Review of grievance register and training record	
	Ensure there is no child labour at the construction. Verify age of workers and casuals.	No of registered workers and their ages	Contractor	Checking the work force database	
	Ensure that all direct and indirect workers have access to and are aware about the Grievance Mechanism where they can raise workplace relevant complaints anonymously.	Grievance Mechanism in place and grievances recorded	Contractor/ PEA	Review of grievance register	
	Ensure all workers have the same rights and are treated equally.	Non-discrimination policy in place	Contractor	Random site inspection Grievance mechanism log	
22. Local recruitment	Ensure local communities are preferred for the supply of goods and services to the Project and Project personnel, where appropriate.	Local Procurement and Employment Records	Contractor	Review procurement and employment rules and records	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
	Local community members to be given priority in employment opportunities, in casual, unskilled labour, semi-skilled and skilled labour where applicable.	Employment Records	Contractor	Review employment rules and records	
23. Community interaction	Engage/ communicate/inform communities. Ensure consultations with the local authorities and communities regarding the construction. Obtain local knowledge regarding chance finds and land acquisition matters.	Minutes of Meetings Grievance Mechanism	Contractor/ PEA	Review of grievance register Minutes of consultation meetings	
	Prevention of SEA through including Code of Conduct (CoC) and ongoing sensitization of staff on responsibilities related to the COC.	No. of SEA Action Plans	Contractor/PEA	Monitoring	
	Initiate an efficient Grievance Mechanism to allow potentially affected individuals to raise their concerns.	Grievance Mechanism in place, grievances recorded	Contractor/ PEA	Review of grievance register	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
	Implement provisions of VLD	Minutes of Meetings Grievance Mechanism records Management Plan for Land Acquisition and Compensation if needed	Contractor/ PEA	Review of grievance register and meeting minutes	
24. Damage to people and property	Ensure contractor implements codes of conduct concerning employment and workforce behaviour (including but not limited to safety rules, zero tolerance for substance abuse, environmental sensitivity of the area, dangers of sexually transmissible diseases and HIV/AIDS, gender equality and sexual harassment, respect for the beliefs and customs of the populations and community relations in general).	Workers Code of Conduct Grievance Mechanism records	Contractor/ PEA	Worker interviews, Review of grievance log	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
	Ensure that site areas are provided with appropriate security, fencing, signage and lighting. Use hazard notices/signs/barriers to protect children and other vulnerable people from harm and prevent access to non-workers.	H&S planning of construction site done, items installed	Contractor	Random site inspection	
	Engagement with the community & development of confidential community-based complaints mechanisms discrete from the standard GRM.	GRM in place	Contractor	Monitoring	
25.Land acquisition and land take	Adhere to the provisions of Voluntary Land Donation (VLD) Framework	Grievance Mechanism Management Plan for Land Acquisition	Contractor	Once during site selection Review of grievance log Follow up of land acquisition/compensation process	
26. Traffic management	Ensure safe driving by Project personnel (e.g. through training/induction).	Driver Training Records as part of Induction training	Contractor	Review of training records	

Topic/ Potential Impact	Mitigation, Management and Enhancement Measures	Means of Verification/Indicator	Responsibility	Monitoring Procedure	Cost (KES)
	Target signage and outreach activities to improve public awareness of traffic changes and potential hazards for high-risk sections of public roads, including near the site and laydown areas.	Warning signs Minutes of Meetings	Contractor	Inspection if traffic routes, Review of grievance register	
27. Fossils/ Archaeological Chance Finds	Establish specific procedures to manage the protection of archaeological and historical sites, chance finds and fossils. Ensure all finds of cultural heritage (e.g. graves, old ceramic, old building fragments) are reported immediately to the relevant authority and avoid excavation in the ultimate neighbourhood of a chance find, fence the chance find and await instructions from the competent authority. This applies to the excavation works of the pipeline.	Training records, records about chance fiends	Contractor/ PEA	Site inspection	
TOTAL COST FOR C-ESMP IMPLEMENTATION (KES)[26]					

[26] This cost is equal to the amount provided for mitigating Environmental and Social issues associated with the construction works, as provided in the BoQ.

Annex 4 – Code of Conduct

We, _____ **(***name of company***)** agree that in the course of our association with the Employer, under _____(contract name)
Tender No. _____
We must:

1. treat children and women with respect regardless of race, colour, gender, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status;
2. not use language or behaviour towards children and women that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate;
3. not engage children under the age of 18 in any form of sexual intercourse or sexual activity (other than in the context of legal unions that took place between parties under the laws of the country), including paying for sexual services or acts;
4. Not engage sexually with any woman, in a situation, without mutual consent.
5. Wherever possible, ensure that another adult is present when working in the proximity of children;
6. Not invite unaccompanied children into our place of residence, unless they are at immediate risk of injury or in physical danger;
7. Not invite women into our place of residence (campsite) if this is not acceptable by the code of ethics of the company;
8. Not sleep close to unsupervised children unless absolutely necessary, in which case we must obtain permission, and ensure that another adult is present if possible;
9. Use any computers, mobile phones, video cameras, cameras or social media appropriately, and never to exploit or harass children or access child exploitation material through any media;
10. Not use physical punishment on children and women;
11. Not hire children for domestic or other labour which is inappropriate given their age or developmental stage, which interferes with their time available for education and recreational activities, or which places them at significant risk of injury;
12. Comply with code of ethics of the company and all relevant local legislation, including labour laws in relation to child labour and behaviour;

13. Immediately report concerns or allegations of child and women exploitation and abuse and policy non-compliance in accordance with appropriate procedures;
14. Immediately disclose all charges, convictions and other outcomes of an offence, which occurred before or occurs during our association with the Employer that relate to child exploitation and abuse.

When photographing or filming a child or using children's images for work-related purposes, We must:

15. Assess and endeavor to comply with local traditions or restrictions for reproducing personal images before photographing or filming a child;
16. Obtain informed consent from the child and parent or guardian of the child before photographing or filming a child. As part of this I must explain how the photograph or film will be used;
17. Ensure photographs, films, videos and DVDs present children in a dignified and respectful manner and not in a vulnerable or submissive manner. Children should be adequately clothed and not in poses that could be seen as sexually suggestive;
18. Ensure images are honest representations of the context and the facts;
19. Ensure file labels, meta data or text descriptions do not reveal identifying information about a child when sending images electronically or publishing images in any form;

We understand that the onus is on us, as a company associated with the Employer, to use common sense and avoid actions or behaviours that could be construed as child exploitation and abuse.

Signed & Stamped: _____

(*Company Representative signing the tender document***)**

Date: