



## REPUBLIC OF KENYA



## NORTHERN WATER WORKS DEVELOPMENT AGENCY

**Bidding Document for Procurement of: Drilling and Equipping 4 No. Exploratory Boreholes in Wajir County**

**VOL I**

**NCB No: KE-NWWDA-229129-CW-RFB**

**Project Name: Water and Sanitation Development Project (WSDP)**

**Credit Nr. IDA 6030-KE**  
**Project No.: P156634**

**Employer: Northern Water Works Development Agency**

**Country : The Republic of Kenya**

**ISSUED ON: 16<sup>th</sup> SEPTEMBER 2021**

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**REQUEST FOR BIDS (RFB)**

**Country:** Kenya

**Project:** WATER AND SANITATION DEVELOPMENT PROJECT

**Credit No.:** IDA-60300

Ref: KE-NWWDA-229129-CW-RFB

**RFB Title: Drilling and Equipping 4 No. Exploratory Boreholes in Wajir County**

**Contract No. KE. NWWDA-229129-CW-RFB**

1. The **Northern Water Works Development Agency** *has received* financing from the World Bank toward the cost of the **Water and Sanitation Development Project**, and intends to apply part of the proceeds toward payments under the contract for **Drilling and Equipping of 4No. Exploratory Boreholes, Contract No. KE. NWWDA-229129-CW-RFB.**
2. The **Northern Water Works Development Agency** now invites sealed bids from eligible bidders for **Drilling and Equipping of Arbajahan and Admesajida 4Nr Exploratory Boreholes and other Civil Works, Contract No. KE. NWWDA-229129-CW-RFB**, as detailed below:
  - Drilling and Development of Boreholes – 350m deep - 4Nr.
  - Solar installation – 2Nr sites
  - Submersible pump and other electromechanical works for 2Nr. Boreholes
  - Distribution Mains for 2Nr. Boreholes
  - 100M<sup>3</sup> elevated steel tank- 2Nr
  - Water Kiosks -2Nr.
  - Fencing of Boreholes-4Nr
  - Cattle trough -4Nr.
3. Bidding will be conducted through the National Competitive Bidding procurement using a Request for Bids as specified in the World Bank’s “Procurement Regulations” for IPF

Borrower July 2016 and is open to all eligible Bidders as defined in the procurement Regulations.

4. Interested eligible Bidders may obtain further information from Northern Water Works Development Agency, Procurement office (A3 Ground floor), **email [procurement@nwwda.go.ke](mailto:procurement@nwwda.go.ke)** and inspect the bidding documents during office hours 00900 to 1600 hours at the address given below
5. The bidding document in English may be purchased by interested Bidders upon the submission of a written application to the address below and upon payment of a nonrefundable fee **Kshs. 1,000 (Kenya Shillings One Thousand Only)** or equivalent in freely convertible currency. The method of payment will be cash or banker's cheque. The Bidding Documents will be collected from the address below upon production of a purchase receipt or downloaded free of charge from our website [www.nwwda.go.ke](http://www.nwwda.go.ke).
6. Bids must be delivered to the address below on or before the **19<sup>th</sup> October 2021 at 11.00 am**. Electronic bidding will not be permitted. Late bids will be rejected. Bids will be publicly opened in the presence of the bidders' designated representatives and anyone who choose to attend at the address below at **Conference Room, at 11.10 am on 19<sup>th</sup> October 2021**.
7. All Bids shall be accompanied by a Bid Security (Unconditional Bank guarantee) of **Kshs. 700,000.00** (Seven Hundred Thousand only)
8. The address referred to above is:

**Chief Executive Officer  
Northern Water Works Development Agency  
Maji House, Kismayu Road  
P.O. Box 495 – 70100  
GARISSA, KENYA  
Fax: +254-46-2103598  
[Info@nwwda.go.ke](mailto:Info@nwwda.go.ke)**

**Website: [www.nwwda.go.ke](http://www.nwwda.go.ke)**

**NB. Upon downloading bidders must send/email their names and contact details to [procurement@nwwda.go.ke](mailto:procurement@nwwda.go.ke) for recording. Addendum/Clarifications will also be posted in the NWWDA website immediately they become available.**

# **PART 1 – Bidding Procedures**

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## 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 for the procurement of the Works as specified in Section VII, Works Requirements. The name, identification, and number of lots (contracts) of this bidding are **specified in the BDS**.
- 1.2 Throughout this Bidding Document:
- (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;
  - (c) “day” means calendar day; and
  - (d) “**ES**” means environmental and social (including Sexual Exploitation, and Abuse (SEA) and Sexual Harassment (SH));
  - (e) “**Sexual Exploitation and Abuse**” “(SEA)” means the following:
    - “**Sexual Exploitation**” is defined as any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another;
    - “**Sexual Abuse**” is defined as the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions;
  - (f) “**Sexual Harassment**” “(SH)” is defined as unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature by the Contractor’s Personnel with other Contractor’s or Employer’s Personnel;
  - (g) “**Contractor’s Personnel**” is as defined in Sub- Clause 1 (ii) of the General Conditions of Contract; and

- (h) **“Employer’s personnel”** is as defined in GCC Sub-Clause 1 of the General Conditions of Contract.

A non-exhaustive list of (i) behaviors which constitute SEA and (ii) behaviors which constitute SH is attached to the Code of Conduct form in Section IV.

- 2. Source of Funds**
- 2.1 The Borrower or Recipient (hereinafter called “Borrower”) **specified in the BDS** has received or has applied for financing (hereinafter called “funds”) from the International Bank for Reconstruction and Development or the International Development Association (hereinafter called “the Bank”) in an amount **specified in the BDS**, toward the project named **in the BDS**. The Borrower intends to apply a portion of the funds to eligible payments under the contract(s) for which these Bidding Documents are issued.
- 2.2 Payment by the Bank will be made only at the request of the Borrower and upon approval by the Bank, and will be subject, in all respects, to the terms and conditions of the Loan (or other financing) Agreement. The Loan (or other financing) Agreement prohibits a withdrawal from the Loan (or other financing) account for the purpose of any payment to persons or entities, or for any import of goods, if such payment or import, to the knowledge of the Bank, is prohibited by a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations. No party other than the Borrower shall derive any rights from the Loan (or other financing) Agreement or have any claim to the proceeds of the Loan (or other financing).
- 3. Corrupt and Fraudulent Practices**
- 3.1 The Bank 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 their agents (whether declared or not), sub-contractors, sub-consultants, service providers, suppliers, and personnel, to permit the Bank to inspect all accounts, records and other documents relating to any prequalification process, bid submission, and contract performance (in the case of award), and to have them audited by auditors appointed by the Bank.
- 4. Eligible Bidders**
- 4.1 A Bidder may be a firm that is a private entity, or a government-owned entity—subject to ITB 4.5—or any combination of them in the form of a joint venture (JV), under an existing agreement, or with the intent to enter into such an agreement supported by a letter of intent. In the case of a joint venture, all members shall be jointly and severally liable for the execution of the Contract in accordance with the Contract terms. The JV shall nominate a Representative

who shall have the authority to conduct all business for and on behalf of any and all the members of the JV during the bidding process and, in the event the JV is awarded the Contract, during contract execution. **Unless specified in the BDS**, there is no limit on the number of members in a JV.

4.2 A Bidder shall not have a conflict of interest. All Bidders 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 bidding process, if the Bidder:

directly or indirectly controls, is controlled by or is under common control with another Bidder; or

receives or has received any direct or indirect subsidy from another Bidder; or

has the same legal representative as another Bidder; or

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. 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

or 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

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

would be providing goods, works, or non-consulting services resulting from or directly related to consulting services for the preparation or implementation of the project specified in the BDS ITB 2.1 that it provided or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm;

has a close business or family relationship with a professional staff of the Borrower (or of the project implementing agency, or of a recipient of a part of the loan) 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 Bank throughout the procurement process and execution of the contract.

- 4.3 A Bidder may have the nationality of any country, subject to the restrictions pursuant to ITB 4.7. A Bidder shall be deemed to have the nationality of a country if the Bidder is constituted, incorporated or registered in and operates in conformity with the provisions of the laws of that country, as evidenced by its articles of incorporation (or equivalent documents of constitution or association) and its registration documents, as the case may be. This criterion also shall apply to the determination of the nationality of proposed sub-contractors or sub-consultants for any part of the Contract including related Services.
- 4.4 A Bidder that has been sanctioned by the Bank in accordance with the above ITB 3.1, including in accordance with the Bank's Guidelines on Preventing and Combating Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants ("Anti-Corruption Guidelines"), shall be ineligible to be prequalified for, bid for, or be awarded a Bank-financed contract or benefit from a Bank-financed contract, financially or otherwise, during such period of time as the Bank shall have determined. The list of debarred firms and individuals is available at the electronic address **specified in the BDS**.
- 4.5 Bidders that are Government-owned enterprises or institutions in the Employer's Country may participate only if they can establish that they (i) are legally and financially autonomous (ii) operate under commercial law, and (iii) are not dependent agencies of the Employer. To be eligible, a government-owned enterprise or institution shall establish to the Bank's satisfaction, through all relevant documents, including its Charter and other information the Bank may request, that it: (i) is a legal entity separate from the government (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 the government, can acquire rights and liabilities, borrow funds and be liable for repayment of its debts, and can be declared bankrupt; and (iv) is not bidding for a contract to be awarded by the department or agency of the government which under their applicable laws or regulations is the reporting or supervisory authority of the enterprise or has the ability to exercise influence or control over the enterprise or institution.

- 4.6 A Bidder shall not be under suspension from bidding by the Employer as the result of the operation of a Bid-Securing Declaration.
- 4.7 Firms and individuals may be ineligible if so indicated in Section V and (a) as a matter of law or official regulations, the Borrower's country prohibits commercial relations with that country, provided that the Bank is satisfied that such exclusion does not preclude effective competition for the supply of goods or the contracting of works or services required; or (b) by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower's country prohibits any import of goods or contracting of works or services from that country, or any payments to any country, person, or entity in that country.
- 4.8 A Bidder shall provide such evidence of eligibility satisfactory to the Employer, as the Employer shall reasonably request.
- 5. Eligible Materials, Equipment and Services**
- 5.1 The materials, equipment and services to be supplied under the Contract and financed by the Bank may have their origin in any country subject to the restrictions specified in Section V, Eligible Countries, 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.

## **B. Contents of Bidding Document**

- 6. Sections of Bidding Document**
- 6.1 The Bidding Document 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**

- Section I - Instructions to Bidders (ITB)
- Section II - Bid Data Sheet (BDS)
- Section III - Evaluation and Qualification Criteria
- Section IV - Bidding Forms
- Section V - Eligible Countries
- Section VI – Bank Policy-Corrupt and Fraudulent Practices

### **PART 2 Works Requirements**

- Section VII - Works Requirements

### **PART 3 Conditions of Contract and Contract Forms**

- Section VIII - General Conditions of Contract (GCC)
- Section IX - Particular Conditions of Contract (PCC)

## Section X - Contract Forms

- 6.2 The Invitation for Bids issued by the Employer is not part of the Bidding Document.
- 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, the minutes of the pre-Bid meeting (if any), or Addenda to the Bidding Documents 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 Document, Site Visit, Pre-Bid Meeting**
- 7.1 A Bidder requiring any clarification of the Bidding Document shall contact the Employer in writing at the Employer's address **specified in the BDS** or raise its inquiries 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 prior to the deadline for submission of bids within a period **specified in the BDS**. 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 specified in the BDS**, the Employer shall also promptly publish its response at the web page identified in the BDS. Should the clarification result in changes to the essential elements of the Bidding Documents, the Employer shall amend the Bidding Documents 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 The Bidder is requested, to submit any questions in writing, to reach the Employer not later than one week before the meeting.
- 7.6 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. Nonattendance at the pre-bid meeting will not be a cause for disqualification of a Bidder.
- 8. Amendment of Bidding Document**
- 8.1 At any time prior to the deadline for submission of bids, the Employer may amend the Bidding Documents by issuing addenda.
- 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 Document 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 prospective 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, pursuant to 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 shall in no case be 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 in accordance with ITB 12;
- (b) completed Schedules, in accordance with ITB 12 and 14: **as specified in the BDS**;
- (c) Bid Security or Bid Securing Declaration, in accordance with ITB 19.1;
- (d) alternative bids, if permissible, in accordance with ITB 13;
- (e) written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 20.2;
- (f) documentary evidence in accordance with ITB 17 establishing the Bidder's qualifications to perform the contract if its Bid is accepted;
- (g) Technical Proposal in accordance with ITB 16;
- (h) 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 in the Letter of Bid 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 and  
Schedules**

12.1 The Letter of Bid and Schedules shall be prepared using the relevant forms furnished in Section IV, Bidding Forms. The forms must be completed without any alterations to the text, and no substitutes shall be accepted except as provided under ITB 20.2. 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**, as will the method of evaluating different times for completion.

- 13.3 Except as provided under ITB 13.4 below, Bidders wishing to offer technical alternatives to the requirements of the Bidding Document must first price the Employer's design as described in the Bidding Document 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 basic technical requirements 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. Such parts will be **identified in the BDS** and described in Section VII. Works Requirements. The method for their evaluation will be stipulated in Section III. Evaluation and Qualification Criteria.
- 14. Bid Prices and Discounts**
- 14.1 The prices and discounts (including any price reduction) 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 prices for all items of the Works, as identified in Section IV. Bidding Forms. In case of admeasurement contracts, 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 will not be paid for by the Employer when executed and shall be deemed covered by the rates for other items and prices in the Bill of Quantities.
- 14.3 The price to be quoted in the Letter of Bid, in accordance with ITB 12.1, 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, in accordance with ITB 12.1.
- 14.5 **Unless otherwise provided in the BDS** and the Conditions of Contract, the prices quoted by the Bidder shall be fixed. If the prices quoted by the Bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract, the Bidder shall furnish the indices and weightings for the price adjustment formulae in the Schedule of Adjustment Data in Section IV- Bidding Forms 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 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 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date 28 days prior to the deadline for submission of bids, shall be included in the rates and prices<sup>1</sup> and the total bid price submitted by the Bidder.
- 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 unit rates and prices and shown in the Schedule of Adjustment Data are reasonable<sup>2</sup>, in which case a detailed breakdown of the foreign currency requirements shall be provided by Bidders.
- 16. Documents Comprising the Technical Proposal**
- 16.1 The Bidder shall furnish a Technical Proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section IV, Bidding Forms, in sufficient detail to demonstrate the adequacy of the Bidders' proposal to meet the work requirements and the completion time.
- 17. Documents Establishing the Qualifications of the Bidder**
- 17.1 In accordance with Section III, Evaluation and Qualification Criteria, to establish its qualifications to perform the Contract, the Bidder shall provide the information requested in the corresponding information sheets included in Section IV, Bidding Forms.
- 17.2 If a margin of preference applies as specified in accordance with ITB 33.1, domestic Bidders, individually or in joint ventures, applying for eligibility for domestic preference shall supply all information required to satisfy the criteria for eligibility specified in accordance with ITB 33.1.

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<sup>1</sup>

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**18. Period of  
Validity of Bids**

- 18.1 Bids shall remain valid until the date specified **in the BDS** or any extended date if amended by the Employer in accordance with ITB 8. A bid that is not valid until the date specified **in the BDS**, or any extended date if amended by the Employer in accordance with ITB 8, shall be rejected by the Employer as nonresponsive.
- 18.2 In exceptional circumstances, prior to the date of expiry of the bid validity, 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 extended date for bid validity. 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, except as provided in ITB 18.3.
- 18.3 If the award is delayed by a period exceeding fifty-six (56) days beyond the expiry of the initial bid validity, the Contract price shall be determined as follows:
- (a) In the case of fixed price contracts, the Contract price shall be the bid price adjusted by the factor **specified in the BDS**.
  - (b) In the case of adjustable price contracts, no adjustment shall be made.
  - (c) In any case, bid evaluation shall be based on the bid price without taking into consideration the applicable correction from those indicated above.

**19. Bid Security**

- 19.1 The Bidder shall furnish as part of its bid, either a Bid-Securing Declaration or a bid security **as specified in the BDS**, in original form and, in the case of a bid security, in the amount and currency **specified in the BDS**.
- 19.2 A Bid Securing Declaration shall use the form included in Section IV, Bidding Forms.
- 19.3 If a bid security is specified pursuant to ITB 19.1, the bid security shall be a demand guarantee in any of the following forms at the Bidder's option:
- (a) an unconditional guarantee issued by a bank or financial institution (such as an insurance, bonding or surety company);
  - (b) an irrevocable letter of credit;
  - (c) a cashier's or certified check; or



(d) another security **specified in the BDS.**

from a reputable source from an eligible country. 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. In the case of a bank guarantee, the bid security shall be submitted either using the Bid Security Form included in Section IV, Bidding Forms, or in another substantially similar format approved by the Employer prior to bid submission. The bid security shall be valid for twenty-eight (28) days beyond the original date of expiry of the bid validity, or beyond any extended date if requested under ITB 18.2.

- 19.4 If a bid security or Bid Securing Declaration is specified pursuant to ITB 19.1, any bid not accompanied by a substantially responsive bid security or Bid-Securing Declaration shall be rejected by the Employer as non-responsive.
- 19.5 If a bid security is specified pursuant to ITB 19.1, 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 and if required in the BDS, the Environmental and Social (ES) Performance Security pursuant to ITB 42.
- 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 and if required in the BDS, the Environmental and Social (ES) Performance Security.
- 19.7 The bid security may be forfeited:
- (a) if a Bidder withdraws its bid prior to the expiry date of the 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:
    - (i) sign the Contract in accordance with ITB 41; or
    - (ii) furnish a performance security and if required in the BDS, the Environmental and Social (ES) Performance Security in accordance with ITB 42.
- 19.8 The bid security or the Bid Securing Declaration of a JV shall be in the name of the JV that submits the bid. If the JV has not been constituted into a legally-enforceable JV, at the time of bidding,

the Bid Security or the Bid Securing Declaration shall be in the names of all future members as named in the letter of intent mentioned in ITB 4.1 and ITB 11.2.

19.9 If a bid security is **not required in the BDS**, and

- (a) if a Bidder withdraws its bid prior to the expiry date of the Bid validity specified by the Bidder on the Letter of Bid or any extended date provided by the Bidder; or
- (b) if the successful Bidder fails to: sign the Contract in accordance with ITB 41; or furnish a performance security and if required in the BDS, the Environmental and Social (ES) Performance Security in accordance with ITB 42;

the Borrower may, **if provided for in the BDS**, declare the Bidder ineligible to be awarded a contract by the Employer for a period of time **as stated in the BDS**.

## 20. Format and Signing of Bid

20.1 The Bidder shall prepare one original of the documents comprising the bid as described in ITB 11 and clearly mark it "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 each of 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 initialed by the person signing the bid.

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.

20.4 Any interlineations, erasures, or overwriting shall be valid only if they are signed or initialed 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 “ORIGINAL”, “ALTERNATIVE” and “COPY.” These envelopes containing the original and the copies shall then be enclosed in one single envelope.

21.2 The inner and outer envelopes shall:

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

(b) be addressed to the Employer as **provided in the BDS** pursuant to ITB 22.1;

(c) bear the specific identification of this bidding process specified in accordance with 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 at the address and no later than the date and time **specified in the BDS**. When so **specified in the BDS**, bidders shall have the option of submitting their bids electronically. Bidders submitting bids electronically shall follow the electronic bid submission procedures **specified in the BDS**.

22.2 The Employer may, at its discretion, extend the deadline for the submission of bids by amending the Bidding Document 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 Bids

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, (except that

withdrawal notices do not require copies). 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 withdrawal 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 25.3 all bids received by the deadline, at the date, time and place **specified in the BDS**, in the presence of Bidders designated representatives and anyone who choose to attend. Any specific electronic bid opening procedures required if electronic bidding is permitted in accordance with ITB 22.1, shall be **as specified in the BDS**.

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 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 bid 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 bid opening. Only envelopes 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, or Bid Securing Declaration, if required; 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 Bill of Quantities are to be initialed by representatives of the Employer attending bid opening in the manner **specified in the BDS**. 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; the Bid Price, per lot (contract) if applicable, including any discounts and alternative bids; and the presence or absence of a bid security, if one was required. 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 evaluation of 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 40.

26.2 Any attempt by a Bidder to influence the Employer in the evaluation of the bids 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 Document;
- (b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and
- (c) "Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.

**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 ITB11.

29.2 A substantially responsive bid is one that meets the requirements of the Bidding Document 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 Document, 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 16, Technical Proposal, 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 Document, it shall be rejected by the Employer and may

not subsequently be made responsive by correction of the material deviation, reservation, or omission.

**30. Nonconformities, Errors, and Omissions**

30.1 Provided that a bid is substantially responsive, the Employer may waive any 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, by adding the average price of the item or component quoted by substantially responsive Bidders. If the price of the item or component cannot be derived from the price of other substantially responsive bids, the Employer shall use its best estimate.

**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) only for admeasurement contracts, 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
- (c) if there is a discrepancy between words and figures, the amount in words shall prevail, unless 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 **Unless otherwise specified in the BDS**, a margin of preference for domestic bidders<sup>3</sup> shall not apply.
- 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.
- 34.2 The Employer may permit subcontracting for certain specialized works as indicated in Section III. When subcontracting is permitted by the Employer, the specialized sub-contractor's experience shall be considered for evaluation. Section III describes the qualification criteria for sub-contractors.
- 34.3 Bidders may propose subcontracting up to the percentage of total value of contracts or the volume of works as **specified in the BDS**.
- 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 and the provision, if any, for contingencies in the Summary Bill of Quantities<sup>4</sup> for admeasurement contracts, but including Daywork<sup>5</sup> items, where priced competitively;
  - (b) price adjustment for correction of arithmetic errors in accordance with ITB 31.1;
  - (c) price adjustment due to discounts offered in accordance with ITB 14.4;
  - (d) converting the amount resulting from applying (a) to (c) above, if relevant, to a single currency in accordance with ITB 32;
  - (e) price adjustment for nonconformities in accordance with ITB 30.3;
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- (f) the additional evaluation factors are 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 this Bidding Document allows Bidders to quote separate prices for different lots (contracts), the methodology to determine the lowest evaluated price of the 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 for an admeasurement contract, which results in the lowest Evaluated Bid Price, is seriously unbalanced or, front loaded in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. 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 Bidder that is selected as having submitted the lowest evaluated 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 17.1.
- 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 next lowest evaluated bid to make a similar determination of that Bidder's qualifications to perform satisfactorily.

- 38. Employer's Right to Accept Any Bid, and to Reject Any or All Bids** 38.1 The Employer reserves the right to accept or reject any bid, and 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**

- 39. Award Criteria** 39.1 Subject to ITB 37.1, the Employer shall award the Contract to the Bidder whose bid has been determined to be the lowest evaluated bid and is substantially responsive to the Bidding Document, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.
- 40. Notification of Award** 40.1 Prior to the expiration of the bid validity, the Employer shall notify the successful Bidder, in writing, via the Letter of Acceptance included in the Contract Forms, that its bid has been accepted. At the same time, the Employer shall also notify all other Bidders of the results of the bidding, and shall publish in UNDB online the results identifying the bid and lot (contract) numbers and the following information:
- (i) name of each Bidder who submitted a Bid;
  - (ii) bid prices as read out at Bid Opening;
  - (iii) name and evaluated prices of each Bid that was evaluated;
  - (iv) name of bidders whose bids were rejected and the reasons for their rejection; and
  - (v) name of the winning Bidder, and the Price it offered, as well as the duration and summary scope of the contract awarded.
- 40.2 Until a formal contract is prepared and executed, the notification of award shall constitute a binding Contract.
- 40.3 The Employer shall promptly respond in writing to any unsuccessful Bidder who, after notification of award in accordance with ITB 40.1, requests in writing the grounds on which its bid was not selected

- 41. Signing of Contract**
- 41.1 Promptly upon notification, the Employer shall send the successful Bidder the Contract Agreement.
- 41.2 Within twenty-eight (28) days of receipt of the Contract Agreement, the successful Bidder shall sign, date, and return it to the Employer.
- 42. Performance Security**
- 42.1 Within twenty-eight (28) days of the receipt of notification of award from the Employer, the successful Bidder shall furnish the performance security and, if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security in accordance with the conditions of contract, subject to ITB 35.5, using for that purpose the Performance Security and ESHS Performance Security Forms 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.
- 42.2 Failure of the successful Bidder to submit the above-mentioned Performance Security and, if required in the BDS, the Environmental, Social, Health and Safety (ESHS) Performance Security, or to sign the Contract Agreement 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.
- 43. Adjudicator**
- 43.1 The Employer proposes the person **named in the BDS** to be appointed as Adjudicator under the Contract, at the hourly fee **specified in the BDS**, plus reimbursable expenses. If the Bidder disagrees with this proposal, the Bidder should so state in his Bid. If, in the Letter of Acceptance, the Employer does not agree on the appointment of the Adjudicator, the Employer will request the Appointing Authority designated in the Particular Conditions of Contract (PCC) pursuant to Clause 23.1 of the General Conditions of Contract (GCC), to appoint the Adjudicator.



## Section II - Bid Data Sheet (BDS)

### A. Introduction

<b>ITB 1.1</b>	<p>The number of the Invitation for Bids is:  <b>KE-NWWDA-229129-CW-RFB</b></p> <p>The Employer is:  <b>Northern Water Works Development Agency</b>  <b>Maji House - Kismayu Road,</b>  <b>P.O Box 495- 70100,</b>  <b>GARISSA-KENYA</b>  <a href="mailto:info@nwwda.go.ke">info@nwwda.go.ke</a></p>
<b>ITB 1.1</b>	<p>The name of the bidding process is: <b>National Competitive Bidding (NCB)</b></p> <p>The identification number of the bidding process is:  <b>KE-NWWDA-229129-CW-RFB</b></p> <p><b>Drilling and Equipping of Arbajahan and Admesajida 4Nr Exploratory Boreholes and other Civil Works</b></p> <p>The number and identification of lots comprising this bidding process is:  <b>Not Applicable</b></p>
<b>ITB 2.1</b>	The Borrower is: <i>The Government of Kenya (GOK)</i>
<b>ITB 2.1</b>	<p>The name of the Project is:  <i>Water and Sanitation Development Project (WSDP) 6030KE</i></p>
<b>60ITB 2.1</b>	Loan or Financing Agreement amount: <i>US\$ 300 Million</i>
<b>ITB 4.1</b>	Maximum number of members in the JV shall be: <i>Not Applicable</i>
<b>ITB 4.4</b>	A list of debarred firms and individuals is available on the Bank's external website: <a href="http://www.worldbank.org/debarr">http://www.worldbank.org/debarr</a> .

### B. Bidding Documents

<b>ITB 7.1</b>	For <b>clarification purposes</b> only, the Employer's address is:
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	<p>Attention: <b>Chief Executive Officer,</b>  <b>Northern Water Works Development Agency</b>  Street Address: <b>Maji House, Kismayu Road</b>  City: <b>Garissa</b>  ZIP Code: <b>70100</b>  Country: <b>KENYA</b>  Telephone: <b>046-2103598</b>  Facsimile number: <b>046-2103197</b>  Electronic mail address: <a href="mailto:info@nwwda.go.ke">info@nwwda.go.ke</a></p> <p>Requests for clarification should be received by the Employer no later than: <b>14 days before the bid submission deadline</b></p>
<b>ITB 7.1</b>	Web page: <a href="http://www.nwwda.go.ke">www.nwwda.go.ke</a>
<b>ITB 7.4</b>	<p>A Pre-Bid meeting <b>shall not</b> take place at the following date, time and place:  Date: <b>N/A</b>  Time: <b>N/A</b>  Place: <b>N/A</b></p> <p>A site visit conducted by the Employer <b>shall not be</b> organized.</p>

### C. Preparation of Bids

<b>ITB 10.1</b>	<p>The language of the bid is: <b>English</b></p> <p>All correspondence exchange shall be in <b>English</b> language.</p> <p>Language for translation of supporting documents and printed literature is <b>English</b></p>
<b>ITB 11.1 (b)</b>	<p>The following schedules shall be submitted with the bid:</p> <p><b>a) Priced Bills of quantities</b>  <b>b) Technical Specifications</b></p>
<b>ITB 11.1 (h)</b>	<p>The Bidder shall submit the following additional documents in its Bid:</p> <p><b>c) Schedule of Sub-Contractors</b>, if any, including details of work for which the Sub-Contractor shall be employed, Value and % of Tender Price of Works sub-contracted and details of Sub-Contractor's experience in that field of work.</p> <p><b>d) Schedule of Projected Cash-Flow</b> – should be based on the outline Programme for execution of the whole of the Works.</p> <p><b>e) Schedule of Manufacturers</b> for the following key materials/equipment:  i. Steel Casings for the borehole</p>

- ii. Gravel Pack
- iii. Borehole slotted screens
- iv. Clay used for drilling

For each item above the Bidder must indicate the name of the manufacturer, Country of Origin, make of the item where applicable and the standard to which the item is manufactured

### **Code of Conduct for Contractor's Personnel (ES)**

The Bidder shall submit its Code of Conduct that will apply to Contractor's Personnel (as defined in Sub- Clause 1 (ii) of the General Conditions of Contract), to ensure compliance with the Contractor's Environmental and Social (ES) obligations under the Contract. The Bidder shall use for this purpose the Code of Conduct form provided in Section IV. No substantial modifications shall be made to this form, except that the Bidder may introduce additional requirements, including as necessary to take into account specific Contract issues/risks.

### **Management Strategies and Implementation Plans (MSIP) to manage the (ES) risks**

*The Bidder shall submit* Management Strategies and Implementation Plans (MSIPs) to manage the following key Environmental and Social (ES) risks:

- i) Sexual Exploitation and Abuse (SEA) prevention and response action plan
- ii) Traffic Management Plan to ensure safety of local communities from construction traffic;
- iii) Water Resource Protection Plan to prevent contamination of drinking water while working alongside existing active pipelines;
- iv) Community Engagement Plan to prevent child labour, child sexual abuse, community health and safety, etc.
- v) Safety Plan to ensure occupational and community health and safety;
- vi) Waste Management Plan for management of hazardous and non-hazardous wastes
- vii) Excessive noise, vibrations and air pollution;
- viii) Strategy for obtaining Consents/Permits prior to the start of relevant works such as opening a quarry or borrow pit and identification of dump areas for surplus excavated material;
- ix) Gender based violence and sexual exploitation and abuse (GBV/SEA) prevention and response action plan.

The Contractor shall be required to submit for approval, and subsequently implement, the Contractor's Environment and Social Management Plan (C-ESMP), in accordance with the Particular Conditions of Contract Sub-Clause 16.2, that includes the agreed Management Strategies and Implementation Plans described above.

<b>ITB 13.1</b>	Alternative bids <i>shall not be</i> permitted.
<b>ITB 13.2</b>	Alternative times for completion <i>Shall not be</i> permitted.
<b>ITB 13.4</b>	Alternative technical solutions shall be permitted for the following parts of the Works: <i>N/A</i>
<b>ITB 14.5</b>	The prices quoted by the Bidder <i>shall not be</i> subject to adjustment during the performance of the Contract.
<b>ITB 15.1</b>	The prices shall be quoted by the bidder in: <i>Kenya Shillings.</i>
<b>ITB 18.1</b>	<i>The Bid shall be valid until: 17<sup>th</sup> January 2022</i>
<b>ITB 18.3 (a)</b>	The bid price shall be adjusted by the following factor(s): <i>N/A</i>
<b>ITB 19.1</b>	A Bid Security <b>shall be</b> required valid <b>28 days</b> beyond the validity period <b>and in form of unconditional on-demand bank guarantee issued by a reputable bank in the Country.</b> A Bid-Securing Declaration <b>shall not</b> be required. If a Bid Security shall be required, the amount and currency of the bid security shall be: <b>KES 700,000 (Kenya Shillings Seven Hundred Thousand Only)</b>
<b>ITB 19.3 (d)</b>	Other types of acceptable securities: None
<b>ITB 20.1</b>	In addition to the original of the bid, the number of copies is <b>One (1)</b>
<b>ITB 20.2</b>	The written confirmation of authorization to sign on behalf of the Bidder shall consist of:  a) <b>The name and description of the documentation required to demonstrate the authority of the signatory to sign the Bid such as a Power of Attorney</b> No authorization to sign the bid on behalf of the Bidder is required if the signing person is the Managing Director, Chief Executive or Proprietor of the bidding firm. If, however, the signatory of the bid is a person holding a lesser position in the firm, submission of a written confirmation of authorization is mandatory; <b>and</b>  b) <b>In the case of Bids submitted by an existing or intended JV an undertaking signed by all parties (i) stating that all parties shall be jointly and severally liable, if so required in accordance with ITB 4.1(a), and (ii) nominating a Representative who shall have the authority to conduct all business for and on behalf of any and all the</b>



	<b>parties of the JV during the bidding process and, in the event the JV is awarded the Contract, during contract execution.</b>
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#### D. Submission and Opening of Bids

<b>ITB 22.1</b>	Bidders <i>shall not have</i> the option of submitting their bids electronically. If electronic bid submission is permitted in accordance with ITB 21.1, the specific bid opening procedures shall be: <i>N/A</i>
<b>ITB 22.1</b>	<p>For <b><u>bid submission purposes</u></b> only, the Employer's address is:</p> <p>Attention: <b>Chief Executive Officer</b></p> <p><b>Northern Water Works Development Agency</b></p> <p>Street Address: <b>Maji House, Kismayu Road</b></p> <p>City: <b>Garissa</b></p> <p>ZIP Code: <b>70100</b></p> <p>Country: <b>KENYA</b></p> <p><b>The deadline for bid submission is:</b></p> <p>Date: <b>19<sup>th</sup> October 2021</b></p> <p>Time: <b>11.00 am East African.</b></p> <p>Bidders <b>shall not</b> have the option of submitting their bids electronically.</p> <p>If bidders have the option of submitting their bids electronically, the electronic bidding submission procedures shall be: <i>N/A</i></p>
<b>ITB 25.1</b>	<p>The bid opening shall take place at:</p> <p><b>Northern Water Works Development Agency</b></p> <p>Street Address: <b>Maji House, Kismayu Road</b></p> <p>City: <b>Garissa</b></p> <p>Country: <b>KENYA</b></p> <p><b>Date: 19<sup>th</sup> October 2021.</b></p> <p><b>Time: 1110hrs East African Time</b></p>
<b>ITB 25.3</b>	The Letter of Bid and Priced Bill of Quantities shall be initialed by <b>Two (2)</b> representatives of the Employer conducting Bid opening.

#### E. Evaluation and Comparison of Bids

<b>ITB 32.1</b>	<p>The currency that shall be used for bid evaluation and comparison purposes to convert all bid prices expressed in various currencies into a single currency is: <b>Kenya Shillings.</b></p> <p>The source of exchange rate shall be: <b>Central Bank of Kenya Selling Rate.</b></p> <p>The date for the exchange rate shall be: <b>The Date of Bid opening.</b></p>
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	<p>The currency(ies) of the Bid shall be converted into a single currency in accordance with the procedure that follows:</p> <p><b>Bidders quote entirely in local currency</b> For comparison of bids, the Bid Price, corrected pursuant to Clause 31, shall first be broken down into the respective amounts payable in various currencies by using the exchange rates specified by the bidder in accordance with Sub-Clause 15.1.</p> <p>In the second step, the Employer will convert the amounts in various currencies in which the Bid Price is payable (excluding Provisional Sums but including Day work where priced competitively) to the single currency identified above at the selling rates established for similar transactions by the authority specified and on the date stipulated above.</p>
<b>ITB 33.1</b>	A margin of preference <i>shall not</i> apply.
<b>ITB 34.1</b>	At this time the Employer <b>does not intend</b> to execute certain specific parts of the Works by sub-contractors selected in advance.
<b>ITB 34.3</b>	<p>Contractor's proposed subcontracting: Maximum percentage of subcontracting permitted is: <b>20 % of the total contract amount or 20 % of the volume of work.</b></p> <p>b) Bidders planning to subcontract more than 10% of total volume of work shall specify, in the Letter of Bid, the activity (ies) or parts of the works to be subcontracted along with complete details of the sub-contractors and their qualification and experience. The qualification and experience of the sub-contractors must meet the minimum criteria for the relevant work to be subcontracted failing which such sub-contractors will not be permitted to participate.</p> <p>c) Sub-contractors' qualification and experience will not be considered for evaluation of the Bidder. The Bidder on its own (without taking into account the qualification and experience of the sub-contractor) should meet the qualification criteria.</p>

#### F. Award of Contract

<b>ITB 43.1</b>	<p>The Adjudicator proposed by the Employer is: <b>Eng. Isaac G. Wanjohi.</b> The hourly fee for this proposed Adjudicator shall be: Ksh 25,000/=</p> <p><b>The biographical data of the proposed: See Annex 1</b></p> <hr/> <p><b>Name:</b> Isaac G. WANJOHI <b>Nationality:</b> Kenyan <b>Profession:</b> Dispute Resolution Expert/Civil Engineer &amp; Project Management <b>Date of Birth:</b> 1939 <b>Experience:</b> 34 years as an Adjudicator</p>
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	<p>Since 1978 to date, Eng. Wanjohi has been responsible for guidance, co-ordination and execution of the projects under taken by Wanjohi Consulting Engineers which are more than 200 covering all the disciplines of Civil Engineering including Highways and Bridges, Water Supply, Sewerage, Ports and Harbors, Housing Estates, Infrastructural services and Buildings. He has also acted as arbitrator, conciliator, adjudicator, expert witness and lay-advocate in dispute resolution tribunals.</p>
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## **Section III - Evaluation and Qualification Criteria**

This section contains all the criteria that the Employer shall use to evaluate bids and qualify Bidders if the bidding was not preceded by a prequalification exercise and post qualification is applied. In accordance with ITB 35 and ITB 37, no other methods, criteria and factors shall be used. The Bidder shall provide all the information requested in the forms included in Section 4 (Bidding Forms).

Wherever a Bidder is required to state a monetary amount, Bidders should indicate the USD equivalent using the rate of exchange determined as follows:

- -For construction turnover or financial data required for each year - Exchange rate prevailing on the last day of the respective calendar year (in which the amounts for that year is to be converted) was originally established.
- -Value of single contract - Exchange rate prevailing on the date of the contract.

Exchange rates shall be taken from the publicly available source identified in the ITB 32.1. Any error in determining the exchange rates in the Bid may be corrected by the Employer

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**1. Margin of Preference: Not Applicable**

**2. Evaluation– Not Applicable**

**Not Applicable**

### 3. Qualification

Eligibility and Qualification Criteria		Compliance Requirements					Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
<b>1. Eligibility</b>							
1.1	<b>Nationality</b>	Nationality in accordance with ITB 4.3	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments
1.2	<b>Conflict of Interest</b>	No conflicts of interest in accordance with ITB 4.2	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Letter of Bid
1.3	<b>Bank Eligibility</b>	Not having been declared ineligible by the Bank, as described in ITB 4.4, 4.5, 4.6 and 4.7	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Letter of Bid
1.4	<b>Government Owned Entity of the Borrower country</b>	Meets conditions of ITB 4.5	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments
1.5	<b>United Nations resolution or Borrower's country law</b>	Not having been excluded as a result of prohibition in the Borrower's country laws or official regulations against commercial relations with the Bidder's country, or by an act of compliance with UN Security Council resolution, both in accordance with ITB 4.7 and Section V.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Forms ELI – 1.1 and 1.2, with attachments



Eligibility and Qualification Criteria		Compliance Requirements			Documentation		
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
<b>2. Historical Contract Non-Performance</b>							
2.1	<b>History of Non-Performing Contracts</b>	Non-performance of a contract <sup>6</sup> did not occur as a result of contractor default since <b>1<sup>st</sup> January 2016</b>	Must meet requirement <sup>12</sup>	Must meet requirements	Must meet requirement <sup>7</sup>	N/A	Form CON-2
2.2	<b>Suspension Based on Execution of Bid Securing Declaration by the Employer or withdrawal of the Bid within Bid validity</b>	Not under suspension based on execution of a Bid Securing Declaration pursuant to ITB 4.6 or withdrawal of the Bid pursuant ITB 19.9.	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Bid Submission Form
2.3	<b>Pending Litigation</b>	Bidder's financial position and prospective long-term profitability sound according to criteria established in 3.1 below and assuming that all pending litigation will be resolved against the Bidder	Must meet requirement	N/A	Must meet requirement	N/A	Form CON – 2

<sup>6</sup> Nonperformance, as decided by the Employer, shall include all contracts where (a) nonperformance was not challenged by the contractor, including through referral to the dispute resolution mechanism under the respective contract, and (b) contracts that were so challenged but fully settled against the contractor. Non performance shall not include contracts where Employers decision was overruled by the dispute resolution mechanism. Non performance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the Bidder have been exhausted.

<sup>7</sup> This requirement also applies to contracts executed by the Bidder as JV member.

Eligibility and Qualification Criteria			Compliance Requirements			Documentation	
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.4	<b>Litigation History</b>	No consistent history of court/arbitral award decisions against the Bidder <sup>8</sup> since <b>1<sup>st</sup> January 2016</b>	Must meet requirement	Must meet requirement	Must meet requirement	N/A	Form CON – 2
2.5	<b>Declaration: Environmental, Social, Health, and Safety (ESHS) past performance</b>	Declare any civil work contracts that have been suspended or terminated and/or performance security called by an employer for breach of environmental or social (including Sexual Exploitation and Abuse)) contractual obligations in the past five years. <sup>9</sup>	Must make the declaration. Where there are Specialized Sub-contractor /s, the Specialized Sub-contractor /s must also make the declaration	N/A	Each must make the declaration. Where there are Specialized Sub-contractor/s, the Specialized Sub-contractor/s must also make the declaration	N/A	Form CON-3 ESHS Performance Declaration

<sup>8</sup> The Bidder shall provide accurate information on the letter of Bid about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the last five years. A consistent history of court/arbitral awards against the Bidder or any member of a joint venture may result in disqualifying the Bidder.

<sup>9</sup> The Employer may use this information to seek further information or clarifications in carrying out its due diligence.



Eligibility and Qualification Criteria		Compliance Requirements			Documentation		
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
			Must meet requirement	N/A	Must meet requirement	N/A	
3.2	<b>Average Annual Construction Turnover</b>	Minimum average annual construction turnover of <b>KES 150 Million</b> , calculated as total certified payments received for contracts in progress and/or completed within the last <i>Five (5) years</i> , divided by <i>Five (5) years</i> ,	Must meet requirement	Must meet requirement	Must meet 50%, (Fifty Percent) of the requirement	Must meet 75%, (Seventy Five Percent) of the requirement	Form FIN – 3.2

Eligibility and Qualification Criteria		Compliance Requirements			Documentation		
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
<b>4. Experience</b>							
4.1 (a)	<b>General Construction Experience</b>	Experience under construction contracts in the role of prime contractor, JV member, sub-contractor, or management contractor for at least the last <b>Five (5) years, starting 1<sup>st</sup> January 2016</b> .	Must meet requirement	N/A	Must meet requirement	N/A	Form EXP – 4.1
4.2 (a)	<b>Specific Construction &amp; Contract Management Experience</b>	(i) A minimum number of similar <sup>10</sup> contracts specified below that have been satisfactorily and substantially <sup>11</sup> completed as a prime contractor, joint venture member <sup>12</sup> , management contractor or sub-contractor <sup>12</sup> between <b>1st January 2016</b> and application submission deadline: (i) three (3) <b>contracts</b> , each of minimum value <b>KES 70Million or in a freely convertible currency</b> .	Must meet requirement	Must meet requirement <sup>13</sup>	N/A	N/A	Form EXP 4.2(a)

<sup>10</sup> The similarity shall be based on the physical size, complexity, methods/technology and/or other characteristics described in Section VII, Work's Requirements. Summation of number of small value contracts (less than the value specified under requirement) to meet the overall requirement will not be accepted.

<sup>11</sup> Substantial completion shall be based on 80% or more works completed under the contract.

<sup>12</sup> For contracts under which the Bidder participated as a joint venture member or sub-contractor, only the Bidder's share, by value, shall be considered to meet this requirement.

<sup>13</sup> In the case of JV, the value of contracts completed by its members shall not be aggregated to determine whether the requirement of the minimum value of a single contract has been met. Instead, each contract performed by each member shall satisfy the minimum value of a single contract as required for single entity. In determining whether the JV meets the requirement of total number of contracts, only the number of contracts completed by all members each of value equal or more than the minimum value required shall be aggregated.

Eligibility and Qualification Criteria		Compliance Requirements			Documentation		
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
4.2 (b)		<p>For the above and any other contracts completed and under implementation as prime contractor, joint venture member, management contractor or sub-contractor<sup>14</sup> on or after the first day of the calendar year during the period stipulated in 4.2 (a) above, a minimum construction experience in the following key activities successfully completed<sup>15</sup>:</p> <p><b>a) Constructed Upvc/HDPE pipelines of approximately 5Km per year in the last five years. The pipeline diameter of 75mm diameter and above.</b></p> <p><b>b) Constructed at least an equivalent of 350m<sup>2</sup> Masonry structures e.g., Water Kiosks, VIP Latrines, Tank etc for each of the past five years.</b></p> <p><b>c) Constructed at least three (3) Elevated Steel Tanks at least one (1) for the past five</b></p>	Must meet requirements	Must meet requirements	N/A	Must meet the requirements	Form EXP – 4.2 (b)

<sup>14</sup> For contracts under which the Bidder participated as a joint venture member or sub-contractor, only the Bidder’s share shall be counted to meet this requirement.

<sup>15</sup> Volume, number or rate of production of any key activity can be demonstrated in one or more contracts combined if executed during same time period. The rate of production shall be the annual production rate for the key construction activity (or activities).

Eligibility and Qualification Criteria		Compliance Requirements			Documentation		
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
		<p>years, with at least one tank 15m high.</p> <p>d)Drilling of boreholes (more than 300m deep) at least 4 No per year in the last five years. Total 15 boreholes.</p> <p>e) Equipping of at least 4 boreholes per year, out of which 2Nr with Solar power of at least 35KW each.</p>					
4.2 (c)	<b>Specific Experience in managing ES aspects</b>	<p>For contracts substantially completed and under implementation] as prime contractor, joint venture member, or Subcontractor between <b>1st January 2016 year]</b> and Application submission deadline, experience in managing ES risks and impacts in the following aspects:</p> <p>i) Labour influx                      ii) Sexual Exploitation and Abuse (SEA)                      iii) Sexual Harassment (SH)                      iv) Gender Based Violence (GBV)                      ESMP</p>	Must meet requirements	Must meet requirements	N/A	Must meet the following requirements:	Form EXP – 4.2 (c)

## 5 Key Personnel

The Bidder must demonstrate that it will have suitably qualified (and in adequate numbers) Key Personnel, as described in the Specifications.

The Bidder shall provide details of the Key Personnel and such other Key Personnel that the Bidder considers appropriate to perform the Contract, together with their academic qualifications and work experience. The Bidder shall complete the relevant Forms in Section IV, Bidding Forms.

### Key Personnel

No.	Position	Qualifications	Total Work Experience (years)	In Similar Works Experience (years)
1.	Contractor's Representative / Project Manager- One (1 Nr)	<ul style="list-style-type: none"> <li>B.Sc. Civil Engineering</li> <li>Professional Engineer registered with the Engineer's Board of Kenya or equivalent</li> </ul>	15	8
2.	Hydrogeologist/Drilling Inspector- One (1 Nr)	<ul style="list-style-type: none"> <li>Professional Geologist, registered with Geological Society of Kenya</li> </ul>	10	6
3.	Drilling Inspector	<ul style="list-style-type: none"> <li>An experienced Drilling Technician</li> </ul>	10	6
4.	Construction Engineer - One (1Nr)	<ul style="list-style-type: none"> <li>B.Sc. Civil Engineering</li> </ul>	10	5
5.	Foreman (Civil Works) - Two (1Nr)	<ul style="list-style-type: none"> <li>Higher National Diploma (HND) in Civil Engineering/Building/ electromechanical/Construction or equivalent</li> </ul>	10	8
6.	Sociologist (1Nr)	<ul style="list-style-type: none"> <li>Degree in Social Science/Sociology or Comm. Development</li> </ul>	8	5
7.	Community Liaison officer	<ul style="list-style-type: none"> <li>Diploma in Social Science/Sociology or Comm. Development</li> </ul>	8	3
8.	Environmentalist (1 Nr)	<ul style="list-style-type: none"> <li>Degree in Environmental Science or equivalent) and registered with NEMA as an Associate Expert or equivalent</li> </ul>	8	5
9.	Health and Safety Expert (1 Nr)	<ul style="list-style-type: none"> <li>Diploma in Environmental Studies and Occupational Health and Safety Science or equivalent) and/or registered with DOSH as an ESHS Advisor, or equivalent</li> </ul>	8	5



## 6. Equipment

The Bidder must demonstrate that it will have access to the key Contractor's equipment listed hereafter:

No.	Equipment Type and Characteristics	Minimum Number required
1	Drilling Rig with a mud pump and compressor capable of drilling up to 350 m deep	One (1)
2	Borehole Test Pumping unit	One (1)
3	Conductivimeter (ECmeter)	One (1)
4	Water Bowser	One (1)
5	7 / 10 / 15-ton Tipper Lorries	One (1)
6	4WD Pick-Ups – 1 Ton	One (1)
7	Concrete Mixers (capacity 0.3m <sup>3</sup> to 1m <sup>3</sup> ), including batch weighing	One (1)
8	Concrete vibrator	One (1)

The Bidder shall provide further details of proposed items of equipment using the relevant Form in Section IV.

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## Letter of Bid

Date: ***[insert date (as day, month and year) of Bid Submission]***

NCB No: **KE-NWWDA-229129-CW-RFB**

**To:** Chief Executive Officer  
Northern Water Works Development Agency  
P.O Box 495-70100,  
**Garissa.**

- (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 meet the eligibility requirements and 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 4.6

(d) We offer to execute in conformity with the Bidding Documents the following Works: **Drilling and Equipping of Arbajahan and Admesajida 4Nr Exploratory Boreholes and other Civil Works**

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

In case of only one lot, total price of the Bid ***[insert the total price of the bid in words and figures, indicating the various amounts and the respective currencies];***

*In case of multiple lots, total price of each lot [insert the total price of each lot in words and figures, indicating the various amounts and the respective currencies];*

- (f) The discounts offered and the methodology for their application are:

(R) The discounts offered are: *[Specify in detail each discount offered.]*

(ii) The exact method of calculations to determine the net price after application of discounts is shown below: *[Specify in detail the method that shall be used to apply the discounts];*

- (g) Our bid shall be valid until *[insert day, month and year in accordance with ITB 18.1]*, and it shall remain binding upon us and may be accepted at any time on or before this date;
- (h) If our bid is accepted, we commit to obtain a performance security *[and an Environmental, Social, Health and Safety (ESHS) Performance Security, Delete if not applicable]* in accordance with the Bidding Documents;
- (i) We are not participating, as a Bidder or as a subcontractor, in more than one bid in this bidding process in accordance with ITB 4.2I, other than alternative bids submitted in accordance with ITB 13;
- (j) We, along with any of our subcontractors, suppliers, consultants, manufacturers, or service providers for any part of the contract, are not subject to, and not controlled by any entity or individual that is subject to, a temporary suspension or a debarment imposed by a member of the World Bank Group or a debarment imposed by the World Bank Group in accordance with the Agreement for Mutual Enforcement of Debarment Decisions between the World Bank and other development banks. Further, we are not ineligible under the Employer's country laws or official regulations or pursuant to a decision of the United Nations Security Council;

- (k) We are not a government owned entity/ We are a government owned entity but meet the requirements of ITB 4.5;<sup>16</sup>
- (l) We have paid, or will pay the following commissions, gratuities, or fees with respect to the bidding process or execution of the Contract: ***[insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount and currency of each such commission or gratuity]***

Name of Recipient	Address	Reason	Amount
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

(If none has been paid or is to be paid, indicate “none.”)

- (m) 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
- (n) We understand that you are not bound to accept the lowest evaluated bid or any other bid that you may receive.
- (o) 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\* ***[insert name of the Bidder]***

Name of the person duly authorized to sign the Bid on behalf of the Bidder\*\* ***[insert complete name of person duly authorized to sign the Bid]***

Title of the person signing the Bid ***[insert complete title of the person signing the Bid]***

Signature of the person named above ***[insert signature of person whose name and capacity are shown above]***

Date signed ***[insert date of signing]*** day of ***[insert month]***, ***[insert year]***

\*: In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder

\*\* : Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid Schedules.

<sup>16</sup> Bidder to use as appropriate

## **Schedules**

### **Preamble and Notes to Bills of Quantities**

**PREAMBLE AND NOTES TO BILLS OF QUANTITIES**

1. These Bills of Quantities form part of the Contract Documents and are to be read in conjunction with the Conditions of Contract, Standard and Special Specifications and Drawings. The Particular Specifications overrides any Clauses / General Specifications given in the Preamble.
2. Whenever reference is made to “The Engineer” or “The Engineer’s Representative” in the Bills of Quantities, it shall be construed to mean the person appointed by the Employer to act as the Project Manager or Engineer for the purposes of the Contract and named in the Contract Data, or other person appointed from time to time by the Employer and notified to the Contractor.
3. The quantities set forth in the Bills of Quantities represent the character of the work to be carried out. There is no guarantee to the Contractor that he will be required to carry out the quantities of work indicated under any one particular item or group of items in the Bills of Quantities. Though on the Contract as a whole, the quantities are intended to represent the overall value of the work to be carried out.
4. The prices and rates inserted in the Bills of Quantities will be used for valuing the work executed and the Engineer will measure the whole of the works executed in accordance with the Contract.
5. The prices and rates inserted in the Bills of Quantities are to be the full inclusive costs of the works described under the items, complete in place and in accordance with the Specifications and Drawings, including setting out of the works, including costs and expenses which may be required in and for the construction of the works described, together with any temporary works and installations which may be necessary and all general risks, liabilities and obligations set forth or implied in the Documents on which the Contract is based.
6. The brief description of the items given in the Bills of Quantities are purely for the purpose of identification and in no way modify or supersede the detailed descriptions given in the Conditions of Contract, Specifications or Drawings. When pricing items, reference is to be made to the Conditions of Contract, Standard Specifications, Drawings and Special Specification for the full directions and description of work and materials.
7. A price or rate is to be inserted, in ink, against each item in the Bills of Quantities, whether quantities are stated or not, and if the Bidder includes the cost of a particular item elsewhere in his rates or prices, he shall insert the word "nil" against both the rate and extension of that particular item. Should the Bidder omit to price an item, then it will be assumed that he has included the cost of the item elsewhere in his rates or prices.
8. No alteration shall be made to the Bills of Quantities and no extra item shall be inserted. The Bidder shall satisfy himself that the Contract Sum arrived at by pricing the quantities and items given is sufficient compensation for constructing and maintaining the whole of the works in accordance with the Contract Documents.
9. For the purpose of payment by Interim Certificate of "Lump Sum" items the Engineer may assess the portion of the work completed on the "Lump Sum" item and allow for payment of the portion of the "Lump Sum" he deems fair and reasonable. The total of all portions allowed shall not exceed the "Lump Sum". All interim payments shall be subject to the retention

stipulated in the Contract Documents.

10. 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 such item. No additional cost will be considered for such an eventuality.
11. The Contractor will be provided by the Employer with all that land occupied by the Permanent Works including the specified working width for pipe laying and other permanent construction works. The costs of compensation and entry upon land (if any) for the specified working width will be paid by the Employer. All other costs for temporary access to the works or additional working space shall be borne by the Contractor.
12. All costs related to strict adherence to all Health and Safety regulations stipulated in the National Legislation of Kenya as well acceptable international good practices for both temporary and permanent works pertaining to nature of the works under this Contract, shall be deemed included in the Contractor's rates.
13. 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 paid under relevant items in the Bills of Quantities.
14. Quantities for site clearance, stripping and spreading shall be based on plan area cleared or stripped.
15. 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 identified by the Contractor in liaison with the Local Authority and approved by the Engineer, except where otherwise provided for in the Bills of Quantities.
16. Generally, excavation items are based on volumes for structures and on linear measurements for certain pipelines. The work may be covered by one or more items. The rates shall include as appropriate for: -
  - a) Breaking through surfaces, handling different classes of material separately; excavation beyond the net plan area of the foundations, for safe working space and for battering or timbering etc.
  - b) Timbering
  - c) Dealing with water from any source whatsoever
  - d) Backfilling as specified
  - e) Disposal of surplus spoil

Measurement of volume of excavation for structures shall be calculated from the plan dimensions of the structure without allowance for working space.

The depth of excavation in pipe trenches will be measured from stripped ground level to the invert of the pipe. Measurement for other excavations will be to the size which is required to accommodate the permanent works. A Bidder shall accordingly allow in his prices for any amount of extra excavation, which may be necessary for safe working space to complete the work to the satisfaction of the Engineer.



Items are included for "Extra Over for Rock" on a volume basis and within the specified trench dimensions. The rates shall include for breaking out, mucking and disposal by method(s) approved by the Engineer and any other additional costs for other works or special methods adopted for excavation and disposal by the Contractor, encountered within measured excavation.

Different rock classifications are defined in the Specifications and have been billed separately. Rock shall be measured as a volume calculated from the thickness encountered within the plan area of a mass excavation, within the plan dimensions of a structure, or within the nominal width of a trench. The decision of the Engineer on the classification of rock encountered in excavation shall be final and binding. Note: Any excavation of murrum in whatever form will be taken as common excavation.

Timbering left in excavations shall only be measured for payment where it is specified or ordered by the Engineer.

17. Excavation by mechanical equipment may not be possible in some area due to restricted wayleaves, slopes/topographical features, ground water from whatsoever source, existing structures, drains, roads, trees, fences, walls, etc. The Contractor's rates for pipe trench excavation shall be deemed to cover mechanical and/or manual excavation. No claim for restricted space or double haulage will be entertained.

The Contractor shall indemnify the Employer against all claims for damage which in opinion of the Engineer may be caused by Excavation. This includes reinstatement of road surfaces, drains, fences, wall, culverts, etc., all in accordance to relevant authority.

18. When the site of any particular item of the Works has been sufficiently cleared of trees, undergrowth etc. and before any excavation or filling has been carried out, the Contractor shall carry out a survey under the Supervision of the Engineer's Representative to take, record and agree upon an adequate number of original ground levels. The data so obtained shall be used as a basis for the computation of excavation and filling and preparation of "As-Built" Drawings by the Contractor. If for whatever reason the Contractor commences excavation without taking levels, the Engineer's decision on the original ground levels to be used for computation will be final.
19. The volume of fill will be measured net to the finished levels as shown on drawings or as amended by the Engineer.

20. METHOD RELATED CHARGES

- a) In order that the Contractor may cover his cost in executing specific portions of work, where those costs are not properly attributable to the quality of permanent works to be executed, he may cover such costs in the Bills of Quantities in accordance with the following provisions.
- b) For the purpose of these charges the following words and expressions shall have the meaning hereby assigned to them.

- i. 'Method Related Charge' means the sum for an item inserted in the Bills of Quantities by a Bidder in accordance with paragraph 20 c).
  - ii. 'Time Related Charge' means a Method Related Charge for work the cost of which is to be considered as proportional to the length of time taken to execute the work.
  - iii. 'Fixed Charge' means a Method Related Charge which is not a Time Related Charge.
- c) A Bidder may insert in the Bills of Quantities, in the Bill provided, such items for Method Related Charges as he may decide to cover items of work relating to his intended method of executing the works, the costs of which are not to be considered as proportional to the quantities, rates and prices for the other items.
- d) Each item for a Method Related Charge inserted by the Bidder shall be fully described so as to define precisely the extent of work covered and to identify the constructional resources (plant, equipment, etc.) to be used and particular items of permanent or temporary works to which the items relate. The description shall include the type of charge (Time Related or Fixed) and in the case of a Time Related Charge, shall include also the expected duration, and the rate of charge.
- e) The insertion by a Bidder of an item for a Method Related Charge in the Bills of Quantities shall not bind him to adopt the method stated in the description of the item. However, in the case of a Time Related Charge, where the method is changed, a revised rate of charge shall be used taking account of the revised execution period to give the same total charge, had the original method, time and charge rate been adhered to.

If the charge is a Fixed Charge, then payment to the Contractor for such an item shall be in equal installments spread evenly throughout the duration of that part of the works which is the subject of the Fixed Charge.

- f) Method Related Charges shall not be admeasured but shall be deemed to be prices for the purpose of Clauses 36 of the Conditions of Contract and shall be paid in accordance with Clause 40.4 of the Conditions of Contract.
- g) In the event of the satisfactory execution of any part of the works which has been the subject of an item for a Method Related Charge using, whether in whole or in part, a method other than that described in the item, the Contractor shall nevertheless be entitled to payment of the Method Related Charge or the balance thereof, as the case may be, such instalments at such times and upon such events as may from time to time be agreed between the Engineer and the Contractor. In default of such agreement the Method Related Charge, or the balance then unpaid, shall be allowed to the Contractor by way of instalments in interim certificates at such times and upon such events as the Engineer shall decide.

The amount of Method Related Charge shall be neither increased nor decreased by reason of any change in method made by the Contractor, unless such change has been

ordered by the Engineer, in which case the provisions of Clause 38 of the Conditions of Contract shall apply.

21. The rates for concrete shall include for fresh and hardened concrete tests prescribed in the Specifications including making and testing concrete cubes and forwarding the results to the Engineer. Testing to be carried out by a Test Laboratory approved by the Engineer. The Contractor shall maintain a written log of cubes prepared indicating date of testing and results achieved. The Contractor shall designate a qualified person for preparation and follow-up on cube tests in co-ordination with the Engineer / Engineer's Representative.
22. The rates for precast concrete paving shall include for all cutting, bedding, jointing and laying to falls.
23. The rates for precast concrete edging and kerbs shall include for formwork, concrete bed and backing, all cutting, jointing and laying.
24. All formwork must be cleaned and oiled prior to use. All exposed concrete edges shall have a 20 mm chamfer unless otherwise directed and costs deemed to be included in formwork rates. The formwork rates shall also be inclusive of all necessary box outs and cut outs for individual holes up to 1 square metre.

The rates for forming rebates in concrete walls etc. shall include for forming pockets for the fish tail fixing cleats where required.

Deductions from formwork quantities will be made for openings more than 1 square metre in area.

25. Formwork for upper surfaces inclined at 30 degrees or less to the horizontal is not measured and the cost of any such formwork used will be deemed to be included in the relevant concrete item rate.
26. Wrought formwork where specified will be measured to 150 mm below final ground levels.
27. Items required for Structural Joints and Construction Joints shown on drawings shall be paid for as per the rates in the Bills of Quantities; the rate for providing and fixing PVC water bar is deemed to be inclusive of all joints, overlaps, junctions, welding, etc. formwork not shown on drawings shall be deemed to be included in the unit rates for concrete work.
28. All rates and sums in the Bills of Quantities shall be in Kenya Shillings and Cents.
29. If possible, a construction wayleave of up to 9m for the Transmission Mains and construction wayleave of up to 3m for Distribution Mains will generally be allowed. In the event the above-mentioned wayleave widths are not available due to obstructions or restricted access, the Contractor will execute the works using suitable approved alternative methods. The costs for alternative methods are deemed to be covered by bid rates. No additional costs 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, footpaths, boundary walls, fences, trees and the like. Payment shall then be according to the actual area

cleared. In case additional space is required this may be made available by the Contractor at his own cost.

No claim for additional space will be entertained by the Engineer. No claims for inconvenience and the like caused by obstruction will be entertained. The rates shall be deemed to include for reinstatement of fences, gates, etc.

30. All pipe diameters indicated in the Bills of Quantities and on Drawings are nominal. Fittings dimensions to suit size/type of pipes supplied by the Bidder and Bidder's rates are deemed to allow for this. No additional cost adjustment will be allowed.
31. Unless otherwise specified the method of measurement shall be in accordance with the Standard Method of Measurement of Civil Engineering Quantities (CESMM3) published by the Institution of Civil Engineers, London, 1991. In some cases variations to this method have been made to suit local practice. A Contractor shall be deemed to have priced the items accordingly and no claims relating to variation from the method of measurement stated in these documents shall be considered.
32. Items for buildings, electrical and mechanical works are not described using CESMM3 for clarity purposes.
33. All quantities have been measured in Metric Units.
34. Explanation of abbreviations used in the Bills of Quantities are as follows: -

L.S.	-	Lump Sum
P.S.	-	Provisional Sum
P.C.	-	Prime Cost
E.O.	-	Extra Over
Avg.	-	Average
Max.	-	Maximum
Min.	-	Minimum
n.e.	-	Not Exceeding
Nr	-	Number
mm	-	Millimetre
m	-	Linear Metre
m <sup>2</sup>	-	Square Metre
m <sup>3</sup>	-	Cubic Metre
Ha.	-	Hectare
Drg.	-	Drawing
Kg.	-	Kilogramme
H.T.	-	High Tensile
M.S.	-	Mild Steel
B.L.	-	Bitumen Lined
Dia.	-	Diameter
E.C.	-	Epoxy Coated
E.L.	-	Epoxy Lined
S & S	-	Socket & Spigot
C.L.	-	Cement-mortar Lined
C.I.	-	Cast Iron

D.I.	-	Ductile Iron
uPVC	-	Unplasticised Polyvinyl Chloride
G.I.	-	Galvanised Iron
G.M.S.	-	Galvanised Mild Steel
P.E.H.	-	Palothene
PE	-	Polyethylene
Hr.	-	Hour
FE/Fe	-	Ferrous

35. The rates for metalwork shall include for bolts, nuts, washers and rag-bolts, 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.
36. The rates for fixing penstocks and flap valves etc. shall include for bedding and grouting, testing for water tightness, greasing all working parts and leaving in good working order; where the item includes supply, the rates shall also include for supplying drawings for approval before manufacture is commenced.

37. Concrete Works

a) Item : Concrete

Unit : m<sup>3</sup> of each class

Concrete shall be measured by the cubic metre of each class calculated from the dimensions given on the drawings or as instructed by the Engineer.

No deduction shall be made in the measurement for:

- i) bolt holes, pockets, box outs and cast-in components provided that the volume of each is less than 0.15 cubic metres;
- ii) mortar beds, fillets, drip moulds, rebates, recesses, grooves, chamfers and the like of 100 mm total width or less;
- iii) reinforcement.

The rates for concrete shall include for the cost of:

- i) provision and transport of cement, aggregate and water;
- ii) admixtures and workability agents including submission of details unless otherwise specified;
- iii) batching, mixing, transporting, placing, compacting and curing;
- iv) class UF1 finish;
- v) laying to sloping surfaces not exceeding 15 degrees from the horizontal and laying to falls;

- vi) formwork to blinding concrete;
  - vii) placing and compacting against excavated surfaces where required including any additional concrete to fill overbreak or working space;
  - viii) complying with all the requirements of the Specifications.
- b) Item : Blinding Concrete
- Unit : m<sup>3</sup>

Blinding concrete shall be measured by the cubic metre calculated as the product of the plan area of the foundation as shown on the drawings and the instructed thickness. No deduction shall be made for openings provided that the area of each is less than 0.5 square metres. Blinding concrete over hard material shall be measured as the volume used provided that the maximum thickness of 150 mm allowed for overbreak is not exceeded.

The rate for blinding concrete shall include for all costs itemised in Note 37(a) of this Preamble.

- c) Item : No Fines Concrete

Unit : m<sup>3</sup>

No fines concrete shall be measured by the cubic metre calculated from the dimensions given on the drawings or as instructed by the Engineer.

The rate for no fines concrete shall include for all costs stated in Note 37(a) of this Preamble.

- d) Item : Unformed Surface Finishes

Unit : m<sup>2</sup> of each class of finish

Unformed surface finishes shall be measured by the square metre from the dimensions given on the drawings or as instructed by the Engineer.

The rate for concrete in Notes 35(a), (b) and (c) shall include for class UF1 finish.

The rate for unformed surface finishes shall include for the cost of complying with Clause 410 of the Specification.

- e) Item : Formwork for Formed Surface Finishes

Unit : m<sup>2</sup> of formwork for each class of finish for each range of inclinations

Except as stated below, formwork shall be measured by the square metre of formwork actually in contact with the finished face of the concrete. No deduction shall be made in the measurement for openings, pipes, ducts and the like, provided that the area of each is less than 0.50 square metres. Unless otherwise stated, if the volume or area of

concrete has not been deducted when measuring the concrete in accordance with Notes 37(a), (b) and (c), formwork to form or box out the void shall not be measured.

Formwork less than 300 mm high to edges of slabs shall be measured by the linear metre in accordance with Note 37(f) of this Preamble.

Inclined formwork shall be measured in accordance with the following classifications:

- i) Horizontal: 85 to 90 degrees inclination from vertical
- ii) Sloping: 10 to 85 degrees inclination from vertical
- iii) Battered: 0 to 10 degrees inclination from vertical
- iv) Vertical: 0 degrees
- v) Sloping upper surfaces inclined at more than 15 degrees from the horizontal

Formwork required for blinding concrete, to form construction joints and shear keys for future concrete and other construction surfaces shall not be measured and the costs shall be included in the rates for other work.

Formwork to contraction and expansion joints shall be measured by the square metre on one face only. The rates shall include for the costs stated below and for forming recesses for sealant and channels for grout.

The rates for formwork shall include for the cost of submission of details, providing and transporting all materials for formwork and falsework, erection including provision of supports, fillets and chamfers 75 mm and less in width, bolts, ties, fixings, cutting to waste, drilling or notching the formwork for reinforcement where required, working around pipes, ducts, conduits and waterstops, temporary openings, cleaning, dressing, stripping, filling bolt holes and any remedial work and for complying with all the requirements of the Specifications.

- f) Item : Formwork to Edges of Slabs  
Unit : m of each class of finish

Formwork less than 300mm high to edges of slabs shall be measured by the linear metre.

The rate shall include for the costs stated in Note 37 (e) of this Preamble.

- g) Item : Waterstops  
Unit : m of each type

Waterstops shall be measured by the metre run of each type.

The rate for water stops shall include for the provision, installation, jointing, any sealants required at the face of the concrete and for placing and compacting concrete around the waterstop.

- h) Item : Mortar  
Unit : m<sup>2</sup>

Mortar used for bedding base plates and the like shall be measured by square metre as the area of the base plate at the specified nominal thickness of bedding.

Mortar used in filling bolts pockets and the like shall not be measured separately and the costs shall be included in the rates for the bolts.

The rates for mortar shall include for the cost of providing and placing the mortar and of complying with all the requirements of the Specifications.

- i) Item : Admixture Workability and Hardening Agents  
Unit : As specified in the Special Specification

Where required by the Special Specification admixtures, workability and hardening agents shall be measured and paid for in accordance with the Special Specification.

- j) Item : Reinforcement  
Unit : Tonne of each type for each range of diameters

Reinforcement shall be measured separately for each of the following ranges:

- i) of diameter equal to or less than 16mm  
ii) of diameter greater than 16mm

Steel fabric reinforcement shall be measured in accordance with Note 37(k) of this Preamble.

Steel (plain and deformed bars) reinforcement shall be measured by the tonne and shall be the calculated weight of the steel required including splice lengths shown on the drawings. No allowance shall be made in the measurement for rolling margins or cutting waste. The density of steel shall be taken as 7850 kilogrammes per cubic metre.

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 and for complying with all the requirements of the Specifications.



k) Item : Fabric Reinforcement

Unit : m<sup>2</sup> of each type

Steel fabric reinforcement shall be measured by the square metre and shall be the calculated area excluding any allowance for laps.

The rate for steel fabric reinforcement shall include for the costs stated in Note 37(j) of this Preamble.

Sewers, Drains and Pipelines

38. The rates for pipes, pipework and specials shall include for supply of all materials, setting of concrete blocks and hardwood wedges where specified, providing any temporary support that may be necessary, preparing ends of pipes for jointing and all labour in jointing, protection to detachable joints, cleaning pipelines and rectifying as specified any damage to surface coating. The rates shall also include for all cutting of pipes consequent upon structures, specials and fittings being constructed in the designated positions.
39. The rates for concrete surround, bed and haunching to pipes, concrete in anchor blocks to pipes, and to gully pots shall include for all formwork required and for any additional concrete the Contractor may place for his own convenience or by reason of the method of carrying out the work.
40. Pipes, Fittings and Valves – General Specifications are given in applicable International Standards referred to in the following SRNs:
- a) uPVC pipes and fittings to SRN 300 Class ‘E’ (16 bar), or as specified
  - b) Steel pipes and fittings to SRN 210, SRN 212 and SRN 216
  - c) Ductile Iron (DI) pipes and fittings to SRN 202
  - d) Galvanized Iron (GI) pipes and fittings to SRN 203
  - e) Flexible joint spigot and socket precast concrete (PVC) pipes to SRN 409  
Rigid joint spigot and socket pcc pipes to SRN 409  
Ogee joint PCC pipes to SRN 407
  - f) All flanges to SRN 207, NP 16 or as specified
  - g) Gate valves to SRN 501, NP 16 or as specified
  - h) Double orifice air valves as specified  
Single large orifice air valves as specified  
Single small orifice air valves as specified

- i) Fire hydrants to SRN 509
- j) Butterfly valves to SRN 506, NP 16 as specified
- k) Ball float valves as specified
- l) All pipe, fittings and valve diameters indicated are nominal diameters
- m) Supply of pipes and fittings to include for cost of supply of all jointing materials like bolts, nuts, washers, gaskets, packings, jointing glue, etc.
- n) uPVC pipes to be supplied complete with compression joints
- o) Supply of C/L steel pipes to be with flange or push-in joints. If plain ended pipes are offered, one number coupling per length is to be included. Coupling is subject to approval by Project Manager
- p) Ductile Iron pipes to be with push-in type joints
- q) Galvanized Iron pipes to be with threaded coupling joints, or as specified
- r) Precast concrete ogee pipes to be complete with all jointing materials

#### Shop Drawings

41. Detailed shop drawings, in triplicate, to be provided for all items where ferrous pipework, fittings and any metalwork i.e. penstocks, ladders etc., are indicated to be installed as outlined in the bills of quantities and drawings. These drawings to be submitted well in advance of ordering of the above materials and the billed rates are deemed to include for provision of these drawings, samples where requested, and inspection where fabricated by the Engineer or his Representative.

#### Prime Cost Items

42. Attendance on nominated Sub-Contractors shall include for all or any of the following as appropriate - labour, materials and plant required for taking delivery, carting, storing, hoisting and builder's work entailed in fixing, erecting and installing as specified or in accordance with the manufacturer's instructions and all overheads and profits.
43. When, in the opinion of the Engineer, it is reasonable to expect the Contractor to price the attendance item it will be so included in the Bills of Quantities. In all other cases it will form the subject of a Provisional Sum to be expended on a Dayworks basis.
44. Profit shall include for establishment charges, profit and any other costs not included in the attendance item.
45. The rates for the supply of any mechanical and electrical equipment shall include for the submission of factory test results.
46. Definitions of Terms used in Bill of Quantities

- a) **‘Provide’** - shall mean all costs to cover purchase of materials in good condition, services for transaction with the supplier, supervision, transport to site of works all charges for rental, consumptions, overheads and profits throughout the Contract. It shall also include for all maintenance, insurance and handling and storage whenever applicable.
  - b) **‘Excavate for’** - shall mean handling of any material from its incumbent position intended for specified work shown in the drawings or directed by the Project Manager and backfilling and compacting part of material after laying of pipes or erection of structures, and cart away remaining to tips to be provided by the Contractor. The cost for this work shall include all survey, supervision, labour, tools, machinery, protection of work, pumping, insurances and overheads and profits.
  - c) **‘Laying’** - shall cover all work necessary for placing an object or material to true line and level specified in a drawing or as directed by the Engineer.
  - d) **‘Jointing’** - shall mean process of fixing specified material, pipes, fittings and specials together using appropriate tools, material, labour and machinery. It should cover for all work necessary to provide matching of opposite parts in size, shape and position indicated and clamps, seatings and holders to hold firmly.
  - e) **‘Testing’** - shall mean provision of all materials, apparatus, labour, machinery, charges for the media or chemical to be used and their transport, repair of object to be tested if required, re-testing, excavation of any part for visual inspection, erection of any type all until the object has been certified as having passed the required test satisfactorily.
  - f) **‘Install’** - shall include for all work requirements stipulated for "laying" and "jointing". It will cover all expenses for the provision of labour, materials, removal from stores, complete erection, installation, supervision, site testing and commissioning as per the Specifications.
47. The unit rates for the various items listed in the BOQ shall include, except insofar as it is otherwise provided under the Contract, all labour, construction equipment, materials, erection, maintenance, supervision, insurances etc. set forth or implied in the Contract. These are all deemed to include all allowances for waste or surplus of any kind, which are not subject to measurement.
48. The rates to be indicated in the Bills of Quantities shall be inclusive of all applicable Government duties and taxes except Value Added Tax (VAT). The VAT amount shall be added to the Overall Bills Total in the Grand Summary. The Grand Total from the Grand Summary (inclusive of VAT) shall be carried to the Letter of Bid.
49. The Employer’s portion (50%) of DAAB’s fees and expenses shall be covered by the contingencies.

# **BILL OF QUANTITIES**

**Drilling and Equipping of Arbajahan and Admesajida 4Nr Exploratory  
Boreholes and other Civil Works**



Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>BILL NO. 1 - PRELIMINARIES AND GENERAL ITEMS</b>				
	<b>Preliminaries and General Items</b>				
	<b>CLASS A: GENERAL ITEMS</b>				
	<b><u>Contractual requirements</u></b>				
A1.10	Performance security	sum	1		
	<b>INSURANCE</b>				
A1.20	Insurance of the Works	sum	1		
A1.30	Contractor's All Risk Insurance	sum	1		
A1.40	Insurance of Plant and Machinery	sum	1		
A1.50	Allow for the Contractors Employees insurance in line with the Work Injury Benefits Act (WIBA)	sum	1		
	<b>MOBILIZATION</b>				
	<b>i) Personnel</b>				
A2.01	Mobilize contractors' personnel to Arbajahan and Admesajida in Wajir County for the drilling and other civil works as captured in the contract. Rate to include for demobilization of staff on completion of works.	Sum	1		
	<b>ii) Machinery</b>				
A2.02	Mobilize and demobilization of contractor's machinery to Arbajahan and Admesajida Both in Wajir county for civil works. Rate to include for demobilization of machinery on completion of works.	Sum	1		
	<b>iii) Contractors campsite(s)</b>				
A2.03	Allow for Renting/ construction of contractors' campsites at Arbajahan and Admesajida for the entire contract period. Rate to include demolition once works are completed	Sum	1		
	<b>Setting Out</b>				
A2.03	Allow for setting out of works to the Engineers satisfaction	Item	1		
	<b>Attendance Upon the Engineer and his Staff</b>				
	<b>i) Accommodation for Supervision staff</b>				
A2.05	Rent Resident Engineer's accommodation, a 2-bedroom house in approved location and to approved quality of finishes for the duration of the contract. All to the Engineer's approval <b>(Provisional)</b>	month	6	50,000	300,000
A2.06	Rent Assistant Engineer's accommodation 2 no 1-bedroom houses in approved location and to approved quality of finishes for the duration of the assignment. All to the Engineer's approval <b>(Provisional)</b>	month	6	30,000	180,000

Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>ii) Allowances</b>				
A2.07	Allow for site and travel allowances to RE and his staff	<b>Sum</b>	<b>1</b>	<b>700,000</b>	<b>700,000</b>
A2.08	Allow for Upkeep and travel for client's Supervision Staff <b>(Provisional)</b>	<b>Sum</b>	<b>1</b>	<b>200,000</b>	<b>200,000</b>
A2.09	E.O. on items A2.05 to A2.08 for contractor's profits and overhead	<b>%</b>	<b>1,380,000</b>		
	<b>Furniture and Equipment for Resident Engineer's office</b>				
	<b>i) Resident Engineer's office</b>				
A3.11	Allow for Hire/Rent of the Resident Engineers office in Habaswein Town for the entire contract duration. The area of the office to be at least 20m2 as provided for in the specifications	Month			
	<b>ii) Equipment for use by the Engineer's Staff</b>				
A3.31	Establish an Engineers desk (furnished offices for three Engineers) In Habaswein area with equipment (as contained in 101 (a), the equipment list in the specifications document. The office furniture and equipment will be transferred to NWWDA at expiry of the contract.	<b>Prov sum</b>	<b>1</b>	<b>400,000</b>	<b>400,000</b>
A3.32	Maintenance of office equipment including consumables e.g. cartridges, reams of paper, water, lighting, cooling, and refreshment.	<b>Prov sum</b>	<b>1</b>	<b>60,000</b>	<b>60,000</b>
	<b>ii) Transport</b>				
A3.41	Provision of 1No. New 4WD Double Cab (Leased on short term basis) with insurances, fuel, service and driver, of engine capacity ranging between <b>2400 and 3000 CC</b> for use by the Resident Engineer for the duration of the contract. Ownership reverts to Contractor at end of Contract.	<b>Vehicle Month</b>	<b>6</b>	<b>250,000</b>	<b>1,500,000</b>
A3.51	Provision of 1No. New 4WD Double Cab (Leased on short term basis) with insurances, fuel, service and driver, of engine capacity ranging between <b>2400 and 2,800 CC</b> for use by the Resident Engineer's Staff for the duration of the contract. Ownership reverts to Contractor at end of Contract.	<b>Vehicle Month</b>	<b>6</b>	<b>200,000</b>	<b>1,200,000</b>
	<b>Electricity and Water</b>				
A3.61	Allow for connection to water and Electricity	<b>Prov Sum</b>	<b>1</b>	<b>100,000</b>	<b>100,000</b>
	<b>Engineers Suspense account</b>				
A3.62	Allow for Engineers suspense account	<b>Sum</b>	<b>1</b>	<b>300,000</b>	<b>300,000</b>

Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
A3.71	<b>Safeguards</b> Allow for additional ESHS outcomes in accordance to the ESMP works requirement	<b>Prov Sum</b>	<b>1</b>	<b>100,000</b>	<b>100,000</b>
A3.72	Allow for provision of labor influx mitigation measures including sexual exploitation and abuse (SEA)/gender-based violence (GBV) awareness and sensitization training. This in accordance with the ESMP of the project.	<b>Prov Sum</b>	<b>1</b>	<b>100,000</b>	<b>100,000</b>
A3.73	<b>Training</b> Allow for training of operators and NWWDA staff on the operation and maintainable of the borehole water supplies	<b>Prov Sum</b>	<b>1</b>	<b>200,000</b>	<b>200,000</b>
A3.74	E.O. on items A3.31 to A3.73 for contractor's profits and overhead	<b>%</b>	<b>3,960,000</b>		
A3.81	<b>Test Running</b> Allow for test running of the project for a duration of 14 days.	item	1		
A3.91	<b>As Built Drawings and O and M Manuals</b> Allow for provision of O and M manuals	Item	1		
A3.92	Ditto as above but as built drawings	Item	1		
A3.93	<b>Temporary Works</b> Establishment and removal of sign boards (location as directed on site)	nr	2		
A3.94	Site security at Contractor's establishment for the two sites	Month	12		
<b>Preliminary and General Sub Total to Contract Summary</b>					



Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
<b>BILL NO 2 - DRILLING AND CONSTRUCTION OF 4Nr BOREHOLES</b>					
<b>Mobilization</b>					
B1.01	Mobilization of drilling unit from contractors' yard(s) in Wajir County to drilling site, erect at position of borehole, dismantle and demobilize on completion	Sum	1		
B2.02	mobilization of test pumping equipment, erect, dismantle and demobilize on completion	Sum	1		
B2.03	Allow for clearance of site on completion	Sum	1		
<b>Drilling</b>					
B3.01	Drilling a 250mm bore from 0 - 100 m	m	100		
B3.02	Ditto as above but from 100 - 200 m	m	100		
B3.03	Ditto above but from 200 - 350 m	m	150		
B3.04	Allow for collection and sampling of drill cuttings at 2-meter intervals	Ls	1		
<b>Well Construction</b>					
B4.01	Supply and install 204mm internal dia' plain casings in the borehole	m	320		
B4.02	Ditto B4.01 but 204mm diameter slotted casings	m	30		
B4.03	Supply and install gravel pack with average grain size of 2 mm	ton	4		
B4.04	Grouting of top 3 meters of annular space between casing and borehole	Sum	1		
B4.05	Form concrete surface plug around casing with dimensions 1000 x 1000 x 1000 mm	Sum	1		
<b>Well Development and Testing</b>					
B5.01	Well development using air or water jetting as recommended by the Engineer or his appointed representatives	Hr	6		
B5.02	Test pumping	Hr	24		
B5.03	Recovery Test	Hr	8		
B5.04	Supply and install 204 mm diameter well cap	Sum	1		
B5.05	Chemical analysis of water	Sum	1		
<b>Disinfection and Testing of works</b>					
B6.01	Allow for disinfection and testing of works	Sum	1		
<b>Erection of Borehole Gantry</b>					
B7.01	Fabrication and erection of borehole gantry	Sum	1		
<b>Sub Total for One Borehole</b>					
<b>Total for four (4) Borehole to Contract Summary</b>		<b>Nr</b>	<b>4</b>		

Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>BILL NO.3 - SOLAR INSTALLATION FOR TWO (2Nr) SITES</b> <i>Provide all materials as below and any other not included to install an operational Solar system for Admesajida/Arbajahan Borehole site(s)</i>				
K1.01	300 Watts Crystalline Solar Modules/Panels (or equivalent) to produce <b>35KW</b> of power to specifications' and acceptable to the Engineer. Allow for MC4 connectors	Watts	35,000		
K1.02	Allow for purchase and installation of solar sunverter/Inverter to operate the below submersible pump	<b>Prov Sum</b>	<b>1</b>	<b>750,000</b>	<b>750,000</b>
L3.01	Allow for contractor's overheads and profits for the above item	%	<b>750,000</b>		
K2.01	Provide for installation purposes 16mm <sup>2</sup> 2core Amoured cable	m	100		
K2.02	Provide for installation purposes 16mm <sup>2</sup> 4core Amoured cable	m	40		
K2.03	Allow for adequate Electrical cables approximately 60m long with MC4 Connectors	Lump sum	1		
K2.04	Provide, and install a Solar PV disconnect of rating equivalent to the above system power	Nr	1		
K2.05	Provide, and install a Solar PV protect for the above Power system that is compliant with IP 54	Sum	1		
K2.06	Provide, and install a Solar Lighting arrestor sufficient for the above system	Sum	1		
K2.07	PV combiner boxes	sum	4		
	<b>Transportation to site</b>				
K3.01	Allow for transportation of Panels and other Solar equipment to Wajir project site	Sum	1		
	<b>Solar Support structure (Ground mounted system)</b> <i>Provide all the specified material as below and any other necessary, Design and construct a mild steel solar support structure. Rates to include labour and any other material not provided for below</i>				
K4.01	<b>Earthworks</b> Excavate in all material sand for the foundation of all the required steel columns. Rate to include backfilling	m <sup>3</sup>	6		
K5.01	<b>Concrete</b> Provide and place mass concrete class 20(20)	m <sup>3</sup>	1		
K7.01	Provide and Install a Mild steel Solar support structure(s) for all the control panels above. Minimum clearance from the Ground to be at least 1.5m high. Allow for aluminium coating	Sum	1		
	<b>Sub Total for One (1) site</b>				
	<b>Total for two (2) Sites to Contract Summary</b>	<b>Nr</b>	<b>2</b>		

Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>BILL NO.4 - SUBMERSIBLE PUMPS &amp; OTHER &amp; ELECTRO MECHANICAL WORKS FOR TWO (2) BOREHOLES</b>				
	<b>Submersible Pumps</b>				
L1.01	Submersible pump and Motor (Grundfos or equivalent) that are capable of discharging up to <b>21m<sup>3</sup>/hr. against a pumping head of 170m</b> with Engineers approval	Prov Sum	1	750,000	750,000
L2.02	<i>Purchase and installation of a control panel for the above pump</i>	Prov Sum	1	200,000	200,000
L3.01	Allow for contractor's overheads and profits for the two items above	%	<b>950,000</b>		
L4.01	Drop cable 4.0mm dia for installation and connected to pump	m	350		
L4.02	1.5mm <sup>2</sup> 2-Core Underground Cable - Electrodes	m	50		
L4.03	25mm <sup>2</sup> 4 Core UG Cable	m	50		
L4.04	<i>16mm<sup>2</sup> 4 Core UG Cable</i>	m	70		
L4.05	Electrode cable	m	400		
L4.06	65mm diameter GI Pipes Class B	m	370		
	<b>Sub total for One (1) Site</b>				
	<b>Total for two (2) Sites Collection Summary and Sub Total for Electromechanical Works to Summary</b>	nr	2		

Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>BILL NO. 5 - DISTRIBUTION MAINS FOR TWO (2Nr) SITES</b> <i>Refer to the Rising mains dwg</i>				
	<b>Site Clearance</b>				
F1.01	General clearance along pipeline route	m	1,000		
	<b>Trench Excavation</b>				
F2.01	Trench for 63-110 mm ND HDPE Pipes for depth N.E. 1.0M	m	1,000		
	<b>Pipework</b> <i>Supply and Install the following. The cost should include required fitting and joinery material</i>				
F3.01	90mm diameter HDPE PN 10 HDPE pipe in compliance with AWWA Specifications C906.	m	700		
F3.02	Provide for fusion of Joints for the entire length above	Lump sum	1		
	<b>Valves</b>				
F4.01	25 mm flanged single air valve PN 10 fitted to 63mm diameter HDPE Main. Include all the required Fittings	nr	2		
	63mm diameter Valve Sockets	Nr	16		
	<b>Wash outs</b>				
F5.01	32 mm. DN GI washout fitted on 63mm diameter HDPE pipe main. The outfall for scour to be HDPE as per relevant drawing	nr	2		
	<b>Gate Valves</b>				
F6.01	50mm diameter Gate Valve. Include all the required Fittings like adaptors etc.	nr	2		
	<b>Valve Chambers</b> For valve chamber detail refer to relevant drg STD No 017-TYPE-003 Sheets 1 to 4				
F7.01	Valve chamber type 3 depth n.e. 1.0m	nr	3		
F7.02	Valve chamber type 2 depth n.e. 1.0 m	nr	2		
	<b>Sub total for DISTRIBUTION Mains for one site</b>				
	<b>Total for two (2) Sites Collection Summary and Total for DISTRIBUTION Mains to Collection Summary</b>	nr	2		

Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>BILL NO 6 - 100M<sup>3</sup> ELEVATED STEEL TANKS (2Nr)</b>				
	<i>Earth works, concrete works and Tank construction to be done in line with EST drawing number NWWDA/WSDP/002</i>				
	<b>EXCAVATION AND EARTHWORKS</b>				
C1.01	Excavate in any material for tank tower foundation spread and level the excavated materials and stack surplus for re-use as directed	m <sup>3</sup>	100		
C1.02	Spread and level on site as directed or dispose of surplus material	m <sup>3</sup>	50		
C1.03	Trim, spread and level the ground around tank to form suitable drainage of surface water	m <sup>3</sup>	6		
	<b>TANK CONSTRUCTION</b>				
C1.21	Supply and place reinforced concrete 1: 2: 4 as foundation for tank tower. Rate to include for reinforcement bars for the foundation as necessary	m <sup>3</sup>	16		
C1.22	Allow for compliance to other foundation requirements as recommended by the manufacturer	Sum	1		
C1.23	Supply all materials, tools and equipment and erect a 100m <sup>3</sup> steel sectional tank of the Braithwaite type or equally approved standard include a tank tower of 12 meters, ladder with ladder guard inside ladder, walkway with walkway guard, water level gauge and tank cover, provision of air vent, support rails, inlets and outlet for pipes etc., for complete installation	No	1		
	<b>PIPES AND SPECIALS</b>				
	All pipes and specials shall comply with the requirements of BS 5950. Allow for gaskets, nuts, washers, bolts, cutting and threading on site				
	Provide, fix and test following: (All screwed flanges listed separately)				
	<b>INLET</b>				
C2.01	100mm G.S. flanged socket adaptor	No	1		
C2.02	100mm 65 G.S. 90° bend	No	2		
C2.03	100mm dia flange	No	10		
C2.04	100mm ball valve Glenfield Gate	No.	1		
C2.05	100mm G.S pipe	m	5		
	<b>Sub Total carried forward to next page</b>				

Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>Sub Total Brought Forward from previous Page</b>				
	<b>OVERFLOW AND SCOUR</b>				
C3.01	100mm G.S 90° bend	No.	1		
C3.02	100mm equal tee	No.	1		
C3.03	100mm flanged sluice Valve	No.	1		
C3.04	100mm G.S pipe	m	5		
C3.05	100mm G.S screwed flange	No.	10		
	<b>OUTLET</b>				
C4.01	100mm flanged G.S steel 90° duck foot bend	No.	1		
C4.02	100mm flanged G.S steel, length 8500mm	No.	1		
C4.03	100mm steel flanged spigot adaptor	No.	1		
C4.04	2100mm long G.S pipe diameter 100mm	m	2		
C4.05	100mm diameter rose strainer or equivalent	No.	1		
	<b>PAINTING</b>				
C5.01	Allow for the complete installation to be painted as recommended by the manufacturers or the engineer	Ls	1		
	<b>TESTING AND STERILISING</b>				
C6.01	Test and sterilize tank including the necessary chemicals	Ls	1		
	<b>Subtotal for One (1 Nr) 100m<sup>3</sup> TANK</b>				
	<b>Total for two (2 Nr) 100m<sup>3</sup> TANKS transferred to summary page</b>	<b>Nr</b>	<b>2</b>		

Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>BILL NO. 7 - WATER KIOSKS (2 Nr)</b>				
	<i>Earth works, concrete works and Water Kiosk construction to be done in line with Water Kiosk drawing number NWWDA/WSDP/001</i>				
	<b>Excavations and Earthworks</b>				
D1.01	Excavate over site not exceeding 150mm deep, remove and deposit as directed.	m <sup>3</sup>	1.8		
D1.02	Excavate foundation trench not exceeding 0.8m deep	m <sup>3</sup>	7		
D1.03	Extra over "ditto" for excavation within rocky formation	m <sup>3</sup>	3.5		
D1.04	Backfill and ram	m <sup>3</sup>	3		
D1.05	Cart away remaining excavated earth material and deposit within site as directed.	m <sup>3</sup>	5.3		
	<b>SUB-STRUCTURE;</b>				
	<b><u>STRIP FOUNDATIONS 600mm WIDE &amp; 150mm THICK;</u></b>				
D2.01	Reinforced concrete 1:2:4 in foundations	m <sup>3</sup>	2		
D2.02	10mm dia. Reinforcements bars	Kgs	58		
	<b>WALLING IN 1:3 GAUGED MORTAR;</b>				
D3.01	225mm thick Concrete Block walling	m <sup>2</sup>	12		
D3.02	Hoop iron belt reinforcement	Kgs	3		
	<b><u>Floor Slab</u></b>				
D3.03	250mm thick, approved hardcore	m <sup>3</sup>	2		
D3.04	50mm thick, mass concrete 1:4:8 blinding	m <sup>3</sup>	0.3		
D3.05	100mm thick Reinforced concrete 1:2:4 floor slab	m <sup>3</sup>	0.729		
D3.06	Allow for A 142 steel reinforcement Mesh	m <sup>2</sup>	8		
D3.07	Damp Proof Membrane	m <sup>2</sup>	6		
D3.08	Form work to sides of floor slab	m <sup>2</sup>	1.5		
	<b>Sub Total for Water Kiosk C/F to Next Page</b>				

Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>Sub Total for Water Kiosk B/F from Previous Page</b>				
	<b>BILL NO 7: WATER KIOSKS (2Nr) CONT</b>				
	<b><u>Walling</u></b>				
D3.09	D.P.C. under walling	m	16		
D3.10	225mm thick Concrete Block walling	m <sup>2</sup>	10		
D3.11	Waste water collection and drainage area walling	m <sup>2</sup>	2.5		
	<b>Columns</b>				
	<b><u>Concrete for Roofing Slab, Beams and Columns</u></b>				
D4.01	Class 20(20) Reinforced Concrete for slab and Ring Beams	m <sup>3</sup>	3.03		
D4.02	1,700x400x300mm reinforced concrete for raised Apron	m <sup>3</sup>	0.25		
	<b>Reinforcement Bars</b>				
D4.03	12mm dia Reinforcement bars for Ring beam and columns	Kg	115		
D4.04	10mm dia Reinforcement bars for roof slab	Kg	120		
D4.05	6mm dia MS Reinforcement bars as stir ups	Kg	22		
	<b>Formwork</b>				
D4.05	Provide for form work along soffit and sides of ring beams	m <sup>2</sup>	15		
D4.08	Provide for form work along soffit and sides of R.C roof	m <sup>2</sup>	9		
D4.09	Excavate and cover with a RC slab a 1000x1000x2000mm soak pit	Item	1		
D4.10	Construct one, 1700x500x75mm RC Kiosk counter reinforced with 50x50mm wire mesh	Item	1		
	<b><u>FIXTURES:</u></b>				
	<b><u>Doors &amp; windows: -</u></b>				
D5.01	Standard 850 x 2100mm steel casement door complete with frame and locks	No	1		
D5.02	Upward opening 1000high x 800mm wide steel casement window that opens and closes in vertical swing motion complete with frame, protective burglar proofing and locks	No	1		
	<b><u>Finishes</u></b>				
D6.01	20mm cement sand 1:3 plaster applied in 3 layers	m <sup>2</sup>	45		
D6.02	50mm cement: sand 1:3 floor screed placed in 2 layers	m <sup>2</sup>	4.6		
	<b>Sub Total for Water Kiosk C/F to Next Page</b>				



Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>Sub Total for Water Kiosk B/F from Previous Page</b>				
D6.03	Include red oxide powder	m <sup>2</sup>	4.6		
D6.04	Red oxide floor polish	m <sup>2</sup>	4.6		
D6.05	Emulsion paints	m <sup>2</sup>	45		
D6.06	Enamel paints	m <sup>2</sup>	38		
	<b>Plumbing &amp; Pipe Fitting</b>				
	<i>Connection of the following pipes, fittings, and appurtenances</i>				
D7.01	50mm dia. G.I. tee	No	1		
D7.02	'Ditto' nipples	No	1		
D7.03	'Ditto' union	No	1		
D7.04	50 x25mm dia. Reducing bush	No	1		
D7.05	25mm dia. G.I. nipple	No	1		
D7.06	'Ditto' Gate valve	No	1		
D7.07	'Ditto' Union	No	1		
D7.08	'Ditto' class 'B' pipe	m	6		
D7.09	'Ditto' 90 <sup>0</sup> bends, M-F	No	4		
D7.10	25 x20mm dia. G.I. Reducing bush	No	1		
D7.11	20mm dia. G.I. nipples	No	9		
D7.12	'Ditto' Unions	No	5		
D7.13	'Ditto' Sockets	No	6		
D7.14	'Ditto' Tees	No	4		
D7.15	'Ditto' Gate valves	No	5		
D7.16	'Ditto' Plug	No	1		
D7.17	'Ditto' class 'B' pipe	m	6		
D7.18	'Ditto' 90 <sup>0</sup> Elbows, F-F	No	4		
D7.19	Allow for connection of Water Kiosk to the new 75/80mm Water Distribution Pipeline	Item	1		
	<b>PVC Tank mounted over R. C. Roof and accessories:</b>				
D8.01	Purchase and Installation of plastic tank 5,000 Litres on the roof slab of the water kiosk as shown in the drawings	Nr	1		
	<b>Sub Total for one Water Kiosk with Tank on Roof slab</b>				
	<b>Total for two (2Nr) Water Kiosks</b>	<b>No</b>	<b>2</b>		

Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>BILL NO. 8 - FENCING OF BOREHOLE SITES (4Nr)</b>				
	<i>Provide all material below and construct a <b>12-gauge</b> chainlink fence restrained with barbed wire and with a double leaf Gate to details in the drawing refence number NWWDA/WSDP/003</i>				
	<i>Concrete Posts to be made from class 20 concrete according to BS 8110</i>				
I1.01	Specified concrete fence post	nr	100		
I1.02	Bracing posts	nr	24		
I1.03	Chain link fencing	m	300		
I1.04	4 strands of Restraining barbed wire	m	400		
I1.05	Concrete Gate posts	nr	2		
I1.06	4 m wide double leaf gate	nr	1		
	<b>Sub Total for Fencing of one site</b>				
	<b>Total for Fencing of 4Nr sites</b>	<b>Nr</b>	<b>4</b>		

Item No.	Description	Unit	Qty	Rate (Kshs)	Amount (Kshs)
	<b>BILL NO 9: CATTLE TROUGHS (4Nr)</b>				
	<b>Excavations</b>				
E1.01	Excavation including maintain and supporting sides and keeping free from water, mud and fallen materials by bailing, pumping or otherwise	m	12		
E1.02	Excavate bulk for pit 0.00-1.5 meters	m <sup>3</sup>	21.7		
E1.03	Remove surplus excavated material from site	m <sup>3</sup>	21.7		
	<b>Hardcore filling</b>				
E2.01	Supply, fill and ram 300mm thick approved Hardcore	Ton	2		
	<b>Concrete work</b>				
	<b>Concrete in foundations</b>				
E3.01	Mass concrete class 15 for strip foundations	m <sup>3</sup>	0.8		
E3.02	10mm diameter reinforcement bars 150mm c/c	m	11		
E3.03	100mm thick reinforced concrete slab class 20(20) to Bs 8110	m <sup>3</sup>	1.3		
E3.04	Timber shattering provided to sides of floor slab	m	30		
E3.05	Wire mesh Reinforcement	m <sup>2</sup>	12.1		
	<b>Walling</b>				
E4.01	225 mm Thick (building stones /rubble/interlocking soil blocks) walling in cement and sand mortar (1:3)	m <sup>2</sup>	13.2		
	<b>Finishes</b>				
	<b>Wall finishes</b>				
	<b>Cement and sand (1:3) render as described in:</b>				
E5.01	13mm Thick with finish to masonry walling	m <sup>2</sup>	13.2		
E5.02	25mm thick floor finish	m <sup>2</sup>	11		
	<b>Others</b>				
	<b>50mm diameter GI pipes and fittings</b>				
E6.01	GI class B pipe	m	50		
E6.02	GI Barrel Nipples	No	6		
E6.03	GI Sockets	No	4		
E6.04	GI Unions	No	3		
E6.05	GI Gate Valves	No	2		
E6.06	GI Ball valve	No	1		
E6.07	GI Elbows	No	4		
	<b>Subtotal for one (1 Nr) Cattle Trough</b>				
	<b>Total for four (4) Nr cattle troughs</b>	<b>Nr</b>	<b>4</b>		

<b>DRILLING AND EQUIPPING EXPLORATORY BOREHOLES SUMMARY</b>		
<b>S/ NR</b>	<b>BILL NAME</b>	<b>AMOUNT</b>
		<b>KES</b>
1	Preliminary and General Items	
2	Drilling and Construction of 4Nr Boreholes	
3	Solar Installation for two (2Nr) Sites	
4	Submersible Pumps & Other E/M Works for two (2 Nr) Boreholes	
5	Distribution Mains for two (2 Nr) Sites	
6	100m <sup>3</sup> Elevated Steel Tanks (2Nr)	
7	Water Kiosks (2Nr)	
8	Fencing of Boreholes sites (4Nr)	
9	Cattle troughs (4Nr)	
10	<b>Sub Total</b>	
11	Add 16% VAT	
<b>12</b>	<b>Grand Total</b>	



### R. Schedule of Payment Currencies

For .....insert name of Section of the Works

Separate tables may be required if the various sections of the Works (or of the Bill of Quantities) will have substantially different foreign and local currency requirements. The Employer should insert the names of each Section of the Works.

	A	B	C	D
Name of Payment Currency	Amount of Currency	Rate of Exchange to Local Currency	Local Currency Equivalent $C = A \times B$	Percentage of Total Bid Price (TBP) $\frac{100 \times C}{TBP}$
Local currency _____		1.00		
Foreign Currency #1 _____				
Foreign Currency #2 _____				
Foreign Currency #3 _____				
<b>Total Bid Price</b>				<b>100.00</b>
Provisional Sums Expressed in Local Currency		1.00		
<b>TOTAL BID PRICE (Including provisional sum)</b>				

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**Schedule(s) of Adjustment Data**

**– Not Applicable**

## Form of Bid Security (Bank Guarantee)

*[Guarantor letterhead or SWIFT identifier code]*

**To:** Chief Executive Officer  
Northern Water Works Development Agency  
P.O Box 495-70100,  
**Garissa**

**Invitation for Bids No: KE-NWWDA-229129-CW-RFB**

**Date:** *[Insert guarantee reference number]*

**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 of the Bidder, which in the case of a joint venture shall be the name of the joint venture (whether legally constituted or prospective) or the names of all members thereof]* (hereinafter called "the Applicant") has submitted or will submit to the Beneficiary its bid (hereinafter called "the Bid") for the execution **Drilling and Equipping of Arbajahan and Admesajida 4Nr Exploratory Boreholes and other Civil Works** under Invitation for Bids No. **KE-NWWDA-229129-CW-RFB** ("the IFB").

Furthermore, we understand that, according to the Beneficiary's conditions, bids must be supported by a bid guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in letters]* (*insert amount in numbers*) upon receipt by us of the Beneficiary's complying supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating either that the Applicant:

- (a) has withdrawn its bid prior to the Bid validity expiry date specified by the Applicant in the Letter of Bid, or any extended date provided by the Applicant; or
- (b) having been notified of the acceptance of its Bid by the Beneficiary prior to the expiry date of the Bid validity or any extension thereto provided by the Applicant, (i) fails to execute the Contract Agreement or (ii) fails to furnish the performance security, and, if required, the Environmental and Social (ES) Performance Security, in accordance with the Instructions to Bidders ("ITB") of the Beneficiary's bidding document.

This guarantee will expire: (a) if the Applicant is the successful Bidder, upon our receipt of copies of the contract agreement signed by the Applicant and the performance security and, if required, the Environmental and Social, Safety (ES) Performance Security, issued to the Beneficiary upon the instruction of the Applicant; and (b) if the Applicant is not the successful Bidder, upon the



earlier of (i) our receipt of a copy of the Beneficiary's notification to the Applicant of the results of the bidding process; or (ii) twenty-eight days after the expiry date of the Bid validity.

Consequently, any demand for payment under this guarantee must be received by us at the office indicated above on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758.

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*[signature(s)]*

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# Technical Proposal

## Technical Proposal Forms

- **Key Personnel Schedule**
- 
- **Equipment**
- 
- **Site Organization**
- 
- **Method Statement**
- 
- **Mobilization Schedule**
- 
- **Construction Schedule**
- 
- **ESHS Management Strategies and Implementation Plans**
- 
- **Code of Conduct (ESHS)**
- 
- **Others**

## Form PER -1

### Key Personnel Schedule

Bidders should provide the names and details of the suitably qualified Key Personnel to perform the Contract. The data on their experience should be supplied using the Form PER-2 below for each candidate.

#### Key Personnel

<b>1.</b>	<b>Title of position:</b>	
	<b>Name of candidate:</b>	
	<b>Duration of appointment:</b>	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	<b>Time commitment for this position:</b>	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	<b>Expected time schedule for this position:</b>	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
<b>2.</b>	<b>Title of position:</b> <i>[Environmental Specialist]</i>	
	<b>Name of candidate:</b>	
	<b>Duration of appointment:</b>	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	<b>Time commitment for this position:</b>	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	<b>Expected time schedule for this position:</b>	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
<b>3.</b>	<b>Title of position:</b> <i>[Health and Safety Specialist]</i>	
	<b>Name of candidate:</b>	
	<b>Duration of appointment:</b>	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	<b>Time commitment for this position:</b>	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	<b>Expected time schedule for this position:</b>	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
<b>4.</b>	<b>Title of position:</b> <i>[Social Specialist]</i>	
	<b>Name of candidate:</b>	
	<b>Duration of appointment:</b>	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>

	<b>Time commitment for this position:</b>	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	<b>Expected time schedule for this position:</b>	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
5.	<b>Title of position: Sexual Exploitation, Abuse and Harassment Expert</b> <i>[Where a Project SEA risks are assessed to be substantial or high, Key Personnel shall include an expert with relevant experience in addressing sexual exploitation, sexual abuse and sexual harassment cases]</i>	
	<b>Name of candidate</b>	
	<b>Duration of appointment:</b>	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	<b>Time commitment for this position:</b>	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	<b>Expected time schedule for this position:</b>	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>
6.	<b>Title of position:</b> <i>[insert title]</i>	
	<b>Name of candidate</b>	
	<b>Duration of appointment:</b>	<i>[insert the whole period (start and end dates) for which this position will be engaged]</i>
	<b>Time commitment for this position:</b>	<i>[insert the number of days/week/months/ that has been scheduled for this position]</i>
	<b>Expected time schedule for this position:</b>	<i>[insert the expected time schedule for this position (e.g. attach high level Gantt chart)]</i>

## Form PER-2:

### Resume and Declaration Key Personnel

<b>Name of Bidder</b>
-----------------------

<b>Position [#I]:</b> <i>[title of position from Form PER-1]</i>
--

<b>Personnel information</b>	<b>Name:</b>	<b>Date of birth:</b>
	<b>Address:</b>	<b>E-mail:</b>
	<b>Professional qualifications:</b>	
	<b>Academic qualifications:</b>	
	<b>Language proficiency:</b> <i>[language and levels of speaking, reading and writing skills]</i>	
<b>details</b>	<b>Address of employer:</b>	
	<b>Telephone:</b>	<b>Contact (manager / personnel officer):</b>
	<b>Fax:</b>	
	<b>Job title:</b>	<b>Years with present employer:</b>

Summarize professional experience in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

Project	Role	Duration of involvement	Relevant experience
<i>[main project details]</i>	<i>[role and responsibilities on the project]</i>	<i>[time in role]</i>	<i>[describe the experience relevant to this position]</i>

## Declaration

I, the undersigned Key Personnel, certify that to the best of my knowledge and belief, the information contained in this Form PER-2 correctly describes myself, my qualifications and my experience.

I confirm that I am available as certified in the following table and throughout the expected time schedule for this position as provided in the Bid:

<b>Commitment</b>	<b>Details</b>
<b>Commitment to duration of contract:</b>	<i>[insert period (start and end dates) for which this Key Personnel is available to work on this contract]</i>
<b>Time commitment:</b>	<i>[insert the number of days/week/months/ that this Key Personnel will be engaged]</i>

I understand that any misrepresentation or omission in this Form may:

- (a) be taken into consideration during Bid evaluation;
- (b) my disqualification from participating in the Bid;
- (c) my dismissal from the contract.

**Name of Key Personnel:** *[insert name]*

Signature: \_\_\_\_\_

Date: (day month year): \_\_\_\_\_

**Countersignature of authorized representative of the Bidder:**

Signature: \_\_\_\_\_

Date: (day month year): \_\_\_\_\_

## Equipment

The Bidder shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in Section III (Evaluation and Qualification Criteria). A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Bidder. The Bidder shall provide all the information requested below, to the extent possible. Fields with asterisk (\*) shall be used for evaluation.

<b>Type of Equipment*</b>		
<b>Equipment Information</b>	<b>Name of manufacturer,</b>	<b>Model and power rating</b>
	<b>Capacity*</b>	<b>Year of manufacture*</b>
<b>Current Status</b>	<b>Current location</b>	
	<b>Details of current commitments</b>	
<b>Source</b>	<b>Indicate source of the equipment</b> <input type="checkbox"/> Owned <input type="checkbox"/> Rented <input type="checkbox"/> Leased <input type="checkbox"/> Specially manufactured	

The following information shall be provided only for equipment not owned by the Bidder.

<b>Owner</b>	<b>Name of owner</b>	
	<b>Address of owner</b>	
	<b>Telephone</b>	<b>Contact name and title</b>
	<b>Fax</b>	<b>Telex</b>
<b>Agreements</b>	<b>Details of rental / lease / manufacture agreements specific to the project</b>	

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## **Site Organization**

*[Insert Site Organization information]*



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## Method Statement

The Bidder shall provide a detailed and comprehensive Method Statement with his Bid showing how he proposes to execute the Works, including but not limited to:

1. Project Planning and Management including details of number(s) and location(s) of Proposed Contractor's Camp(s) and Store(s).
2. Statement of Commitment and Bidder's proposed Procedures to comply with the labour standards of the International Labour Organization (ILO).
3. Method Statement of the Bidder's proposed Operational Safety and Health (OSH) Procedures and CV of designated person(s) in charge.
4. Description of the Bidder's proposed Quality Assurance System and CV of designated person(s) in charge.
5. Method Statement of the Bidder's proposed Environmental Management System at the construction site(s), including the organizational structure thereof and an outline of the resources to ensure compliance with the requirements and conditions of the project's Environmental Management Plan, relative to at least:
  - Waste management,
  - Noise and excessive vibrations pollution control, and air pollution control,
  - Water quality,
  - Operational Safety and Health (OSH) measures, Personal Protection Equipment (PPE) and related training, and sanitary facilities for workers,
  - Traffic Management Plan.
6. Method Statement for Rock Excavation in areas where blasting is not allowed.
7. Method Statement for Public Safety / Public Relations.

Any other Method Statement required by specific items in the Bills of Quantities

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## **Mobilization Schedule**

In accordance with the Particular Conditions, Sub-Clause 4.1, the Contractor shall not carry out mobilization to Site unless the Engineer gives consent that appropriate measures are in place to address environmental and social risks and impacts, which at a minimum shall include applying the Management Strategies and Implementation Plans (MSIPs) and Code of Conduct for Contractor's Personnel, submitted as part of the Bid and agreed as part of the Contract

## **Construction Schedule**

*[insert Construction Schedule]*

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## **ES Management Strategies and Implementation Plans**

### **(ES-MSIP)**

The Bidder shall submit comprehensive and concise Environmental and Social Management Strategies and Implementation Plans (ES-MSIP) as required by ITB 11.1 (h) of the Bid Data Sheet. These strategies and plans shall describe in detail the actions, materials, equipment, management processes etc. that will be implemented by the Contractor, and its subcontractors.

In developing these strategies and plans, the Bidder shall have regard to the ES provisions of the contract including those as may be more fully described in the Works Requirements in Section VII.

## Code of Conduct for Contractor's Personnel (ES) Form

### *Note to the Employer:*

*The following minimum requirements shall not be modified. The Employer may add additional requirements to address identified issues, informed by relevant environmental and social assessment.*

*The types of issues identified could include risks associated with: labor influx, spread of communicable diseases, and Sexual Exploitation and Abuse (SEA), Sexual Harassment (SH) etc.*

*Delete this Box prior to issuance of the bidding documents.*

### **Note to the Bidder:**

**The minimum content of the Code of Conduct form as set out by the Employer shall not be substantially modified.** However, the Bidder may add requirements as appropriate, including to take into account Contract-specific issues/risks.

The Bidder shall initial and submit the Code of Conduct form as part of its bid.

## CODE OF CONDUCT FOR CONTRACTOR'S PERSONNEL

We are the Contractor, [*enter name of Contractor*]. We have signed a contract with [*enter name of Employer*] for [*enter description of the Works*]. These Works will be carried out at [*enter the Site and other locations where the Works will be carried out*]. Our contract requires us to implement measures to address environmental and social risks related to the Works, including the risks of sexual exploitation, sexual abuse and sexual harassment.

This Code of Conduct is part of our measures to deal with environmental and social risks related to the Works. It applies to all our staff, laborers and other employees at the Works Site or other places where the Works are being carried out. It also applies to the personnel of each subcontractor and any other personnel assisting us in the execution of the Works. All such persons are referred to as “**Contractor's Personnel**” and are subject to this Code of Conduct.

This Code of Conduct identifies the behavior that we require from all Contractor's Personnel.

Our workplace is an environment where unsafe, offensive, abusive or violent behavior will not be tolerated and where all persons should feel comfortable raising issues or concerns without fear of retaliation.

### **REQUIRED CONDUCT**

Contractor's Personnel shall:

1. carry out his/her duties competently and diligently;
2. comply with this Code of Conduct and all applicable laws, regulations and other requirements, including requirements to protect the health, safety and well-being of other Contractor's Personnel and any other person;
3. maintain a safe working environment including by:
  - a. ensuring that workplaces, machinery, equipment and processes under each person's control are safe and without risk to health;
  - b. wearing required personal protective equipment;
  - c. using appropriate measures relating to chemical, physical and biological substances and agents; and
  - d. following applicable emergency operating procedures.
4. report work situations that he/she believes are not safe or healthy and remove himself/herself from a work situation which he/she reasonably believes presents an imminent and serious danger to his/her life or health;
5. treat other people with respect, and not discriminate against specific groups such as women, people with disabilities, migrant workers or children;
6. not engage in Sexual Harassment, which means unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature with other Contractor's or Employer's Personnel;
7. not engage in Sexual Exploitation, which means any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another;
8. not engage in Sexual Abuse, which means the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions;
9. not engage in any form of sexual activity with individuals under the age of 18, except in case of pre-existing marriage;
10. complete relevant training courses that will be provided related to the environmental and social aspects of the Contract, including on health and safety matters, and Sexual Exploitation and Abuse (SEA), and Sexual Harassment (SH);
11. report violations of this Code of Conduct; and
12. not retaliate against any person who reports violations of this Code of Conduct, whether to us or the Employer, or who makes use of the grievance mechanism for Contractor's Personnel or the project's Grievance Redress Mechanism.

### **RAISING CONCERNS**

If any person observes behavior that he/she believes may represent a violation of this Code of Conduct, or that otherwise concerns him/her, he/she should raise the issue promptly. This can be done in either of the following ways:

1. Contact [*enter name of the Contractor's Social Expert with relevant experience in handling gender-based violence, or if such person is not required under the Contract, another individual designated by the Contractor to handle these matters*] in writing at this address [ ] or by telephone at [ ] or in person at [ ]; or

2. Call [ ] to reach the Contractor's hotline (*if any*) and leave a message.

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. We take seriously all reports of possible misconduct and will investigate and take appropriate action. We will provide warm referrals to service providers that may help support the person who experienced the alleged incident, as appropriate.

There will be no retaliation against any person who raises a concern in good faith about any behavior prohibited by this Code of Conduct. Such retaliation would be a violation of this Code of Conduct.

### **CONSEQUENCES OF VIOLATING THE CODE OF CONDUCT**

Any violation of this Code of Conduct by Contractor's Personnel may result in serious consequences, up to and including termination and possible referral to legal authorities.

#### **FOR CONTRACTOR'S PERSONNEL:**

I have received a copy of this Code of Conduct written in a language that I comprehend. I understand that if I have any questions about this Code of Conduct, I can contact [*enter name of Contractor's contact person with relevant experience*] requesting an explanation.

Name of Contractor's Personnel: [insert name]

Signature: \_\_\_\_\_

Date: (day month year): \_\_\_\_\_

Countersignature of authorized representative of the Contractor:

Signature: \_\_\_\_\_

Date: (day month year): \_\_\_\_\_

**ATTACHMENT 1: Behaviors constituting Sexual Exploitation and Abuse (SEA) and behaviors constituting Sexual Harassment (SH)**

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**ATTACHMENT 1 TO THE CODE OF CONDUCT FORM****BEHAVIORS CONSTITUTING SEXUAL EXPLOITATION AND ABUSE (SEA) AND  
BEHAVIORS CONSTITUTING SEXUAL HARASSMENT (SH)**

The following non-exhaustive list is intended to illustrate types of prohibited behaviors:

(1) **Examples of sexual exploitation and abuse** include, but are not limited to:

- A Contractor's Personnel tells a member of the community that he/she can get them jobs related to the work site (e.g. cooking and cleaning) in exchange for sex.
- A Contractor's Personnel that is connecting electricity input to households says that he can connect women headed households to the grid in exchange for sex.
- A Contractor's Personnel rapes, or otherwise sexually assaults a member of the community.
- A Contractor's Personnel denies a person access to the Site unless he/she performs a sexual favor.
- A Contractor's Personnel tells a person applying for employment under the Contract that he/she will only hire him/her if he/she has sex with him/her.

(2) **Examples of sexual harassment in a work context**

- Contractor's Personnel comment on the appearance of another Contractor's Personnel (either positive or negative) and sexual desirability.
- When a Contractor's Personnel complains about comments made by another Contractor's Personnel on his/her appearance, the other Contractor's Personnel comment that he/she is "asking for it" because of how he/she dresses.
- Unwelcome touching of a Contractor's or Employer's Personnel by another Contractor's Personnel.
- A Contractor's Personnel tells another Contractor's Personnel that he/she will get him/her a salary raise, or promotion if he/she sends him/her naked photographs of himself/herself.



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## Others

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## **Bidder's Qualification**

To establish its qualifications to perform the contract in accordance with Section III (Evaluation and Qualification Criteria) the Bidder shall provide the information requested in the corresponding Information Sheets included hereunder

## Form ELI -1.1: Bidder Information Form

Date: \_\_\_\_\_  
 ICB No. and title: \_\_\_\_\_  
 Page \_\_\_\_\_ of \_\_\_\_\_ pages

Bidder's name
In case of Joint Venture (JV), name of each member:
Bidder's actual or intended country of registration: <i>[indicate country of Constitution]</i>
Bidder's actual or intended year of incorporation:
Bidder's legal address [in country of registration]:
Bidder's authorized representative information Name: _____ Address: _____ Telephone/Fax numbers: _____ E-mail address: _____
R. Attached are copies of original documents of <input type="checkbox"/> Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above, in accordance with ITB 4.3. <input type="checkbox"/> In case of JV, letter of intent to form JV or JV agreement, in accordance with ITB 4.1. <input type="checkbox"/> In case of Government-owned enterprise or institution, in accordance with ITB 4.5 documents establishing: <ul style="list-style-type: none"> <li>• Legal and financial autonomy</li> <li>• Operation under commercial law</li> <li>• Establishing that the Bidder is not dependent agency of the Employer</li> </ul>
2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

## Form ELI -1.2: Information Form for JV Bidders

(to be completed for each member of Joint Venture)

Date: \_\_\_\_\_

ICB No. and title: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_ pages

Bidder's Joint Venture name:
JV member's name:
JV member's country of registration:
JV member's year of constitution:
JV member's legal address in country of constitution:
JV member's authorized representative information Name: _____ Address: _____ Telephone/Fax numbers: _____ E-mail address: _____
<b>R.</b> Attached are copies of original documents of <ul style="list-style-type: none"> <li><input type="checkbox"/> Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above, in accordance with ITB 4.3.</li> <li><input type="checkbox"/> In case of a Government-owned enterprise or institution, documents establishing legal and financial autonomy, operation in accordance with commercial law, and absence of dependent status, in accordance with ITB 4.5.</li> </ul> 2. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

## Form CON – 2: Historical Contract Non-Performance, Pending Litigation and Litigation History

Bidder's Name: \_\_\_\_\_

Date: \_\_\_\_\_

Joint Venture Member's Name \_\_\_\_\_

ICB No. and title: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_ pages

Non-Performed Contracts in accordance with Section III, Evaluation and Qualification Criteria			
<input type="checkbox"/> Contract non-performance did not occur since 1 <sup>st</sup> January <i>[insert year]</i> specified in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.1.			
<input type="checkbox"/> Contract(s) not performed since 1 <sup>st</sup> January <i>[insert year]</i> specified in Section III, Evaluation and Qualification Criteria, requirement 2.1			
Year	Non-performed portion of contract	Contract Identification	Total Contract Amount (current value, currency, exchange rate and US\$ equivalent)
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for nonperformance: <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>
Pending Litigation, in accordance with Section III, Evaluation and Qualification Criteria			
<input type="checkbox"/> No pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3.			
<input type="checkbox"/> Pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3 as indicated below.			

<b>Year of dispute</b>	<b>Amount in dispute (currency)</b>	<b>Contract Identification</b>	<b>Total Contract Amount (currency), USD Equivalent (exchange rate)</b>
		Contract Identification: _____ Name of Employer: _____ Address of Employer: _____ Matter in dispute: _____ Party who initiated the dispute: _____  Status of dispute: _____	
		Contract Identification: Name of Employer: Address of Employer: Matter in dispute: Party who initiated the dispute: Status of dispute:	
Litigation History in accordance with Section III, Evaluation and Qualification Criteria			
<input type="checkbox"/> No Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4. <input type="checkbox"/> Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4 as indicated below.			
<b>Year of award</b>	<b>Outcome as percentage of Net Worth</b>	<b>Contract Identification</b>	<b>Total Contract Amount (currency), USD Equivalent (exchange rate)</b>
<i>[insert year]</i>	<i>[insert percentage]</i>	Contract Identification: <i>[indicate complete contract name, number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Matter in dispute: <i>[indicate main issues in dispute]</i> Party who initiated the dispute: <i>[indicate "Employer" or "Contractor"]</i> Reason(s) for Litigation and award decision <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>

## Form CON – 3: Environmental and Social Performance Declaration

*[The following table shall be filled in for the Bidder, each member of a Joint Venture and each Specialized Subcontractor]*

Bidder's Name: *[insert full name]*

Date: *[insert day, month, year]*

Joint Venture Member's or Specialized Subcontractor's Name: *[insert full name]*

ICB No. and title: *[insert ICB number and title]*

Page *[insert page number]* of *[insert total number]* pages

Environmental and Social Performance Declaration in accordance with Section III, Qualification Criteria, and Requirements			
<input type="checkbox"/> <b>No suspension or termination of contract:</b> An employer has not suspended or terminated a contract and/or called the performance security for a contract for reasons related to Environmental, or Social (ES) performance since the date specified in Section III, Qualification Criteria, and Requirements, Sub-Factor 2.5.			
<input type="checkbox"/> <b>Declaration of suspension or termination of contract:</b> The following contract(s) has/have been suspended or terminated and/or Performance Security called by an employer(s) for reasons related to Environmental or Social (ES) performance since the date specified in Section III, Qualification Criteria, and Requirements, Sub-Factor 2.5. Details are described below:			
Year	Suspended or terminated portion of contract	Contract Identification	Total Contract Amount (current value, currency, exchange rate and US\$ equivalent)
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for suspension or termination: <i>[indicate main reason(s) e.g. for gender-based violence; sexual exploitation or sexual abuse breaches]</i>	<i>[insert amount]</i>
<i>[insert year]</i>	<i>[insert amount and percentage]</i>	Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i> Name of Employer: <i>[insert full name]</i> Address of Employer: <i>[insert street/city/country]</i> Reason(s) for suspension or termination: <i>[indicate main reason(s)]</i>	<i>[insert amount]</i>

...	...	<i>[list all applicable contracts]</i>	...
<b>Performance Security called by an employer(s) for reasons related to ESHS performance</b>			
Year	Contract Identification		Total Contract Amount (current value, currency, exchange rate and US\$ equivalent)
<i>[insert year]</i>	<p>Contract Identification: <i>[indicate complete contract name/ number, and any other identification]</i></p> <p>Name of Employer: <i>[insert full name]</i></p> <p>Address of Employer: <i>[insert street/city/country]</i></p> <p>Reason(s) for calling of performance security: <i>[indicate main reason(s) e.g. for gender-based violence; sexual exploitation, or sexual abuse breaches]</i></p>		<i>[insert amount]</i>



## Form CCC: Current Contract Commitments / Works in Progress

Bidders and each partner to a JV should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued.

Name of contract	Employer, contact address/tel/fax	Value of outstanding work (current US\$ equivalent)	Estimated completion date	Average monthly invoicing over last six months (US\$/month)
1.				
2.				
3.				
4.				
5.				
etc.				

## Form FIN – 3.1: Financial Situation and Performance

Bidder's Name: \_\_\_\_\_

Date: \_\_\_\_\_

Joint Venture Member's Name \_\_\_\_\_

ICB No. and title: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_ pages

### R. Financial data

Type of Financial information in (currency)	Historic information for previous _____ years, (amount in currency, currency, exchange rate, USD equivalent)				
	Year 1	Year 2	Year 3	Year 4	Year 5
Statement of Financial Position (Information from Balance Sheet)					
Total Assets (TA)					
Total Liabilities (TL)					
Total Equity/Net Worth (NW)					
Current Assets (CA)					
Current Liabilities (CL)					
Working Capital (WC)					
Information from Income Statement					
Total Revenue (TR)					
Profits Before Taxes (PBT)					
Cash Flow Information					
Cash Flow from Operating Activities					

**R. Sources of Finance**

Specify sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments.

No.	Source of finance	Amount (US\$ equivalent)
1		
2		
3		

**R. Financial documents**

The Bidder and its parties shall provide copies of financial statements for \_\_\_\_\_ years pursuant Section III, Evaluation and Qualifications Criteria, Sub-factor 3.2. The financial statements shall:

(R) reflect the financial situation of the Bidder or in case of JV member , and not an affiliated entity (such as parent company or group member).

(R) be independently audited or certified in accordance with local legislation.

(R) Ibe complete, including all notes to the financial statements.

(R) correspond to accounting periods already completed and audited.

Attached are copies of financial statements<sup>17</sup> for the \_\_\_\_\_ years required above; and complying with the requirements

<sup>17</sup> If the most recent set of financial statements is for a period earlier than 12 months from the date of bid, the reason for this should be justified.

**Form FIN – 3.2: Average Annual Construction Turnover**

Bidder's Name: \_\_\_\_\_

Date: \_\_\_\_\_

Joint Venture Member's Name \_\_\_\_\_

ICB No. and title: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_ pages

		Annual turnover data (construction only)	
Year	Amount Currency	Exchange rate	USD equivalent
<i>[indicate year]</i>	<i>[insert amount and indicate currency]</i>		
Average Annual Construction Turnover *			

\* See Section III, Evaluation and Qualification Criteria, Sub-Factor 3.2.

---

**Form FIN - 3.3: Financial Resources**

Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total construction cash flow demands of the subject contract or contracts as specified in Section III (Evaluation and Qualification Criteria)

Source of financing	Amount (US\$ equivalent)
1.	
2.	
3.	
4.	

## Form EXP – 4.1: General Construction Experience

Bidder's Name: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Joint Venture Member's Name \_\_\_\_\_  
 ICB No. and title: \_\_\_\_\_  
 Page \_\_\_\_\_ of \_\_\_\_\_ pages

Starting Year	Ending Year	Contract Identification	Role of Bidder
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of Employer: _____ Address: _____	
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of Employer: _____ Address: _____	
		Contract name: _____ Brief Description of the Works performed by the Bidder: _____ Amount of contract: _____ Name of Employer: _____ Address: _____	

## Form EXP – 4.2(a): Specific Construction and Contract Management Experience

Bidder's Name: \_\_\_\_\_

Date: \_\_\_\_\_

Joint Venture Member's Name \_\_\_\_\_

ICB No. and title: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_ pages

Similar Contract No.	Information			
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor <input type="checkbox"/>	Member in JV <input type="checkbox"/>	Management Contractor <input type="checkbox"/>	Sub-contractor <input type="checkbox"/>
Total Contract Amount			US\$ *	
If member in a JV or sub-contractor, specify participation in total Contract amount			*	
Employer's Name:				
Address:				
Telephone/fax number				
E-mail:				

**Form EXP – 4.2(a) (cont.)****Specific Construction and Contract Management Experience (cont.)**

<b>Similar Contract No.</b>	<b>Information</b>
Description of the similarity in accordance with Sub-Factor 4.2(a) of Section III:	
1. Amount	
2. Physical size of required works items	
3. Complexity	
4. Methods/Technology	
5. Construction rate for key activities	
6. Other Characteristics	



## Form EXP – 4.2(b): Construction Experience in Key Activities

Bidder's Name: \_\_\_\_\_

Date: \_\_\_\_\_

Joint Venture Member's Name \_\_\_\_\_

Sub-contractor's Name<sup>18</sup> (as per ITB 34.2 and 34.3): \_\_\_\_\_

ICB No. and title: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_ pages

Sub-contractor's Name (as per ITB 34.2 and 34.3): \_\_\_\_\_

All Sub-contractors for key activities must complete the information in this form as per ITB 34.2 and 34.3 and Section III, Qualification Criteria and Requirements, Sub-Factor 4.2.

R. Key Activity No One: \_\_\_\_\_

	<b>Information</b>			
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor <input type="checkbox"/>	Member in JV <input type="checkbox"/>	Management Contractor <input type="checkbox"/>	Sub-contractor <input type="checkbox"/>
Total Contract Amount			US\$	
Quantity (Volume, number or rate of production, as applicable) performed under the contract per year or part of the year	Total quantity in the contract (i)	Percentage participation (ii)		Actual Quantity Performed (i) x (ii)
Year 1				
Year 2				
Year 3				
Year 4				
Employer's Name:				
Address:Telephone/fax numberE-mail:				

<sup>18</sup> If applicable.

	<b>Information</b>
Employer's Name:	
Address:  Telephone/fax number  E-mail:	

2. Activity No. Two

3. ....

	<b>Information</b>
Description of the key activities in accordance with Sub-Factor 4.2(b) of Section III:	

## Form EXP – 4.2I: Specific Experience in Managing ES aspects

*[The following table shall be filled in for contracts performed by the Bidder, and each member of a Joint Venture]*

Bidder's Name: \_\_\_\_\_

Date: \_\_\_\_\_

Bidder's JV Member Name: \_\_\_\_\_

RFB No. and title: \_\_\_\_\_

Page \_\_\_\_\_ of \_\_\_\_\_ pages

1. Key Requirement no 1 in accordance with 4.2 I: \_\_\_\_\_

Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor <input type="checkbox"/>	Member in JV <input type="checkbox"/>	Management Contractor <input type="checkbox"/>	Subcontractor <input type="checkbox"/>
Total Contract Amount			US\$	
Details of relevant experience				

2. Key Requirement no 2 in accordance with 4.2 I: \_\_\_\_\_

3. Key Requirement no 3 in accordance with 4.2 I: \_\_\_\_\_



## Section V – Eligible Countries

### Eligibility for the Provision of Goods, Works and Services in Bank-Financed Procurement

R. In reference to ITB 4.7, and 5.1, for the information of the Bidders, at the present time firms, goods and services from the following countries are excluded from this bidding process:

Under ITB 4.7 (a) and 5.1      *[insert a list of the countries following approval by the Bank to apply the restriction or state “none”]*

Under ITB 4.7 (b) and 5.1      *[insert a list of the countries following approval by the Bank to apply the restriction or state “none”]*

## Section VI. Bank Policy – Corrupt and Fraudulent Practices

(Section VI shall not be modified)

### **Guidelines for Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits & Grants by World Bank Borrowers, dated January 2011:**

#### **“Fraud and Corruption:**

1.16 It is the Bank’s policy to require that Borrowers (including beneficiaries of Bank loans), bidders, suppliers, contractors and their agents (whether declared or not), sub-contractors, sub-consultants, service providers or suppliers, and any personnel thereof, observe the highest standard of ethics during the procurement and execution of Bank-financed contracts.<sup>19</sup> In pursuance of this policy, the Bank:

(a) defines, for the purposes of this provision, the terms set forth below as follows:

(i) “corrupt practice” is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;<sup>20</sup>

(ii) “fraudulent practice” is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;<sup>21</sup>

(R) “collusive practice” is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;<sup>22</sup>

(iv) “coercive practice” is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;<sup>23</sup>

(v) “obstructive practice” is

(aa) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive or collusive practice;

<sup>19</sup> In this context, any action to influence the procurement process or contract execution for undue advantage is improper.

<sup>20</sup> For the purpose of this sub-paragraph, “*another party*” refers to a public official acting in relation to the procurement process or contract execution. In this context, “*public official*” includes World Bank staff and employees of other organizations taking or reviewing procurement decisions.

<sup>21</sup> For the purpose of this sub-paragraph, “*party*” refers to a public official; the terms “*benefit*” and “*obligation*” relate to the procurement process or contract execution; and the “*act or omission*” is intended to influence the procurement process or contract execution.

<sup>22</sup> For the purpose of this sub-paragraph, “*parties*” refers to participants in the procurement process (including public officials) attempting either themselves, or through another person or entity not participating in the procurement or selection process, to simulate competition or to establish bid prices at artificial, non-competitive levels, or are privy to each other’s bid prices or other conditions.

<sup>23</sup> For the purpose of this sub-paragraph, “*party*” refers to a participant in the procurement process or contract execution.

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, or

- (bb) acts intended to materially impede the exercise of the Bank's inspection and audit rights provided for under paragraph 1.16I below.
- (b) will reject a proposal for award if it determines that the bidder recommended for award, or any of its personnel, or its agents, or its sub-consultants, sub-contractors, service providers, suppliers and/or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;
  - I will declare mis-procurement and cancel the portion of the loan allocated to a contract if it determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement or the implementation of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;
- (d) will sanction a firm or individual, at any time, in accordance with the prevailing Bank's sanctions procedures,<sup>24</sup> including by publicly declaring such firm or individual ineligible, either indefinitely or for a stated period of time: (i) to be awarded a Bank-financed contract; and (ii) to be a nominated<sup>25</sup> sub-contractor, consultant, supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract;
  - I will require that a clause be included in bidding documents and in contracts financed by a Bank loan, requiring bidders, suppliers and contractors, and their sub-contractors, agents, personnel, consultants, service providers, or suppliers, to permit the Bank to inspect all accounts, records, and other documents relating to the submission of bids and contract performance, and to have them audited by auditors appointed by the Bank.”

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<sup>24</sup> A firm or individual may be declared ineligible to be awarded a Bank financed contract upon: (i) completion of the Bank's sanctions proceedings as per its sanctions procedures, including, inter alia, cross-debarment as agreed with other International Financial Institutions, including Multilateral Development Banks, and through the application the World Bank Group corporate administrative procurement sanctions procedures for fraud and corruption; and (ii) as a result of temporary suspension or early temporary suspension in connection with an ongoing sanctions proceeding. See footnote 14 and paragraph 8 of Appendix 1 of these Guidelines.

<sup>25</sup> A nominated sub-contractor, consultant, manufacturer or supplier, or service provider (different names are used depending on the particular bidding document) is one which has either been: (i) included by the bidder in its pre-qualification application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.





## **PART 2 – Works Requirements**

## **Section VII – Works Requirements**

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## Specifications

1. The Specifications to be used for the Works are the General and Technical Specifications given in Volume II of the Bidding Documents.
2. Standards, brand names, catalog numbers or similar classifications provided in the Specifications are indicative of performance requirements and offers which have similar characteristics and which provide performance and quality equal or higher to the performance requirements specified would be accepted.
3. The Terms “The Engineer” (or “The Resident Engineer”) and “Engineer’s Representative” have the same meaning as “The Project Manager” and “The Project Manager’s Representative” respectively.

**THE DETAILED SPECIFICATIONS ARE GIVEN IN VOLUME II OF THE BIDDING DOCUMENTS**

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## **Environmental, Social, Health and Safety (ESHS)**

### **Health, Safety and Environmental Plan**

The contractor shall prepare and submit Construction Environmental Social Health and Safety Management Plans (C-ESMPs) to the Supervising Engineer for review and approval at least 14 days prior to any programmed construction activities on site. The C-ESMPs shall outline:

- Construction risk assessment and control measures put in place;
- Organisation and management arrangements for implementing the C-ESMPs;
- Appropriate specified safety requirements, licences, insurances and statutory permits to be obtained; and
- Welfare arrangements for staff messing, first aid and sanitary arrangements.

The Contractor shall not take possession of the Site before the Engineer has approved his Health and Safety Plans.

### **Health and Safety Co-ordinator**

The Contractor shall appoint an experienced Safety Co-ordinator in addition to the site EHS officer whose role shall be to promote, monitor and enforce safe working practices on the Site. The Safety Co-ordinator shall be a senior member of the Contractor's staff.

The Contractor shall arrange and undertake regular safety briefings for all of his staff, workmen and sub-Contractor's staff. In addition, he shall ensure that regular safety liaison meetings are held between the Contractor, Engineer and Employer. The Contractor shall carry out a safety audit and site ESHS inspection regularly in compliance with the project ESMPs, national statutory requirement and WB ESHS guidelines.

The Contractor shall ensure that all statutory safety obligations are met before mobilizing to Site.

### **Payment for ESHS Requirements**

In the majority of cases, the payment for the delivery of ESHS requirements shall be a subsidiary obligation of the Contractor covered under the prices quoted for other Bill of Quantity items or activities. For example, normally the cost of implementing work place safe systems of work, including the majors necessary for ensuring traffic safety, community and workers occupational health and safety shall be covered by the Bidder's rates for the relevant works. There are other activities as included in the project ESIA ESMP that will require additional resources and should be included in the BOQ. For example, for HIV and GBV/SEA awareness and sensitization to encourage the contractor to deliver additional ESHS outcomes beyond the requirement of the Contract.

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# Environmental Policy

## **ENVIRONMENT AND SOCIAL POLICY STATEMENT**

Northern Water Works Development Agency (NWWDA) recognizes the importance of environmental and social considerations on the sustainability of our core organizational operations. NWWDA is therefore committed to integrating and upholding environmental and social best practices in all our services.

### **Our Policy Goal**

The policy goal is to minimize negative ecological, social and climate change foot print while enhancing positive impacts of our organization operations and services.

### **Policy Objectives**

1. To attain compliance and enforce environmental legal obligations in our operations and services delivery.
2. To promote environmental and social sustainability in our operations and services delivery.
3. To promote public consultations and social inclusion in our service delivery
4. To ensure our suppliers, contractors, consultants, water service providers and other clients associated with our operations conduct business in environmental and social best practices.

### **Guiding Principles**

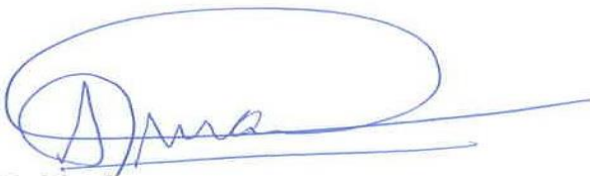
The policy shall be guided by the following values and principles:

1. Conduct all operations in a manner that ensure upholding of environmental sustainability in our operations and service delivery as per the requirements of the Kenya constitutional right to a clean and healthy environment for all persons under article 42.
2. Comply with all environmental policies, laws and regulations by proactively taking necessary measures to comply and promote environmental and social sustainability.

- 
3. Give considerations to applicable compliance with environmental and social policies of our development partners as shall be deemed appropriate in the course of a working relationship.
  4. Endeavour to ensure that resource consumption in our operations is efficient while preventing and managing any by-products, consistent with best industry practices.
  5. Incorporate social and environmental considerations in every decision and activity undertaken by the organization or any other service providers associated with our operations and service delivery.
  6. Ensure public consultation and engagement in all our operations and service delivery, with respect and high integrity.
  7. Promote environmental consciousness among our suppliers, contractors, consultants, employees, water service providers/clients or any other service provider, encouraging them to work in an environmental and socially conscientious way.

### **Review of the Policy**

Northern Water Works Development Agency shall strive to continually improve our environmental and social performance by periodically reviewing our environmental and social policy in light of our current and planned future activities. The policy document shall be reviewed by the technical department in consultation with relevant departments. The Head of technical department shall express the need and justification for such reviews and communicate the same to the CEO who shall sanction the process.



**Abdikadir Osman, HSC**  
**Chief Executive Officer**

## Key Personnel

### Contractor's Representative and Key Personnel

No.	Position	Qualifications	Total Work Experience (years)	In Similar Works Experience (years)
1	Contractor's Representative / Project Manager- One (1 Nr)	<ul style="list-style-type: none"> <li>B.Sc. Civil Engineering</li> <li>Professional Engineer registered with the Engineer's Board of Kenya or equivalent</li> </ul>	15	8
2.	Hydrogeologist/Drilling Inspector- One (1 Nr)	<ul style="list-style-type: none"> <li>Professional Geologist, registered with Geological Society of Kenya</li> </ul>	10	6
3.	Drilling Inspector	<ul style="list-style-type: none"> <li>An experienced Drilling Technician</li> </ul>	10	6
4.	Construction Engineer - One (1Nr)	<ul style="list-style-type: none"> <li>B.Sc. Civil Engineering</li> </ul>	10	5
5.	Foreman (Civil Works) - Two (1Nr)	<ul style="list-style-type: none"> <li>Higher National Diploma (HND) in Civil Engineering/Building/ electromechanical/Construction or equivalent</li> </ul>	10	8
6.	Sociologist (1Nr)	<ul style="list-style-type: none"> <li>Degree in Social Science/Sociology or Comm. Development</li> </ul>	8	5
7.	Community Liaison officer	<ul style="list-style-type: none"> <li>Diploma in Social Science/Sociology or Comm. Development</li> </ul>	8	3
8.	Environmentalist (1 Nr)	<ul style="list-style-type: none"> <li>Degree in Environmental Science or equivalent) and registered with NEMA as an Associate Expert or equivalent</li> </ul>	8	5
9.	Health and Safety Expert (1 Nr)	<ul style="list-style-type: none"> <li>Diploma in Environmental Studies and Occupational Health and Safety Science or equivalent) and/or registered with DOSH as an ESHS Advisor, or equivalent</li> </ul>	8	5

# Drawings

**Provided in separate document as Volume III**



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## Supplementary Information

**Not** Applicable.

## **PART 3 – Conditions of Contract and Contract Forms**

## **Section VIII. General Conditions of Contract**

These General Conditions of Contract (GCC), read in conjunction with the Particular Conditions of Contract (PCC) and other documents listed therein, should be a complete document expressing fairly the rights and obligations of both parties.

These General Conditions of Contract have been developed on the basis of considerable international experience in the drafting and management of contracts, bearing in mind a trend in the construction industry towards simpler, more straightforward language.

The GCC can be used for both smaller admeasurement contracts and lump sum contracts.

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## General Conditions of Contract

### A. General

#### 1. Definitions

Boldface type is used to identify defined terms.

- (a) The “**Accepted Contract Amount**” means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.
- (b) The “**Activity Schedule**” is a schedule of the activities comprising the construction, installation, testing, and commissioning of the Works in a lump-sum contract. It includes a lump-sum price for each activity, which is used for valuations and for assessing the effects of Variations and Compensation Events.
- (c) The “**Adjudicator**” is the person appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in GCC Clause 23.
- (d) “**Bank**” means the financing institution **named in the PCC**.
- (e) “**Bill of Quantities**” means the priced and completed Bill of Quantities forming part of the Bid.
- (f) “**Compensation Events**” are those defined in GCC Clause 44 hereunder.
- (g) The “**Completion Date**” is the date of completion of the Works as certified by the Project Manager, in accordance with GCC Sub-Clause 55.1.
- (h) The “**Contract**” is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in GCC Sub-Clause 2.3 below.
- (i) The “**Contractor**” is the party whose Bid to carry out the Works has been accepted by the Employer.
- (j) The “**Contractor’s Bid**” is the completed bidding document submitted by the Contractor to the Employer.
- (k) The “**Contract Price**” is the Accepted Contract Amount stated in the Letter of Acceptance and thereafter as adjusted in accordance with the Contract.
- (l) “**Days**” are calendar days; months are calendar months.
- (m) “**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.
- (n) A “**Defect**” is any part of the Works not completed in accordance with the Contract.
  - (o) The “**Defects Liability Certificate**” is the certificate issued by Project Manager upon correction of defects by the Contractor.
  - (p) The “**Defects Liability Period**” is the period **named in the PCC** pursuant to GCC Sub-Clause 36.1 and calculated from the Completion Date.
  - (q) “**Drawings**” means the drawings of the Works, as included in the Contract, and any additional and modified drawings issued by (or on behalf of) the Employer in accordance with the Contract, include calculations and other information provided or approved by the Project Manager for the execution of the Contract.
  - (r) The “**Employer**” is the party who employs the Contractor to carry out the Works, **as specified in the PCC**.
  - (s) “**Equipment**” is the Contractor’s machinery and vehicles brought temporarily to the Site to construct the Works.
  - (t) “**In writing**” or “**written**” means hand-written, typewritten, printed or electronically made, and resulting in a permanent record;
  - (u) The “**Initial Contract Price**” is the Contract Price listed in the Employer’s Letter of Acceptance.
  - (v) 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 PCC**. The Intended Completion Date may be revised only by the Project Manager by issuing an extension of time or an acceleration order.
  - (w) “**Materials**” are all supplies, including consumables, used by the Contractor for incorporation in the Works.
  - (x) “**Plant**” is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.
  - (y) The “**Project Manager**” is the person **named in the PCC** (or any other competent person appointed by the Employer 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.

- (z) **“PCC”** means Particular Conditions of Contract.
- (aa) The **“Site”** is the area **defined as such in the PCC**.
- (bb) **“Site Investigation Reports”** are those that were included in the bidding document and are factual and interpretative reports about the surface and subsurface conditions at the Site.
- (cc) **“Specifications”** means the Specifications of the Works included in the Contract and any modification or addition made or approved by the Project Manager.
- (dd) The **“Start Date”** is **given in the PCC**. 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.
- (ee) 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.
- (ff) **“Temporary Works”** are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.
- (gg) A **“Variation”** is an instruction given by the Project Manager which varies the Works.
- (hh) The **“Works”** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, **as defined in the PCC**.
- (ii) **“Contractor’s Personnel”** refers to all personnel whom the Contractor utilizes on the Site or other places where the Works are carried out, including the staff, labor and other employees of each Subcontractor.
- (jj) **“Key Personnel”** means the positions (if any) of the Contractor’s personnel that are stated in the Specifications.
- (kk) **“ES”** means Environmental and Social (including Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH);
- (ll) **“Sexual Exploitation and Abuse” “(SEA)”** means the following:  
**“Sexual Exploitation”** is defined as any actual or attempted abuse of position of vulnerability, differential power or trust, for sexual purposes, including, but not



limited to, profiting monetarily, socially or politically from the sexual exploitation of another;

“**Sexual Abuse**” is defined as the actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions;

- (mm) “**Sexual Harassment**” “**(SH)**” is defined as unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature by the Contractor’s Personnel with other Contractor’s or Employer’s Personnel; and
- (nn) “**Employer’s Personnel**” refers to the Project Manager and all other staff, labor and other employees (if any) of the Project Manager and of the Employer engaged in fulfilling the Employer’s obligations under the Contract; and any other personnel identified as Employer’s Personnel, by a notice from the Employer or the Project Manager to the Contractor.

## 2. Interpretation

- 2.1 In interpreting these GCC, words indicating one gender include all genders. Words indicating the singular also include the plural and words indicating the plural also include the singular. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Project Manager shall provide instructions clarifying queries about these GCC.
- 2.2 If sectional completion is **specified in the PCC**, references in the GCC 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 following order of priority:
  - (a) Agreement,
  - (b) Letter of Acceptance,
  - (c) Contractor’s Bid,
  - (d) Particular Conditions of Contract,
  - (e) General Conditions of Contract, including Appendices,
  - (f) Specifications,
  - (g) Drawings,

- (h) Bill of Quantities,<sup>26</sup> and
  - (i) any other document **listed in the PCC** as forming part of the Contract.
- 3. Language and Law**
- 3.1 The language of the Contract and the law governing the Contract are **stated in the PCC**.
- 3.2 Throughout the execution of the Contract, the Contractor shall comply with the import of goods and services prohibitions in the Employer’s country when
- (a) as a matter of law or official regulations, the Borrower’s country prohibits commercial relations with that country; or
  - (b) by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, the Borrower’s Country prohibits any import of goods from that country or any payments to any country, person, or entity in that country.
- 4. Project Manager’s Decisions**
- 4.1 Except where otherwise specifically stated, the Project Manager shall decide contractual matters between the Employer and the Contractor in the role representing the Employer.
- 5. Delegation**
- 5.1 Otherwise **specified in the PCC**, the Project Manager may delegate any of his duties and responsibilities to other people, except to the Adjudicator, after notifying the Contractor, and may revoke any delegation after notifying the Contractor.
- 6. Communications**
- 6.1 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.
- 7. Subcontracting**
- 7.1 The Contractor may subcontract with the approval of the Project Manager, but may not assign the Contract without the approval of the Employer in writing. Subcontracting shall not alter the Contractor’s obligations. The Contractor shall require that its Subcontractors execute the Works in accordance with the Contract, including complying with the relevant ES requirements and the obligations set out in GCC Sub-Clause 26.1 of the General Conditions of Contract.
- 8. Other Contractors**
- 8.1 The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of Other Contractors, as **referred to in the PCC**. The Contractor shall also provide facilities and

<sup>26</sup> In lump-sum contracts, delete “Bill of Quantities” and replace with “Activity Schedule.”

services for them as described in the Schedule. The Employer may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification.

**9. Personnel and Equipment**

- 9.1 The Contractor shall employ the Key Personnel and use the Equipment identified in its Bid, to carry out the Works or other personnel and Equipment approved by the Project Manager. The Project Manager shall approve any proposed replacement of Key Personnel and Equipment only if their relevant qualifications or characteristics are substantially equal to or better than those proposed in the Bid.
- 9.2 The Project Manager may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Key Personnel (if any), who:
- (a) persists in any misconduct or lack of care;
  - (b) carries out duties incompetently or negligently;
  - (c) fails to comply with any provision of the Contract;
  - (d) persists in any conduct which is prejudicial to safety, health, or the protection of the environment;
  - (e) based on reasonable evidence, is determined to have engaged in Fraud and Corruption during the execution of the Works;
  - (f) has been recruited from the Employer's Personnel;
  - (g) undertakes behavior which breaches the Code of Conduct for Contractor's Personnel (ES).

If appropriate, the Contractor shall then promptly appoint (or cause to be appointed) a suitable replacement with equivalent skills and experience.

Notwithstanding any requirement from the Project Manager to remove or cause to remove any person, the Contractor shall take immediate action as appropriate in response to any violation of (a) through (g) above. Such immediate action shall include removing (or causing to be removed) from the Site or other places where the Works are being carried out, any Contractor's Personnel who engages in (a), (b), (c), (d), (e) or (g) above or has been recruited as stated in (f) above."

**9.3 Labor**

- 9.3.1 *Engagement of Staff and Labor.* The Contractor shall provide and employ on the Site for the execution of the Works such skilled, semi-skilled and unskilled labor as is necessary for the proper and timely execution of the Contract. The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labor with appropriate qualifications and experience from sources within the Employer's country.

Unless otherwise provided in the Contract, the Contractor shall be responsible for the recruitment, transportation, accommodation and welfare facilities in accordance with GCC Sub-Clause 9.3.6, of the Contractor's Personnel, and for all payments in connection therewith.

- 9.3.2 *Conditions of Labor.* The Contractor shall pay rates of wages, and observe conditions of labor, which comply with all applicable laws. The Contractor shall inform the Contractor's Personnel about their liability to pay personal income taxes in the Employer's country in respect of such of their salaries, wages, allowances and any benefits as are subject to tax under the Laws of the country for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such Laws.
- 9.3.3 The Contractor may bring in to the Employer's country any foreign personnel who are necessary for the execution of the Works to the extent allowed by the applicable Laws. The Contractor shall ensure that these personnel are provided with the required residence visas and work permits. The Employer will, if requested by the Contractor, use its best endeavors in a timely and expeditious manner to assist the Contractor in obtaining any local, state, national, or government permission required for bringing in the Contractor's personnel.
- 9.3.4 The Contractor shall at its own expense provide the means of repatriation to and the Contractor's Personnel employed on the Contract at the Site to their various home countries. It shall also provide suitable temporary maintenance of all such persons from the cessation of their employment on the Contract to the date programmed for their departure. In the event that the Contractor defaults in providing such means of transportation and temporary maintenance, the Employer may provide the same to such personnel and recover the cost of doing so from the Contractor.
- 9.3.5 *Disorderly conduct.* The Contractor shall at all times during the progress of the Contract use its best endeavors to prevent any unlawful, riotous or disorderly conduct or behavior by or amongst the Contractor's Personnel.
- 9.3.6 *Facilities for Staff and Labor.* Except as otherwise stated in the Specifications, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel. The Contractor shall also provide facilities for the Employer's Personnel as stated in the Specification.
- 9.3.7 The Contractor shall, in all dealings with the Contractor's Personnel, pay due regard to all recognized festivals, official

holidays, religious or other customs and all local laws and regulations pertaining to the employment of labor. The Contractor shall provide the Contractor's Personnel annual holiday and sick, maternity and family leave, as required by applicable laws or as stated in the Specification.

- 9.3.8 *Supply of Foodstuffs.* The Contractor shall arrange for the provision of a sufficient supply of suitable food as may be stated in the Specification at reasonable prices for the Contractor's Personnel for the purposes of or in connection with the Contract.
- 9.3.9 *Supply of Water.* The Contractor shall, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of the Contractor's Personnel.
- 9.3.10 *Measures against Insect and Pest Nuisance.* The Contractor shall at all times take the necessary precautions to protect the Contractor's Personnel employed on the Site from insect and pest nuisance, and to reduce the danger to their health. The Contractor shall comply with all the regulations of the local health authorities, including use of appropriate insecticide.
- 9.3.11 *Alcoholic Liquor or Drugs.* The Contractor shall not, otherwise than in accordance with the laws of the Employer's country, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter or disposal thereto by Contractor's Personnel.
- 9.3.12 *Arms and Ammunition.* The Contractor shall not give, barter, or otherwise dispose of, to any person, any arms or ammunition of any kind, or allow Contractor's Personnel to do so.
- 9.3.13 *Funeral Arrangements.* The Contractor shall be responsible, to the extent required by local regulations, for making any funeral arrangements for any of its local employees who may die while engaged upon the Works.
- 9.3.14 *Forced Labor.* The Contractor, including its Subcontractors, shall not employ or engage forced labor. Forced labor consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty, and includes any kind of involuntary or compulsory labor, such as indentured labor, bonded labor or similar labor-contracting arrangements.

No persons shall be employed or engaged who have been subject to trafficking. Trafficking in persons is defined as the recruitment, transportation, transfer, harboring or receipt of persons by means of the threat or use of force or other forms of coercion, abduction, fraud, deception, abuse of power, or of a position of vulnerability, or of the giving or receiving of

payments or benefits to achieve the consent of a person having control over another person, for the purposes of exploitation.

- 9.3.15 *Child Labor.* The Contractor, including its Subcontractors, shall not employ or engage a child under the age of 14 unless the national law specifies a higher age (the minimum age).

The Contractor, including its Subcontractors, shall not employ or engage a child between the minimum age and the age of 18 in a manner that is likely to be hazardous, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development.

The Contractor including its Subcontractors, shall only employ or engage children between the minimum age and the age of 18 after an appropriate risk assessment has been conducted by the Contractor with the Project Manager's approval. The Contractor shall be subject to regular monitoring by the Project Manager that includes monitoring of health, working conditions and hours of work.

Work considered hazardous for children is work that, by its nature or the circumstances in which it is carried out, is likely to jeopardize the health, safety, or morals of children. Such work activities prohibited for children include work:

- (a) with exposure to physical, psychological or sexual abuse;
- (b) underground, underwater, working at heights or in confined spaces;
- (c) with dangerous machinery, equipment or tools, or involving handling or
- (d) transport of heavy loads;
- (e) in unhealthy environments exposing children to hazardous substances, agents, or processes, or to temperatures, noise or vibration damaging to health; or
- (f) Under difficult conditions such as work for long hours, during the night or in confinement on the premises of the employer.

- 9.3.16 *Employment Records of Workers.* The Contractor shall keep complete and accurate records of the employment of labor at the Site. The records shall include the names, ages, genders, hours worked, and wages paid to all workers. These records shall be summarized on a monthly basis and submitted to the project Manager.

9.3.17 *Workers' Organizations.* In countries where the relevant labor laws recognize workers' rights to form and to join workers' organizations of their choosing and to bargain collectively without interference, the Contractor shall comply with such laws. In such circumstances, the role of legally established workers' organizations and legitimate workers' representatives will be respected, and they will be provided with information needed for meaningful negotiation in a timely manner. Where the relevant labor laws substantially restrict workers' organizations, the Contractor shall enable alternative means for the Contractor's Personnel to express their grievances and protect their rights regarding working conditions and terms of employment. The Contractor shall not seek to influence or control these alternative means. The Contractor shall not discriminate or retaliate against the Contractor's Personnel who participate, or seek to participate, in such organizations and collective bargaining or alternative mechanisms. Workers' organizations are expected to fairly represent the workers in the workforce.

9.3.18 *Non-Discrimination and Equal Opportunity.* The Contractor shall not make decisions relating to the employment or treatment of Contractor's Personnel on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment of Contractor's Personnel on the principle of equal opportunity and fair treatment, and shall not discriminate with respect to any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, and disciplinary practices.

Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job shall not be deemed discrimination. The Contractor shall provide protection and assistance as necessary to ensure non-discrimination and equal opportunity, including for specific groups such as women, people with disabilities, migrant workers and children (of working age in accordance with GCC Sub-Clause 9.3.15).

9.3.19 *Contractor's Personnel Grievance Mechanism.* The Contractor shall have a grievance mechanism for Contractor's Personnel, and where relevant the workers' organizations stated in GCC Sub-Clause 9.3.17, to raise workplace concerns. The grievance mechanism shall be proportionate to the nature, scale, risks and impacts of the Contract. The mechanism shall address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned in a language they



understand, without any retribution, and shall operate in an independent and objective manner.

The Contractor's Personnel shall be informed of the grievance mechanism at the time of engagement for the Contract, and the measures put in place to protect them against any reprisal for its use. Measures will be put in place to make the grievance mechanism easily accessible to all Contractor's Personnel.

The grievance mechanism shall not impede access to other judicial or administrative remedies that might be available, or substitute for grievance mechanisms provided through collective agreements.

The grievance mechanism may utilize existing grievance mechanisms, providing that they are properly designed and implemented, address concerns promptly, and are readily accessible to Contractor's Personnel. Existing grievance mechanisms may be supplemented as needed with Contract-specific arrangements.

9.3.20 *Training of Contractor's Personnel.* The Contractor shall provide appropriate training to relevant Contractor's Personnel on ES aspects of the Contract, including appropriate sensitization on prohibition of SEA and SH, and health and safety training.

As stated in the Specification or as instructed by the Project Manager, the Contractor shall also allow appropriate opportunities for the relevant Contractor's Personnel to be trained on ES aspects of the Contract by the Employer's Personnel.

The Contractor shall provide training on SEA, including its prevention, to any of its personnel who has a role to supervise other Contractor's Personnel.

**10. Employer's and Contractor's Risks**

10.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

**11. Employer's Risks**

11.1 From the Start Date until the Defects Liability Certificate has been issued, the following are Employer's risks:

- (a) 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 Employer or by any person employed by or contracted to him except the Contractor.
  - (b) The risk of damage to the Works, Plant, Materials, and Equipment to the extent that it is due to a fault of the Employer or in the Employer's design, or due to war or radioactive contamination directly affecting the country where the Works are to be executed.
- 11.2 From the Completion Date until the Defects Liability Certificate has been issued, the risk of loss of or damage to the Works, Plant, and Materials is an Employer'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 Employer's risk, or
  - (c) the activities of the Contractor on the Site after the Completion Date.
- 12. Contractor's Risks**
  - 12.1 From the Starting Date until the Defects Liability 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 Employer's risks are Contractor's risks.
- 13. Insurance**
  - 13.1 The Contractor shall provide, in the joint names of the Employer 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 PCC** 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.
  - 13.2 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.
  - 13.3 If the Contractor does not provide any of the policies and certificates required, the Employer may effect the insurance which

the Contractor should have provided and recover the premiums the Employer 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.

13.4 Alterations to the terms of an insurance shall not be made without the approval of the Project Manager.

13.5 Both parties shall comply with any conditions of the insurance policies.

**14. Site Data**

14.1 The Contractor shall be deemed to have examined any Site Data **referred to in the PCC**, supplemented by any information available to the Contractor.

**15. Contractor to Construct the Works**

15.1 The Contractor shall construct and install the Works in accordance with the Specifications and Drawings.

**16. The Works to Be Completed by the Intended Completion Date**

16.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Program submitted by the Contractor, as updated with the approval of the Project Manager, and complete them by the Intended Completion Date.

16.2 The Contractor shall not carry out mobilization to the Site unless the Project Manager gives approval, an approval that shall not be unreasonably delayed, to the measures the Contractor proposes to address environmental and social risks and impacts, which at a minimum shall include applying the Management Strategies and Implementation Plans (MSIPs) and Code of Conduct for Contractor's Personnel submitted as part of the Bid and agreed as part of the Contract.

The Contractor shall submit, to the Project Manager for its approval any additional MSIPs as are necessary to manage the ES risks and impacts of ongoing Works. These MSIPs collectively comprise the Contractor's Environmental and Social Management Plan (C-ESMP). The Contractor shall review the C-ESMP, periodically (but not less than every six (6) months), and update it as required to ensure that it contains measures appropriate to the Works. The updated C-ESMP shall be submitted to the Project Manager for its approval.

**17. Approval by the Project Manager**

17.1 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Project Manager, for his approval.

- 17.2 The Contractor shall be responsible for design of Temporary Works.
- 17.3 The Project Manager's approval shall not alter the Contractor's responsibility for design of the Temporary Works.
- 17.4 The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.
- 17.5 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 this use.
- 18. Health, Safety and Protection of the Environment**
- 18.1 The Contractor shall be responsible for the safety of all activities on the Site.
- 18.2 The Contractor shall:
- (a) comply with all applicable health and safety regulations and Laws;
  - (b) comply with all applicable health and safety obligations specified in the Contract;
  - (c) take care for the health and safety of all persons entitled to be on the Site and other places, if any, where the Works are being executed;
  - (d) keep the Site and Works clear of unnecessary obstruction so as to avoid danger to these persons;
  - (e) provide fencing, lighting, safe access, guarding and watching of:
    - (i) the Works until the Works are taken over by the Employer; and
    - (ii) any part of the Works where the Contractor is executing outstanding works or remedying any defects during the Defects Liability Period; and
  - (f) provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and protection of the public and of owners and occupiers of adjacent land.
- 18.3 Protection of the environment
- The Contractor shall take all necessary measures to:
- (a) protect the environment (both on and off the Site); and
  - (b) limit damage and nuisance to people and property resulting from pollution, noise and other results of the Contractor's operations and/ or activities.

The Contractor shall ensure that emissions, surface discharges, effluent and any other pollutants from the Contractor's activities shall exceed neither the values indicated in the Specification, nor those prescribed by applicable laws.

In the event of damage to the environment, property and/or nuisance to people, on or off Site as a result of the Contractor's operations, the Contractor shall agree with the Project Manager the appropriate actions and time scale to remedy, as practicable, the damaged environment to its former condition. The Contractor shall implement such remedies at its cost to the satisfaction of the Project Manager

**19. Archaeological and Geological Findings**

19.1 All fossils, coins, articles of value or antiquity, structures, groups of structures, and other remains or items of geological, archaeological, paleontological, historical, architectural or religious interest found on the Site shall be placed under the care and custody of the Employer. The Contractor shall:

- (a) take all reasonable precautions, including fencing-off the area or site of the finding, to avoid further disturbance and prevent Contractor's Personnel or other persons from removing or damaging any of these findings;
- (b) train relevant Contractor's Personnel on appropriate actions to be taken in the event of such findings; and
- (c) Implement any other action consistent with the requirements of the Specification and relevant laws.

The Contractor shall, as soon as practicable after discovery of any such finding, notify the Project Manager of such discoveries and carry out the Project Manager's instructions for dealing with them..

**20. Possession of the Site**

20.1 The Employer 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 PCC**, the Employer shall be deemed to have delayed the start of the relevant activities, and this shall be a Compensation Event.

**21. Access to the Site**

21.1 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.

**22. Instructions, Inspections and Audits**

22.1 The Contractor shall carry out all instructions of the Project Manager which comply with the applicable laws where the Site is located.

22.2 The Contractor shall keep, and shall make all reasonable efforts to cause its Subcontractors and sub consultants to keep, accurate and systematic accounts and records in respect of the Works in such form and details as will clearly identify relevant time changes and costs.

### 22.3 Inspections & Audit by the Bank

Pursuant to paragraph 1.16 (e) of Appendix A to the GCC- Fraud and Corruption, the Contractor shall permit and shall cause its agents (where declared or not), subcontractors, subconsultants, service providers, suppliers, and personnel, to permit, the Bank and/or persons appointed by the Bank to inspect the site and/or the accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have such accounts, records and other documents audited by auditors appointed by the Bank. The Contractor's and its Subcontractors' and subconsultants' attention is drawn to GCC Sub-Clause 25.1 (Fraud and Corruption) which provides, inter alia, that acts intended to materially impede the exercise of the Bank's inspection and audit rights constitute a prohibited practice subject to contract termination (as well as to a determination of ineligibility pursuant to the Bank's prevailing sanctions procedures).

## 23. Appointment of the Adjudicator

23.1 The Adjudicator shall be appointed jointly by the Employer and the Contractor, at the time of the Employer's issuance of the Letter of Acceptance. If, in the Letter of Acceptance, the Employer does not agree on the appointment of the Adjudicator, the Employer will request the Appointing Authority **designated in the PCC**, to appoint the Adjudicator within 14 days of receipt of such request.

23.2 Should the Adjudicator resign or die, or should the Employer and the Contractor agree that the Adjudicator is not functioning in accordance with the provisions of the Contract, a new Adjudicator shall be jointly appointed by the Employer and the Contractor. In case of disagreement between the Employer and the Contractor, within 30 days, the Adjudicator shall be designated by the Appointing Authority **designated in the PCC** at the request of either party, within 14 days of receipt of such request.

## 24. Procedure for Disputes

24.1 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.

24.2 The Adjudicator shall give a decision in writing within 28 days of receipt of a notification of a dispute.

24.3 The Adjudicator shall be paid by the hour at the **rate specified in the PCC**, together with reimbursable expenses of the types **specified in the PCC**, and the cost shall be divided equally between the Employer 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 shall be final and binding.

24.4 The arbitration shall be conducted in accordance with the arbitration procedures published by the institution named and in the place **specified in the PCC**.

## **25. Fraud and Corruption**

25.1 The Bank requires compliance with the Bank's Anti-Corruption Guidelines and its prevailing sanctions policies and procedures as set forth in the WBG's Sanctions Framework, as set forth in Appendix A to the GCC.

25.2 The Employer requires the Contractor to disclose any commissions or fees that may have been paid or are to be paid to agents or any other party with respect to the bidding process or execution of the Contract. The information disclosed must include at least the name and address of the agent or other party, the amount and currency, and the purpose of the commission, gratuity or fee.

## **26. Code of Conduct**

26.1 The Contractor shall have a Code of Conduct for the Contractor's Personnel.

The Contractor shall take all necessary measures to ensure that each Contractor's Personnel is made aware of the Code of Conduct including specific behaviors that are prohibited, and understands the consequences of engaging in such prohibited behaviors.

These measures include providing instructions and documentation that can be understood by the Contractor's Personnel and seeking to obtain that person's signature acknowledging receipt of such instructions and/or documentation, as appropriate.

The Contractor shall also ensure that the Code of Conduct is visibly displayed in multiple locations on the Site and any other place where the Works will be carried out, as well as in areas outside the Site accessible to the local community and project affected people. The posted Code of Conduct shall be provided in languages comprehensible to Contractor's Personnel, Employer's Personnel and the local community.

The Contractor's Management Strategy and Implementation Plans shall include appropriate processes for the Contractor to verify compliance with these obligations.

**27. Security of the Site** 27.1 The Contractor shall be responsible for the security of the Site, and:

- (a) for keeping unauthorized persons off the Site;
- (b) authorized persons shall be limited to the Contractor's Personnel, the Employer's personnel, and to any other personnel identified as authorized personnel (including the Employer's other contractors on the Site), by a notice from the Employer or the Project Manager to the Contractor.

The Contractor shall (i) conduct appropriate background checks on any personnel retained to provide security; (ii) train the security personnel adequately (or determine that they are properly trained) in the use of force (and where applicable, firearms), and appropriate conduct towards Contractor's Personnel, Employer's Personnel and affected communities; and (iii) require the security personnel to act within the applicable Laws and any requirements set out in the Specification.

The Contractor shall not permit any use of force by security personnel in providing security except when used for preventive and defensive purposes in proportion to the nature and extent of the threat.

In making security arrangements, the Contractor shall also comply with any additional requirements stated in the Specification.”

## **B. Time Control**

- 28. Program** 28.1 Within the time **stated in the PCC**, after the date of the Letter of Acceptance, the Contractor shall submit to the Project Manager for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works. In the case of a lump-sum contract, the activities in the Program shall be consistent with those in the Activity Schedule. The Project Manager's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Project Manager again at any time. A revised Program shall show the effect of Variations and Compensation Events.
- 28.2 An update of the Program shall be a program 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.

- 28.3 The Contractor shall monitor progress of the Works and submit to the Project manager progress report and any updated Program showing the actual progress achieved and the effect of the progress achieved on the timing of the remaining Works, including any changes to the sequence of the activities, at intervals no longer than the period **stated in the PCC**. If the Contractor does not submit an updated Program within this period, the Project Manager may withhold the amount **stated in the PCC** from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Program has been submitted. In the case of lump-sum Contract, the Contractor shall provide an updated Activity Schedule within 14 days of being instructed to by the Project Manager.
- 28.4 Unless otherwise stated in the Specification, each progress report shall include the Environmental and Social (ES) metrics set out in Appendix B
- 28.5 In addition to the progress report, the Contractor shall inform the Project Manager immediately of any allegation, incident or accident in the Site, which has or is likely to have a significant adverse effect on the environment, the affected communities, the public, Employer's Personnel, or Contractor's Personnel. This includes, but is not limited to, any incident or accident causing fatality or serious injury; significant adverse effects or damage to private property; or any allegation of SEA and/or SH. In case of SEA and/or SH, while maintaining confidentiality as appropriate, the type of allegation (sexual exploitation, sexual abuse or sexual harassment), gender and age of the person who experienced the alleged incident should be included in the information.

The Contractor, upon becoming aware of the allegation, incident or accident, shall also immediately inform the Project Manager of any such incident or accident on the Subcontractors' or suppliers' premises relating to the Works which has or is likely to have a significant adverse effect on the environment, the affected communities, the public, Employer's Personnel, or Contractor's, its Subcontractors' and suppliers' personnel. The notification shall provide sufficient detail regarding such incidents or accidents. The Contractor shall provide full details of such incidents or accidents to the Project Manager within the timeframe agreed with the Project Manager.

The Contractor shall require its Subcontractors and suppliers (other than Subcontractors) to immediately notify the Contractor of any incidents or accidents referred to in this Subclause.

- 29. Extension of the Intended Completion Date**
- 29.1 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.
- 29.2 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.
- 30. Acceleration**
- 30.1 When the Employer wants the Contractor to finish before the Intended Completion Date, the Project Manager shall obtain priced proposals for achieving the necessary acceleration from the Contractor. If the Employer accepts these proposals, the Intended Completion Date shall be adjusted accordingly and confirmed by both the Employer and the Contractor.
- 30.2 If the Contractor's priced proposals for an acceleration are accepted by the Employer, they are incorporated in the Contract Price and treated as a Variation.
- 31. Delays Ordered by the Project Manager**
- 31.1 The Project Manager may instruct the Contractor to delay the start or progress of any activity within the Works.
- 32. Management Meetings**
- 32.1 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.
- 32.2 The Project Manager shall record the business of management meetings and provide copies of the record to those attending the meeting and to the Employer. 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.
- 33. Early Warning**
- 33.1 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.

33.2 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.

### C. Quality Control

#### 34. Identifying Defects

34.1 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.

#### 35. Tests

35.1 If the Project Manager instructs the Contractor to carry out a test not specified in the Specifications 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.

#### 36. Correction of Defects

36.1 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 PCC**. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

36.2 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.

#### 37. Uncorrected Defects

37.1 If the Contractor has not corrected a Defect within the time specified in the Project Manager's notice, the Project Manager shall assess the cost of having the Defect corrected, and the Contractor shall pay this amount.

### D. Cost Control

#### 38. Contract Price<sup>27</sup>

38.1 The Bill of Quantities shall contain priced items for the Works to be performed by the Contractor. The Bill of Quantities is used to

<sup>27</sup> In lump-sum contracts, replace GCC Sub-Clauses 38.1 as follows:

calculate the Contract Price. The Contractor will be paid for the quantity of the work accomplished at the rate in the Bill of Quantities for each item.

- 39. Changes in the Contract Price<sup>28</sup>**
- 39.1 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. 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 Employer.
- 39.2 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.
- 40. Variations**
- 40.1 All Variations shall be included in updated Programs<sup>29</sup> produced by the Contractor.
- 40.2 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 Contractor shall also provide information of any ES risks and impacts of the Variation. The Project Manager shall assess the quotation, which shall be given within seven (7) days of the request or within any longer period stated by the Project Manager and before the Variation is ordered.
- 40.3 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.
- 40.4 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.

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38.1 The Contractor shall provide updated Activity Schedules within 14 days of being instructed to by the Project Manager. The Activity Schedule shall contain the priced activities for the Works to be performed by the Contractor. The Activity Schedule is used to monitor and control the performance of activities on which basis the Contractor will be paid. If payment for materials on site shall be made separately, the Contractor shall show delivery of Materials to the Site separately on the Activity Schedule.

<sup>28</sup> In lump-sum contracts, replace entire GCC Clause 39 with new GCC Sub-Clause 39.1, as follows:

39.1 The Activity Schedule shall be amended by the Contractor to accommodate changes of Program or method of working made at the Contractor's own discretion. Prices in the Activity Schedule shall not be altered when the Contractor makes such changes to the Activity Schedule.

<sup>29</sup> In lump-sum contracts, add "and Activity Schedules" after "Programs."

40.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

40.6 If the work in the Variation corresponds to an item description in the Bill of Quantities and if, in the opinion of the Project Manager, the quantity of work above the limit stated in GCC Sub-Clause 39.1 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.<sup>30</sup>

#### **41. Cash Flow Forecasts**

41.1 When the Program,<sup>31</sup> 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.

#### **42. Payment Certificates**

42.1 The Contractor shall submit to the Project Manager monthly statements of the estimated value of the work executed less the cumulative amount certified previously.

42.2 The Project Manager shall check the Contractor's monthly statement and certify the amount to be paid to the Contractor.

42.3 The value of work executed shall be determined by the Project Manager.

42.4 The value of work executed shall comprise the value of the quantities of work in the Bill of Quantities that have been completed.<sup>32</sup>

42.5 The value of work executed shall include the valuation of Variations and Compensation Events.

42.6 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.

42.7 If the Contractor was, or is, failing to perform any ES obligations or work under the Contract, the value of this work or obligation, as determined by the Project Manager, may be withheld until the work or obligation has been performed, and/or the cost of

<sup>30</sup> In lump-sum contracts, delete this paragraph.

<sup>31</sup> In lump-sum contracts, add "or Activity Schedule" after "Program."

<sup>32</sup> In lump-sum contracts, replace this paragraph with the following: "The value of work executed shall comprise the value of completed activities in the Activity Schedule."

rectification or replacement, as determined by the Project Manager, may be withheld until rectification or replacement has been completed. Failure to perform includes, but is not limited to the following:

- (a) failure to comply with any ES obligations or work described in the Works' Requirements which may include: working outside site boundaries, excessive dust, failure to keep public roads in a safe usable condition, damage to offsite vegetation, pollution of water courses from oils or sedimentation, contamination of land e.g. from oils, human waste, damage to archeology or cultural heritage features, air pollution as a result of unauthorized and/or inefficient combustion;
- (b) failure to regularly review C-ESMP and/or update it in a timely manner to address emerging ES issues, or anticipated risks or impacts;
- (c) failure to implement the C-ESMP e.g. failure to provide required training or sensitization;
- (d) failing to have appropriate consents/permits prior to undertaking Works or related activities;
- (e) failure to submit ES report/s (as described in Appendix B), or failure to submit such reports in a timely manner;

failure to implement remediation as instructed by the Project Manager within the specified timeframe (e.g. remediation addressing non-compliance/s).

### **43. Payments**

43.1 Payments shall be adjusted for deductions for advance payments and retention. The Employer shall pay the Contractor the amounts certified by the Project Manager within 28 days of the date of each certificate. If the Employer 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.

43.2 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.

43.3 Unless otherwise stated, all payments and deductions shall be paid or charged in the proportions of currencies comprising the Contract Price.

43.4 Items of the Works for which no rate or price has been entered in shall not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

#### **44. Compensation Events**

44.1 The following shall be Compensation Events:

- (a) The Employer does not give access to a part of the Site by the Site Possession Date pursuant to GCC Sub-Clause 20.1.
- (b) The Employer 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 bidders (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 Employer, or additional work required for safety or other reasons.
- (h) Other contractors, public authorities, utilities, or the Employer 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 Employer's Risks.
- (k) The Project Manager unreasonably delays issuing a Certificate of Completion.

44.2 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.

- 44.3 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 shall assume that the Contractor shall react competently and promptly to the event.
- 44.4 The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor's not having given early warning or not having cooperated with the Project Manager.

#### 45. Tax

- 45.1 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 bids 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 GCC Clause 47.

#### 46. Currencies

- 46.1 Where payments are made in currencies other than the currency of the Employer's country **specified in the PCC**, the exchange rates used for calculating the amounts to be paid shall be the exchange rates stated in the Contractor's Bid.

#### 47. Price Adjustment

- 47.1 Prices shall be adjusted for fluctuations in the cost of inputs only if **provided for in the PCC**. If so provided, the amounts certified in each payment certificate, before deducting for Advance Payment, shall be adjusted by applying the respective price adjustment factor to the payment amounts due in each currency. A separate formula of the type specified below applies to each Contract currency:

$$P_c = A_c + B_c \text{ Imc/Ioc}$$

where:

$P_c$  is the adjustment factor for the portion of the Contract Price payable in a specific currency "c."



$A_c$  and  $B_c$  are coefficients<sup>33</sup> **specified in the PCC**, representing the nonadjustable and adjustable portions, respectively, of the Contract Price payable in that specific currency “c;” and

$I_{mc}$  is the index prevailing at the end of the month being invoiced and  $I_{oc}$  is the index prevailing 28 days before Bid opening for inputs payable; both in the specific currency “c.”

47.2 If the value of the index is changed after it has been used in a calculation, the calculation shall be corrected and an adjustment made in the next payment certificate. The index value shall be deemed to take account of all changes in cost due to fluctuations in costs.

#### **48. Retention**

48.1 The Employer shall retain from each payment due to the Contractor the proportion **stated in the PCC** until Completion of the whole of the Works.

48.2 Upon the issue of a Certificate of Completion of the Works by the Project Manager, in accordance with GCC Sub-Clause 55.1, half the total amount retained shall be repaid to the Contractor and 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. The Contractor may substitute retention money with an “on demand” Bank guarantee.

#### **49. Liquidated Damages**

49.1 The Contractor shall pay liquidated damages to the Employer at the rate per day **stated in the PCC** 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 PCC**. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor’s liabilities.

49.2 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 GCC Sub-Clause 43.1.

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<sup>33</sup> The sum of the two coefficients  $A_c$  and  $B_c$  should be 1 (one) in the formula for each currency. Normally, both coefficients shall be the same in the formulae for all currencies, since coefficient A, for the nonadjustable portion of the payments, is a very approximate figure (usually 0.15) to take account of fixed cost elements or other nonadjustable components. The sum of the adjustments for each currency are added to the Contract Price.

- 50. Bonus**
- 50.1 The Contractor shall be paid a Bonus calculated at the rate per calendar day **stated in the PCC** 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.
- 51. Advance Payment**
- 51.1 The Employer shall make advance payment to the Contractor of the amounts **stated in the PCC** by the date **stated in the PCC**, against provision by the Contractor of an Unconditional Bank Guarantee in a form and by a bank acceptable to the Employer 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 shall not be charged on the advance payment.
- 51.2 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.
- 51.3 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.
- 52. Securities**
- 52.1 The Performance Security shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount **specified in the PCC**, by a bank or surety acceptable to the Employer, 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 Certificate of Completion in the case of a Performance Bond.
- 53. Dayworks**
- 53.1 If applicable, the Dayworks rates in the Contractor's Bid shall be used only when the Project Manager has given written instructions in advance for additional work to be paid for in that way.

53.2 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.

53.3 The Contractor shall be paid for Dayworks subject to obtaining signed Dayworks forms.

#### **54. Cost of Repairs**

54.1 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.

### **E. Finishing the Contract**

#### **55. Completion**

55.1 The Contractor shall request the Project Manager to issue a Certificate of Completion of the Works, and the Project Manager shall do so upon deciding that the whole of the Works is completed.

#### **56. Taking Over**

56.1 The Employer shall take over the Site and the Works within seven days of the Project Manager's issuing a certificate of Completion.

#### **57. Final Account**

57.1 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.

#### **58. Operating and Maintenance Manuals**

58.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates **stated in the PCC**.

58.2 If the Contractor does not supply the Drawings and/or manuals by the dates **stated in the PCC** pursuant to GCC Sub-Clause 58.1, or they do not receive the Project Manager's approval, the Project Manager shall withhold the amount **stated in the PCC** from payments due to the Contractor.

**59. Termination**

59.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

59.2 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 Program 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 Employer 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 Employer 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;
- (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 PCC**; or
- (h) if the Contractor, in the judgment of the Employer has engaged in Fraud and Corruption, as defined in paragraph 1.16 of Appendix A to the GCC, in competing for or in executing the Contract, then the Employer may, after giving fourteen (14) days written notice to the Contractor, terminate the Contract and expel him from the Site.

59.3 Notwithstanding the above, the Employer may terminate the Contract for convenience.

59.4 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.

59.5 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 GCC Sub-Clause 59.2 above, the Project Manager shall decide whether the breach is fundamental or not.

**60. Payment upon Termination**

- 60.1 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 **specified in the PCC**. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.
- 60.2 If the Contract is terminated for the Employer's convenience or because of a fundamental breach of Contract by the Employer, 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.

**61. Property**

- 61.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer if the Contract is terminated because of the Contractor's default.

**62. Release from Performance**

- 62.1 If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of either the Employer 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.

**63. Suspension of Bank Loan or Credit**

- 63.1 In the event that the Bank suspends the Loan or Credit to the Employer, from which part of the payments to the Contractor are being made:
- (a) The Employer is obligated to notify the Contractor of such suspension within 7 days of having received the Bank's suspension notice.
  - (b) If the Contractor has not received sums due to it within the 28 days for payment provided for in GCC Sub-

Clause 43.1, the Contractor may immediately issue a 14-day termination notice

## APPENDIX A

### TO GENERAL CONDITIONS

#### Bank’s Policy- Corrupt and Fraudulent Practices

##### **Guidelines for Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits & Grants by World Bank Borrowers, dated January 2011:**

##### **“Fraud and Corruption:**

1.16 It is the Bank’s policy to require that Borrowers (including beneficiaries of Bank loans), bidders, suppliers, contractors and their agents (whether declared or not), sub-contractors, sub-consultants, service providers or suppliers, and any personnel thereof, observe the highest standard of ethics during the procurement and execution of Bank-financed contracts.<sup>34</sup> In pursuance of this policy, the Bank:

- (a) defines, for the purposes of this provision, the terms set forth below as follows:
  - (i) “corrupt practice” is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;<sup>35</sup>
  - (ii) “fraudulent practice” is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;<sup>36</sup>
  - (iii) “collusive practice” is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;<sup>37</sup>
  - (iv) “coercive practice” is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;<sup>38</sup>

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<sup>34</sup> In this context, any action to influence the procurement process or contract execution for undue advantage is improper.

<sup>35</sup> For the purpose of this sub-paragraph, “*another party*” refers to a public official acting in relation to the procurement process or contract execution. In this context, “*public official*” includes World Bank staff and employees of other organizations taking or reviewing procurement decisions.

<sup>36</sup> For the purpose of this sub-paragraph, “*party*” refers to a public official; the terms “*benefit*” and “*obligation*” relate to the procurement process or contract execution; and the “*act or omission*” is intended to influence the procurement process or contract execution.

<sup>37</sup> For the purpose of this sub-paragraph, “*parties*” refers to participants in the procurement process (including public officials) attempting either themselves, or through another person or entity not participating in the procurement or selection process, to simulate competition or to establish bid prices at artificial, non-competitive levels, or are privy to each other’s bid prices or other conditions.

<sup>38</sup> For the purpose of this sub-paragraph, “*party*” refers to a participant in the procurement process or contract execution.

- (v) “obstructive practice” is
- (aa) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank 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, or
  - (bb) acts intended to materially impede the exercise of the Bank’s inspection and audit rights provided for under paragraph 1.16(e) below.
- (b) will reject a proposal for award if it determines that the bidder recommended for award, or any of its personnel, or its agents, or its sub-consultants, sub-contractors, service providers, suppliers and/or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;
- (c) will declare misprocurement and cancel the portion of the loan allocated to a contract if it determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement or the implementation of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;
- (d) will sanction a firm or individual, at any time, in accordance with the prevailing Bank’s sanctions procedures,<sup>39</sup> including by publicly declaring such firm or individual ineligible, either indefinitely or for a stated period of time: (i) to be awarded a Bank-financed contract; and (ii) to be a nominated<sup>40</sup> sub-contractor, consultant, supplier, or service provider of an otherwise eligible firm being awarded a Bank-financed contract;
- (e) will require that a clause be included in bidding documents and in contracts financed by a Bank loan, requiring bidders, suppliers and contractors, and their

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<sup>39</sup> A firm or individual may be declared ineligible to be awarded a Bank financed contract upon: (i) completion of the Bank’s sanctions proceedings as per its sanctions procedures, including, inter alia, cross-debarment as agreed with other International Financial Institutions, including Multilateral Development Banks, and through the application the World Bank Group corporate administrative procurement sanctions procedures for fraud and corruption; and (ii) as a result of temporary suspension or early temporary suspension in connection with an ongoing sanctions proceeding. See footnote 14 and paragraph 8 of Appendix 1 of these Guidelines.

<sup>40</sup> A nominated sub-contractor, consultant, manufacturer or supplier, or service provider (different names are used depending on the particular bidding document) is one which has either been: (i) included by the bidder in its pre-qualification application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.



sub-contractors, agents, personnel, consultants, service providers, or suppliers, to permit the Bank to inspect all accounts, records, and other documents relating to the submission of bids and contract performance, and to have them audited by auditors appointed by the Bank.”

## APPENDIX B

### Environmental, Social, Health and Safety (ESHS)

#### Metrics for Progress Reports

*Metrics for regular reporting:*

- a. *environmental incidents or non-compliances with contract requirements, including contamination, pollution or damage to ground or water supplies;*
- b. *health and safety incidents, accidents, injuries that require treatment and all fatalities;*
- c. *interactions with regulators: identify agency, dates, subjects, outcomes (report the negative if none);*
- d. *status of all permits and agreements:*
  - i. *work permits: number required, number received, actions taken for those not received;*
  - ii. *status of permits and consents:*
    - *list areas/facilities with permits required (quarries, asphalt & batch plants), dates of application, dates issued (actions to follow up if not issued), dates submitted to resident engineer (or equivalent), status of area (waiting for permits, working, abandoned without reclamation, decommissioning plan being implemented, etc.);*
    - *list areas with landowner agreements required (borrow and spoil areas, camp sites), dates of agreements, dates submitted to resident engineer (or equivalent);*
    - *identify major activities undertaken in each area in the reporting period and highlights of environmental and social protection (land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation);*
    - *for quarries: status of relocation and compensation (completed, or details of activities and current status in the reporting period).*
- e. *health and safety supervision:*
  - i. *safety officer: number days worked, number of full inspections & partial inspections, reports to construction/project management;*
  - ii. *number of workers, work hours, metric of PPE use (percentage of workers with full personal protection equipment (PPE), partial, etc.), worker violations*

observed (by type of violation, PPE or otherwise), warnings given, repeat warnings given, follow-up actions taken (if any);

*f. worker accommodations:*

- i. number of expats housed in accommodations, number of locals;
- ii. date of last inspection, and highlights of inspection including status of accommodations' compliance with national and local law and good practice, including sanitation, space, etc.;

- iii. actions taken to recommend/require improved conditions, or to improve conditions.

*g. Health services: provider of health services, information and/or training, location of clinic, number of non-safety disease or illness treatments and diagnoses (no names to be provided);*

*h. gender (for expats and locals separately): number of female workers, percentage of workforce, gender issues raised and dealt with (cross-reference grievances or other sections as needed);*

*i. training:*

- i. number of new workers, number receiving induction training, dates of induction training;
- ii. number and dates of toolbox talks, number of workers receiving Occupational Health and Safety (OHS), environmental and social training;
- iii. number and dates of communicable diseases (including STDs) sensitization and/or training, no. workers receiving training (in the reporting period and in the past); same questions for gender sensitization, flag person training.
- iv. number and date of SEA and SH prevention sensitization and/or training events, including number of workers receiving training on Code of Conduct for Contractor's Personnel (in the reporting period and in the past), etc.

*j. environmental and social supervision:*

- i. environmentalist: days worked, areas inspected and numbers of inspections of each (road section, work camp, accommodations, quarries, borrow areas, spoil areas, swamps, forest crossings, etc.), highlights of activities/findings (including violations of environmental and/or social best practices, actions taken), reports to environmental and/or social specialist/construction/site management;
- ii. sociologist: days worked, number of partial and full site inspections (by area: road section, work camp, accommodations, quarries, borrow areas, spoil areas, clinic, HIV/AIDS center, community centers, etc.), highlights of activities (including violations of environmental and/or social requirements observed, actions taken), reports to environmental and/or social specialist/construction/site management; and

- iii. community liaison person(s): days worked (hours community center open), number of people met, highlights of activities (issues raised, etc.), reports to environmental and/or social specialist /construction/site management.
- k. *Grievances*: list new grievances (e.g. number of allegations of SEA and SH) received in the reporting period and number of unresolved past grievances by date received, complainant's age and sex, how received, to whom referred to for action, resolution and date (if completed), data resolution reported to complainant, any required follow-up (Cross-reference other sections as needed).
  - i. Worker grievances;
  - ii. Community grievances
- l. *Traffic, road safety and vehicles/equipment*:
  - i. traffic and road safety incidents and accidents involving project vehicles & equipment: provide date, location, damage, cause, follow-up;
  - ii. traffic and road safety incidents and accidents involving non-project vehicles or property (also reported under immediate metrics): provide date, location, damage, cause, follow-up;
  - iii. overall condition of vehicles/equipment (subjective judgment by environmentalist); non-routine repairs and maintenance needed to improve safety and/or environmental performance (to control smoke, etc.).
- m. *Environmental mitigations and issues (what has been done)*:
  - i. dust: number of working bowsters, number of waterings/day, number of complaints, warnings given by environmentalist, actions taken to resolve; highlights of quarry dust control (covers, sprays, operational status); % of rock/spoil lorries with covers, actions taken for uncovered vehicles;
  - ii. erosion control: controls implemented by location, status of water crossings, environmentalist inspections and results, actions taken to resolve issues, emergency repairs needed to control erosion/sedimentation;
  - iii. quarries, borrow areas, spoil areas, asphalt plants, batch plants: identify major activities undertaken in the reporting period at each, and highlights of environmental and social protection: land clearing, boundary marking, topsoil salvage, traffic management, decommissioning planning, decommissioning implementation;
  - iv. blasting: number of blasts (and locations), status of implementation of blasting plan (including notices, evacuations, etc.), incidents of off-site damage or complaints (cross-reference other sections as needed);

- v. spill cleanups, if any: material spilled, location, amount, actions taken, material disposal (report all spills that result in water or soil contamination);
  - vi. waste management: types and quantities generated and managed, including amount taken offsite (and by whom) or reused/recycled/disposed on-site;
  - vii. details of tree plantings and other mitigations required undertaken in the reporting period;
  - viii. details of water and swamp protection mitigations required undertaken in the reporting period.
- n. compliance:*
- i. compliance status for conditions of all relevant consents/permits, for the Work, including quarries, etc.): statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance;
  - ii. compliance status of C-ESMP/ESIP requirements: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
  - iii. compliance status of SEA and SH prevention and response action plan: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
  - iv. compliance status of Health and Safety Management Plan re: statement of compliance or listing of issues and actions taken (or to be taken) to reach compliance
  - v. other unresolved issues from previous reporting periods related to environmental and social: continued violations, continued failure of equipment, continued lack of vehicle covers, spills not dealt with, continued compensation or blasting issues, etc. Cross-reference other sections as needed.

## Section IX. Particular Conditions of Contract

<b>A. General</b>	
<b>GCC 1.1 (d)</b>	The financing institution is: <b>International Development Association (IDA)</b>
<b>GCC 1.1 (r)</b>	The Employer is: <b>Chief Executive Officer,</b> <b>Northern Water Works Development Agency</b> <b>Maji House - Kismayu Road,</b> <b>P.O Box 495- 70100,</b> <b>GARISSA-KENYA.</b>
<b>GCC 1.1 (v)</b>	The Intended Completion Date for the whole of the Works shall be <i>Six (6) Months (180days) plus six (6) months defects liability period</i>
<b>GCC 1.1 (y)</b>	The Project Manager is <i>The Technical Services Manager</i> <b>Northern Water Works Development Agency</b>
<b>GCC 1.1 (aa)</b>	The Sites are located as below: <b>Arbajahan is located 135km to the west of Wajir Town while Admesajida is located at approximately 103km from Wajir Town and it is near Habaswein Town which is on Wajir Garissa Road.</b>
<b>GCC 1.1 (dd)</b>	The Start Date shall be <b>the commencement date to notify in writing by Employer.</b>
<b>GCC 1.1 (hh)</b>	The Works consist of: <b>Drilling and Equipping of two (2) Exploratory Boreholes in Arbajahan and related Civil Works</b> <b>Drilling and Equipping of two Exploratory (2) Exploratory Boreholes in Admesajida and other Civil Works</b>
<b>GCC 2.2</b>	Sectional Completions are: <i>Each set of boreholes will be a unit and completion dates will apply for each unit.</i>
<b>GCC 2.3(i)</b>	The following documents also form part of the Contract: <i>None</i>
<b>GCC 3.1</b>	The language of the contract is: <b>English</b>  The law that applies to the Contract is the law of <i>The Republic of Kenya</i>

<b>GCC 5.1</b>	The Project Manager <i>may</i> delegate any of his duties and responsibilities.
<b>GCC 8.1</b>	Schedule of other contractors: <b><i>Not Applicable</i></b>
<b>GCC 13.1</b>	The minimum insurance amounts and deductibles shall be: (a) For loss or damage to the Works, Plant and Materials: <b>Equivalent to contract price;</b> (b) For loss or damage to Equipment: <b>KES 10 Million</b> (c) For loss or damage to property (except the Works, Plant, Materials, and Equipment) in connection with Contract <b>KES 10 Million</b> (d) For personal injury or death: (i) of the Contractor’s employees: <b>KES 5 Million</b> (ii) of other people: Kshs5 million: <b>KES 5 Million</b>
<b>GCC 14.1</b>	Site Data are: <b>The bidder shall rely on the provided contract drawings and physical site inspections and investigations by the bidder.</b>
<b>GCC 20.1</b>	The Site Possession Date(s) shall be:  <b>Within 28 days of the Commencement Date</b>
<b>GCC 23.1 &amp; GCC 23.2</b>	Appointing Authority for the Adjudicator:  <b>The Kenya Chapter of the Chartered Institute of Arbitrators, P.O Box 50163-00200, Nairobi.</b>
<b>GCC 24.3</b>	Hourly rate and types of reimbursable expenses to be paid to the Adjudicator: <b>Kshs. 25,000/-</b>
<b>GCC 24.4</b>	Institution whose arbitration procedures shall be used: <b>The Kenya Chapter of the Chartered Institute of Arbitrators</b>  Sub-Clause 25.3 – Any dispute, controversy, or claim arising out of or relating to this Contract, or breach, termination, or invalidity thereof, shall be settled by arbitration in accordance with the “ <b>Chartered Institute of Arbitrators (Kenya Chapter) Arbitration Rules as at present in force.</b> ”  The place of arbitration shall be: <b>Nairobi, Kenya</b>
<b>B. Time Control</b>	
<b>GCC 28.1</b>	The Contractor shall submit for approval a Program for the Works within <b>28 Days</b> from the date of the Letter of Acceptance.
<b>GCC 28.3</b>	The period between Program updates is <b>Monthly</b>

	The amount to be withheld for late submission of an updated Program is <b>KES 100,000</b> The period for submission of progress reports is <b>Monthly</b>
<b>C. Quality Control</b>	
<b>GCC 36.1</b>	The Defects Liability Period is: <b>6 Months (180 Days).</b>
<b>D. Cost Control</b>	
<b>GCC 46.1</b>	The currency of the Employer's country is: <b>Kenya Shilling</b>
<b>GCC 47.1</b>	The Contract <b>is not</b> subject to price adjustment in accordance with GCC Clause 45, and the following information regarding coefficients <b>does not</b> apply.
<b>GCC 48.1</b>	The proportion of payments retained is: <b>10%</b> Limit of Retention: <b>5% of Accepted Contract Amount (inclusive of VAT)</b>
<b>GCC 49.1</b>	The liquidated damages for the whole of the Works are five ( <b>0.05%</b> ) of <b>final Contract Price per day. The maximum amount of liquidated damages for the whole of the Works is 5% of the final Contract Price.</b>
<b>GCC 50.1</b>	The Bonus for the whole of the Works <b>Not Applicable</b>
<b>GCC 51.1</b>	The Advance Payments shall be: <b>Not Applicable</b>
<b>GCC 52.1</b>	An Environmental and Social (ES) <b>Performance Security shall not be</b> provided to the Employer
<b>GCC 52.1</b>	The Performance Security amount is: (a) Performance Security – Bank Guarantee (unconditional and on demand): in the amount(s) of <b>ten (10) percent</b> of the Accepted Contract Amount and in the same currency(ies) of the Accepted Contract Amount. (b) Performance Security – Performance Bond: <b>N/A</b>
<b>E. Finishing the Contract</b>	
<b>GCC 58.1</b>	The date by which operating and maintenance manuals are required is <b>30 days after substantial completion.</b>



	The date by which “as built” drawings are required is <b>30 days after substantial completion.</b>
<b>GCC 58.2</b>	The amount to be withheld for failing to produce “as built” drawings and/or operating and maintenance manuals by the date required in GCC Sub-Clause 58.1 is <b>KES 250, 000/-</b>
<b>GCC 59.2 (g)</b>	The maximum number of days is: <b>90 days</b>
<b>GCC 60.1</b>	The percentage to apply to the value of the work not completed, representing the Employer’s additional cost for completing the Works, is <b>15% (Fifteen Percent)</b>

## **Section X - Contract Forms**

This Section contains forms which, once completed, will form part of the Contract. The forms for Performance Security and Advance Payment Security, when required, shall only be completed by the successful Bidder after contract award.

### **Table of Forms**

<b>Letter of Acceptance .....</b>	<b>167</b>
<b>Contract Agreement .....</b>	<b>168</b>
<b>Performance Security (Bank Guarantee) .....</b>	<b>170</b>

# Letter of Acceptance

..... [date] .....

To: ..... [ name and address of the Contractor] .....

Subject: ..... [Notification of Award Contract No]. .....

This is to notify you that your Bid dated . . . . [insert date] . . . . for execution of the . . . . .  
. . . . [insert name of the contract and identification number, as given in the PCC] . . . . . for the  
Accepted Contract Amount of . . . . . [insert amount in numbers and words and name of  
currency], as corrected and modified in accordance with the Instructions to Bidders is  
hereby accepted by our Agency.

You are requested to furnish the Performance Security and an Environmental, Social,  
Health and Safety Performance Security **[Delete ESHS Performance Security if it is not  
required under the contract]** within 28 days in accordance with the Conditions of  
Contract, using for that purpose the of the Performance Security Form and the ES  
Performance Security Form, **[Delete reference to the ESHS Performance Security Form  
if it is not required under the contract]** included in Section X - Contract Forms, of the  
bidding document.

**[Choose one of the following statements:]**

We accept that \_\_\_\_\_ **[insert the name of Adjudicator proposed by the  
Bidder]** be appointed as the Adjudicator.

**[or]**

We do not accept that \_\_\_\_\_ **[insert the name of the Adjudicator proposed  
by the Bidder]** be appointed as the Adjudicator, and by sending a copy of this Letter of  
Acceptance to \_\_\_\_\_ **[insert name of the  
Appointing Authority]**, the Appointing Authority, we are hereby requesting such Authority  
to appoint the Adjudicator in accordance with ITB 43.1 and GCC 23.1.

Authorized Signature: .....

Name and Title of Signatory: .....

Name of Agency: .....

## Contract Agreement

THIS AGREEMENT made the . . . . .day of . . . . ., . . . . ., between **Northern Water Works Development Agency**. (hereinafter “the Employer”), of the one part, and . . . . . [*name of the Contractor*]. . . . .(hereinafter “the Contractor”), of the other part:

WHEREAS the Employer desires that the Works known as. **Drilling and Equipping of Arbajahan and Admesajida 4Nr Exploratory Boreholes and other Civil Works**

. 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,

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.
  - (a) the Letter of Acceptance
  - (b) the Letter of Bid
  - (c) the addenda Nos \_\_\_\_\_(if any)
  - (d) the Particular Conditions
  - (e) the General Conditions of Contract, including Appendices;
  - (f) the Specification
  - (g) the Drawings
  - (h) Bill of Quantities;<sup>41</sup> and
  - (i) any other document listed in the PCC as forming part of the Contract, but not limited to;
    - i. the ES Management Strategies and Implementation Plans; and
    - ii. Code of Conduct for Contractor’s Personnel (ES;
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

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<sup>41</sup> In lump sum contracts, delete “Bill of Quantities” and replace with “Activity Schedule.”

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 the **Republic of Kenya** on the day, month and year specified above.

Signed by: .....  
for and on behalf of the Employer

Signed by: .....  
for and on behalf the Contractor

in the  
presence of: .....  
Witness, Name, Signature, Address, Date

in the  
presence of: .....  
Witness, Name, Signature, Address, Date

## Performance Security (Bank Guarantee)

### (Bank Guarantee)

*[Guarantor letterhead or SWIFT identifier code]*

**Northern Water Works Development Agency**

**P.O Box 495**

**Garissa**

**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 of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (hereinafter called "the Applicant") has entered into Contract No. *[insert reference number of the contract]* dated *[insert date]* with the Beneficiary, for the execution of \_ *[insert name of 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.

At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]* (\_\_\_\_\_) *[insert amount in words]*,<sup>1</sup> such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's complying 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 to show grounds for your demand or the sum specified therein.

This guarantee shall expire, no later than the .... Day of ....., 2...<sup>2</sup>, and any demand for payment under it must be received by us at this office indicated above on or before that date.

---

<sup>1</sup> *The Guarantor shall insert an amount representing the percentage of the Accepted Contract Amount specified in the Letter of Acceptance, less provisional sums, if any, and denominated either in the currency(cies) of the Contract or a freely convertible currency acceptable to the Beneficiary.*

<sup>2</sup> *Insert the date twenty-eight days after the expected completion date as described in GC Sub-Clause 55.1. 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*

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.

---

*[signature(s)]*

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*paragraph: "The Guarantor agrees to a 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."*

**NORTHERN WATER WORKS DEVELOPMENT AGENCY**

**Bidding Document for Procurement of: Drilling and Equipping 4 No. Exploratory Boreholes in Wajir County**

**VOLUME III**

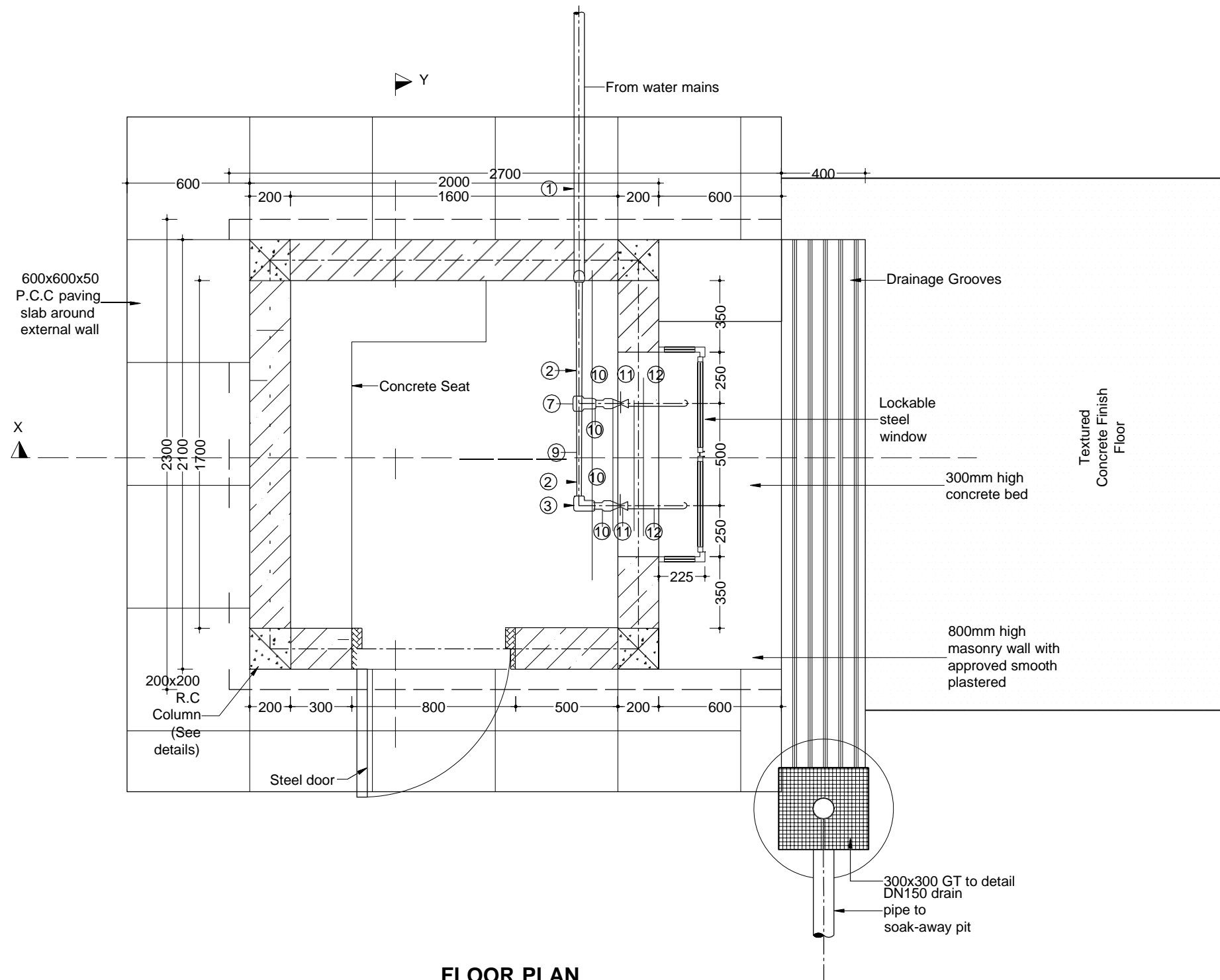
**BOOK OF DRAWINGS**

**ISSUED ON: 16<sup>th</sup> SEPTEMBER 2021**



# WATER KIOSK

D:\GEOFFREY PERSONAL LAPTOP\Geoffrey Hard Disc 2019\WSSIP\WSDP\Exploratory Boreholes\Exploratory Boreholes\NWWDA-WSDP-W5-001-Standard Water Kiosks.dwg <Plan> Tue, 31 Aug 2021 - 01:44pm User



**FLOOR PLAN**  
Scale 1:25 (A3)

**NOTES:**

1. All dimensions are in millimeters unless specified otherwise.
2. All dimensions to be read and confirmed before construction begins and any discrepancy reported to Engineer.
3. Foundation depths to be determined on site but to hard stratum and approved by Engineer on site.
4. All concrete works to be class 20/25.
5. All steel reinforcement to BS4449.
6. Form-work to be fair-finished.
7. Drains under buildings and driveways to be encased in at least 150mm thick concrete.
8. Foundation trenches and concrete works to be treated with approved anti-termite chemical with at least 10 year guarantee.
9. All materials are subject to Engineer's approval before use.

**CLIENT**



**NORTHERN WATER WORKS  
DEVELOPMENT AGENCY**

**PROJECT:**

**WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)**

**CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT**

**ENGINEER:**

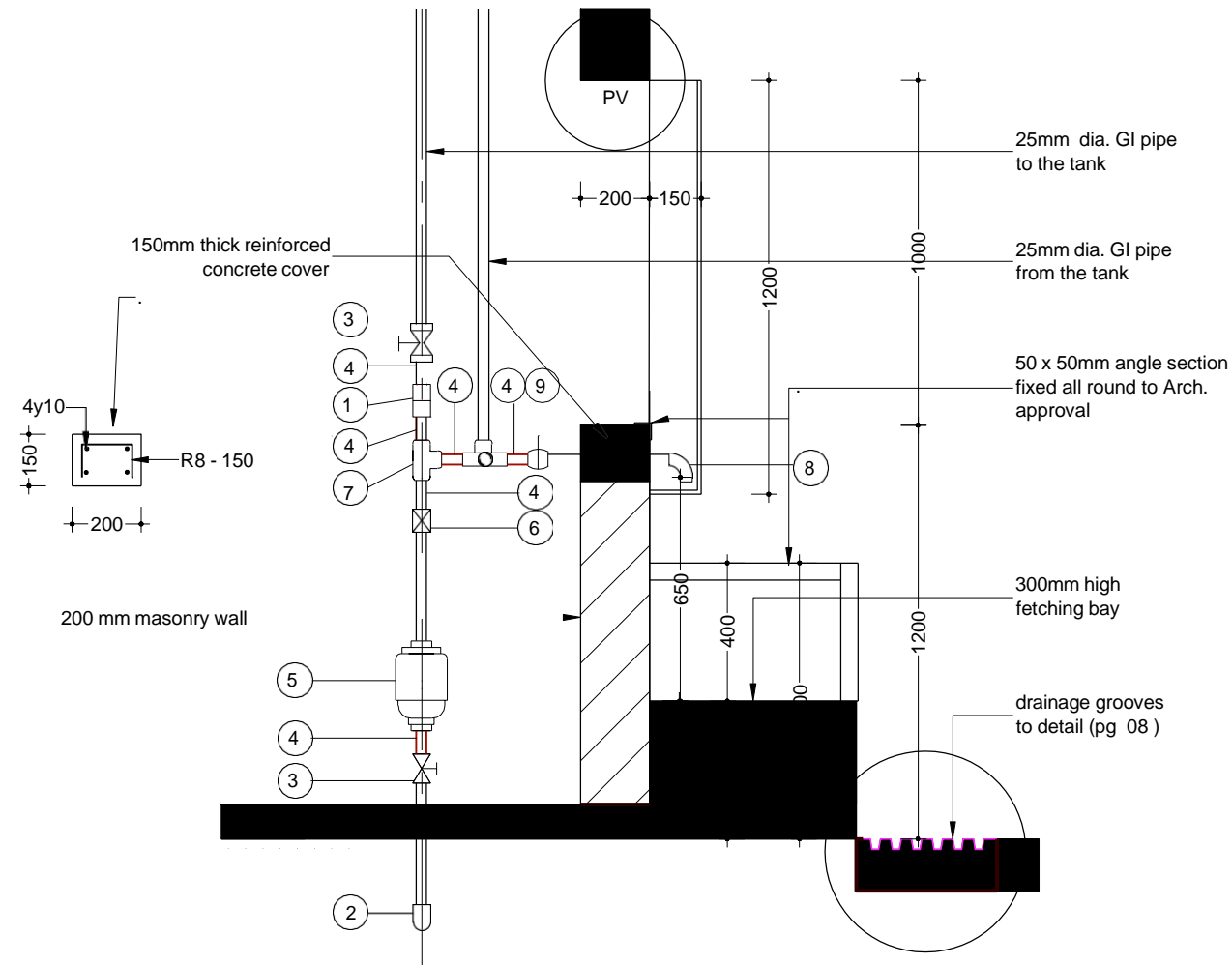
**TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY**

**DRAWING TITLE:**

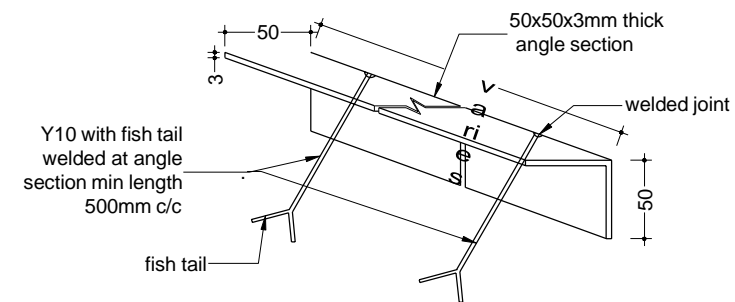
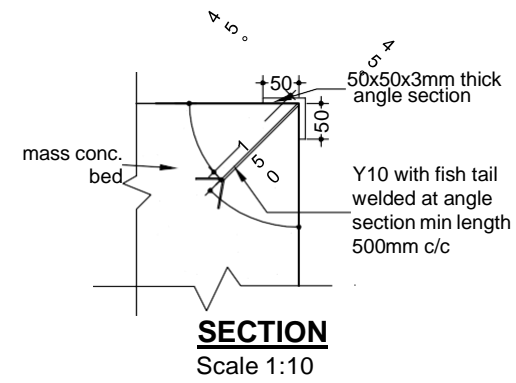
**STANDARD WATER KIOSK  
(ARCHITECTURAL PLAN)**

**DRAWING DETAILS:**

Designed by:	Drawn by:
Eng. Peter Ouma	Kurgat D.K.
Revised by:	Approved by:
	Eng. J. Loveday
Scale:	Date:
As Shown	
Sheet No:	1 of 16
Drawing No:	NWWDA/WSDP/001



**DETAIL C**  
Scale 1:20



ITEM NO.	DESCRIPTION (ALL 25NN DIA)	UNIT)	QTY
1	Galvanised Iron Union	No.	3
2	Galvanised Iron Elbows	No.	3
3	Galvanised Iron Gate Valve (Pegler)	No.	2
4	Galvanised Iron Nipples	No.	11
5	Water Meter	No.	1
6	Non Return Valve	No.	1
7	Galvanised Iron Equal Tee	No.	5
8	Galvanised Iron Bend	No.	4
9	Ball Cock Water Taps	No.	3
10	Galvanised Iron Long Thread Nipples	No.	2
17	Galvanised Iron Black Nuts	No.	4
12	Galvanised Iron Class B Pipe (per metres)	No.	4
13	Boss white (400g)	No.	3
14	Temp Thread	LM..	2

N.T.S

**NOTES:**

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3. Foundation depths to be determined on site but to hard stratum and approved by Engineer on site.
4. All concrete works to be class 20/25.
5. All steel reinforcement to BS4449.
6. Form-work to be fair-finished.
7. Drains under buildings and driveways to be encased in at least 150mm thick concrete.
8. Foundation trenches and concrete works to be treated with approved anti-termite chemical with at least 10 year guarantee.
9. All materials are subject to Engineer's approval before use.

**CLIENT**



**NORTHERN WATER WORKS  
DEVELOPMENT AGENCY**

**PROJECT:**

**WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)**

**CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT**

**ENGINEER:**

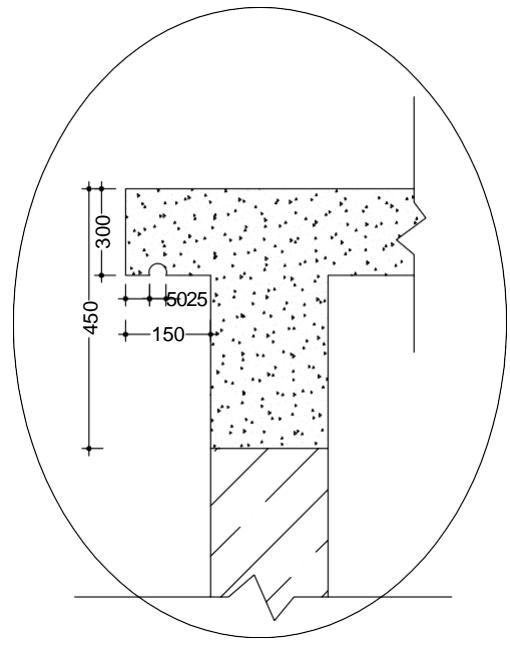
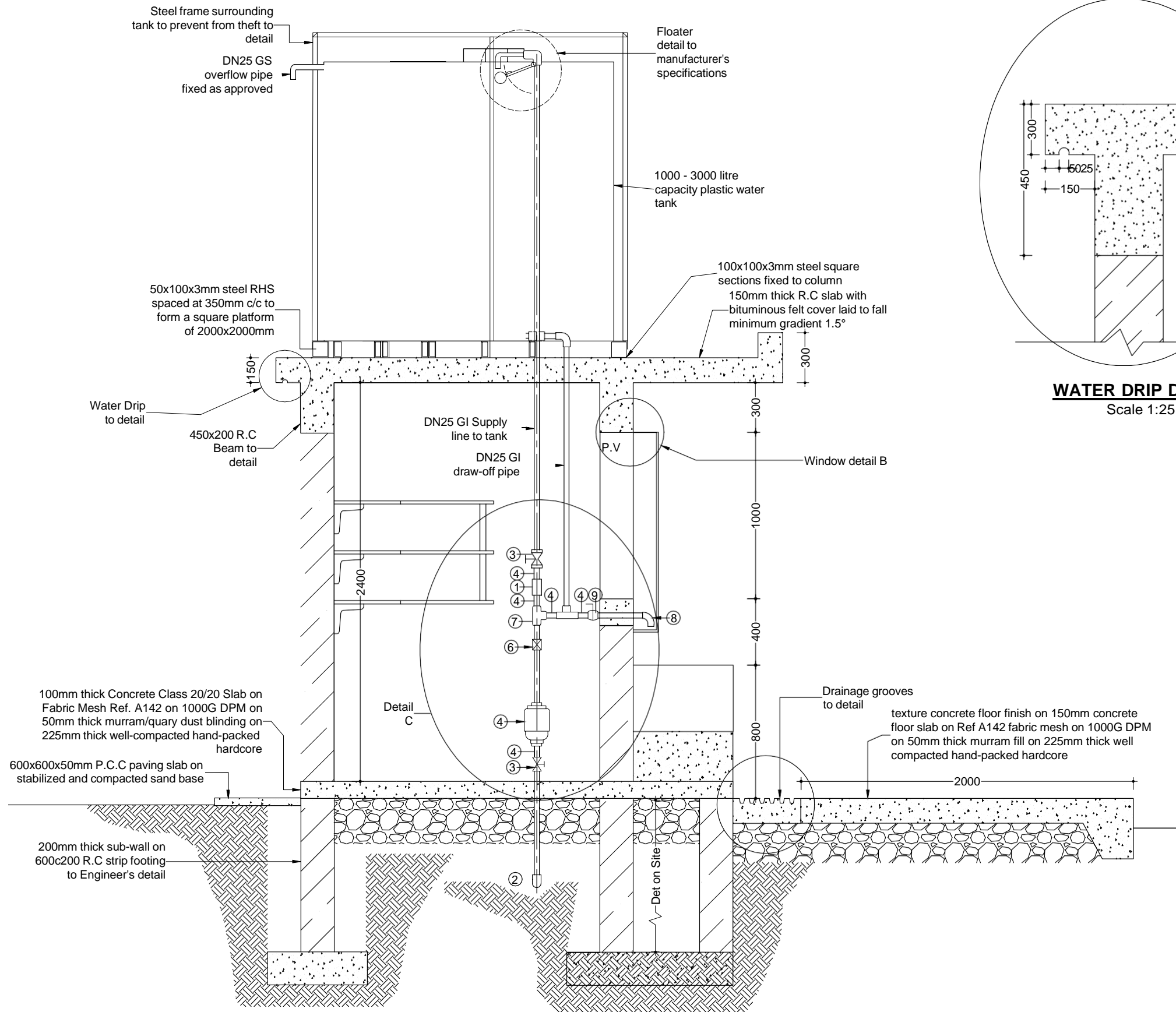
**TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY**

**DRAWING TITLE:**

**STANDARD WATER  
KIOSK TYPE 1  
(PLUMBING DETAILS)**

**DRAWING DETAILS:**

Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	12 of 16	Drawing No:	NWWD/ARS/DB/001



**WATER DRIP DETAIL**  
Scale 1:25

**SECTION X-X**  
Scale 1:25(A3)

**NOTES:**

1. All dimensions are in millimeters unless specified otherwise.
2. All dimensions to be read and confirmed before construction begins and any discrepancy reported to Engineer.
3. Foundation depths to be determined on site but to hard stratum and approved by Engineer on site.
4. All concrete works to be class 20/25.
5. All steel reinforcement to BS4449.
6. Form-work to be fair-finished.
7. Drains under buildings and driveways to be encased in at least 150mm thick concrete.
8. Foundation trenches and concrete works to be treated with approved anti-termite chemical with at least 10 year guarantee.
9. All materials are subject to Engineer's approval before use.

**CLIENT**



NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

**PROJECT:**

**WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)**  
  
**CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT**

**ENGINEER:**

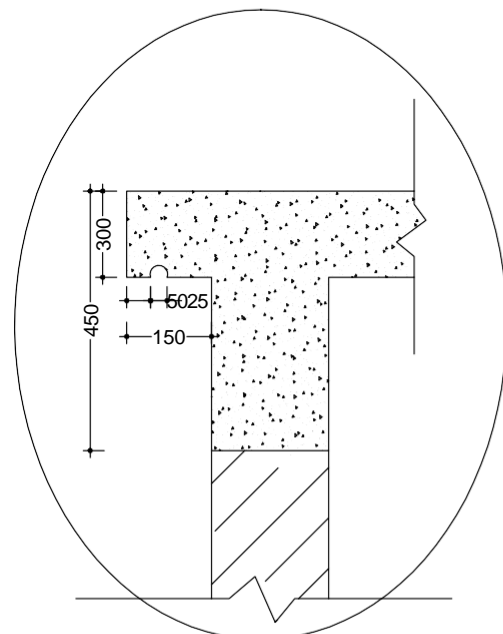
**TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY**

**DRAWING TITLE:**

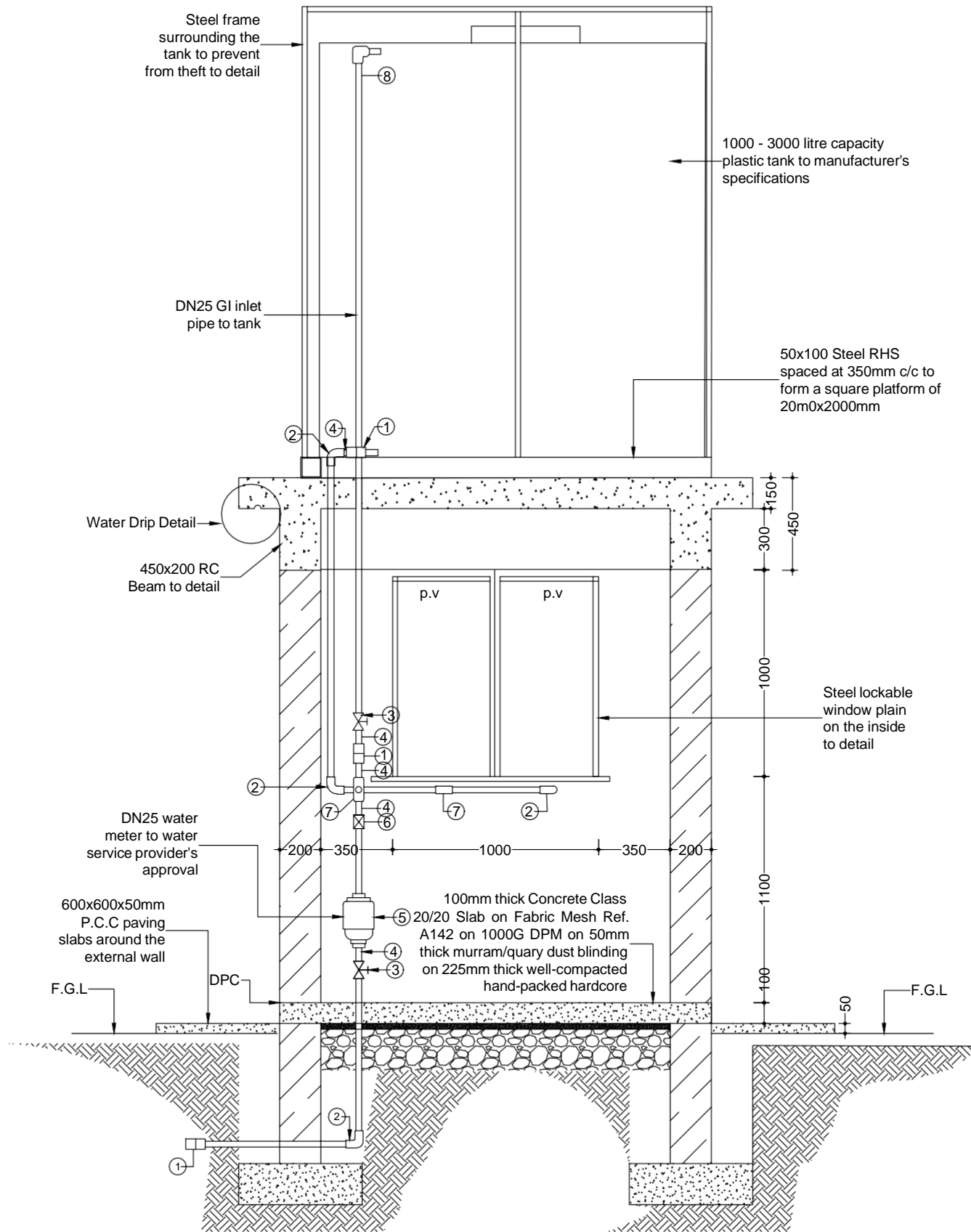
**STANDARD WATER  
KIOSK  
(SECTION X-X)**

**DRAWING DETAILS:**

Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	6 of 16	Drawing No:	NWWD/WSDP/001



**WATER DRIP DETAIL**  
Scale 1:25 (A3)



**SECTION Y-Y**  
Scale 1:25

**NOTES:**

1. All dimensions are in millimeters unless specified otherwise.
2. All dimensions to be read and confirmed before construction begins and any discrepancy reported to Engineer.
3. Foundation depths to be determined on site but to hard stratum and approved by Engineer on site.
4. All concrete works to be class 20/25.
5. All steel reinforcement to BS4449.
6. Form-work to be fair-finished.
7. Drains under buildings and driveways to be encased in at least 150mm thick concrete.
8. Foundation trenches and concrete works to be treated with approved anti-termite chemical with at least 10 year guarantee.
9. All materials are subject to Engineer's approval before use.

**CLIENT**



NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

**PROJECT:**

**WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)**

**CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT**

**ENGINEER:**

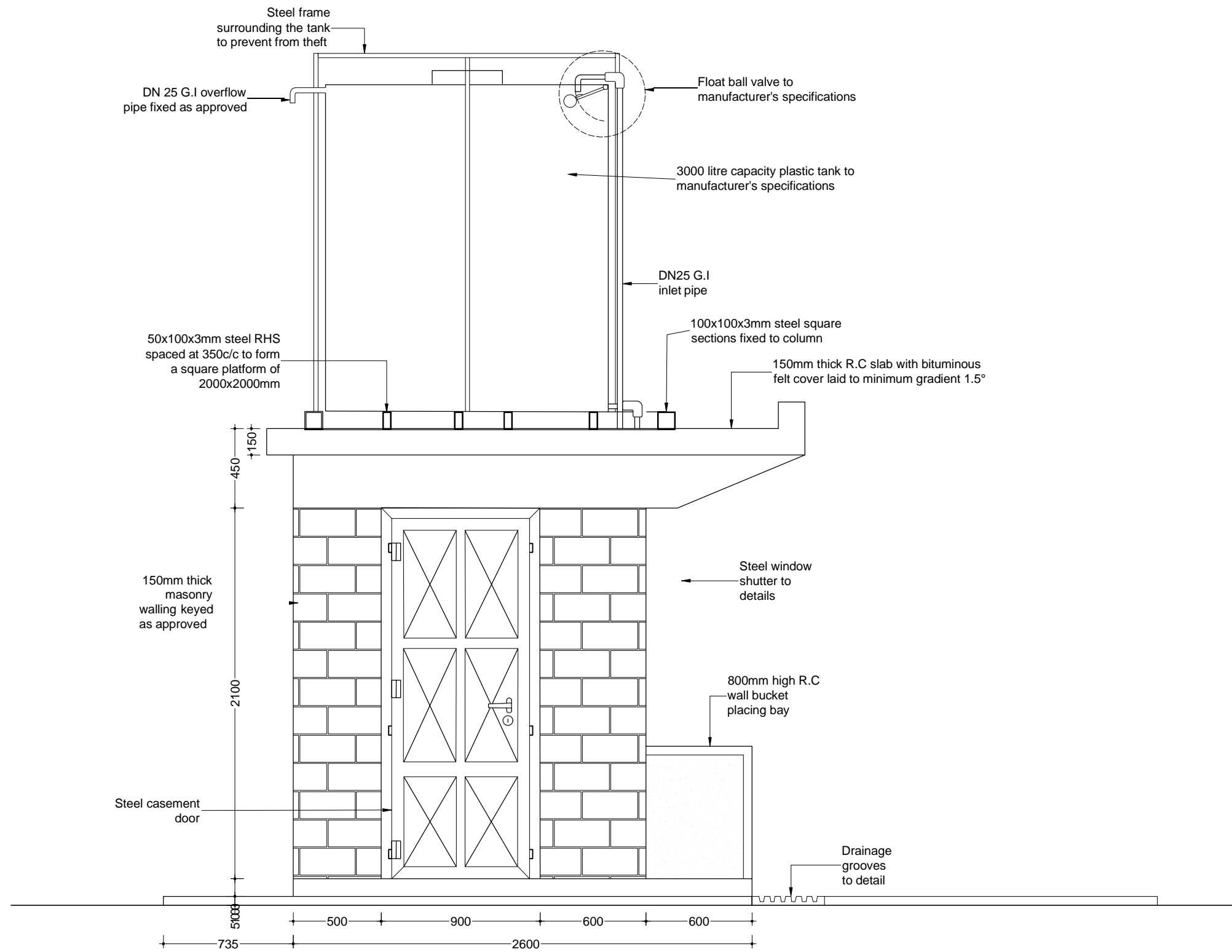
**TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY**

**DRAWING TITLE:**

**STANDARD WATER  
KIOSK TYPE 1  
(SECTION Y-Y)**

**DRAWING DETAILS:**

Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	7 of 16		
Drawing No:	NWWDA/WSDP/001		



**SIDE ELEVATION**  
Scale 1:25 (A3)

**NOTES:**

1. All dimensions are in millimeters unless specified otherwise.
2. All dimensions to be read and confirmed before construction begins and any discrepancy reported to Engineer.
3. Foundation depths to be determined on site but to hard stratum and approved by Engineer on site.
4. All concrete works to be class 20/25.
5. All steel reinforcement to BS4449.
6. Form-work to be fair-finished.
7. Drains under buildings and driveways to be encased in at least 150mm thick concrete.
8. Foundation trenches and concrete works to be treated with approved anti-termite chemical with at least 10 year guarantee.
9. All materials are subject to Engineer's approval before use.

**CLIENT**



NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

**PROJECT:**

WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)

CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT

**ENGINEER:**

TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

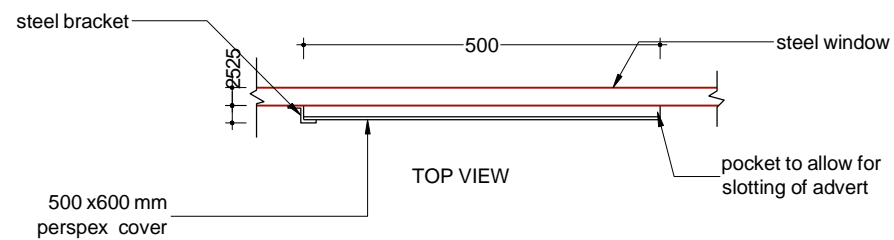
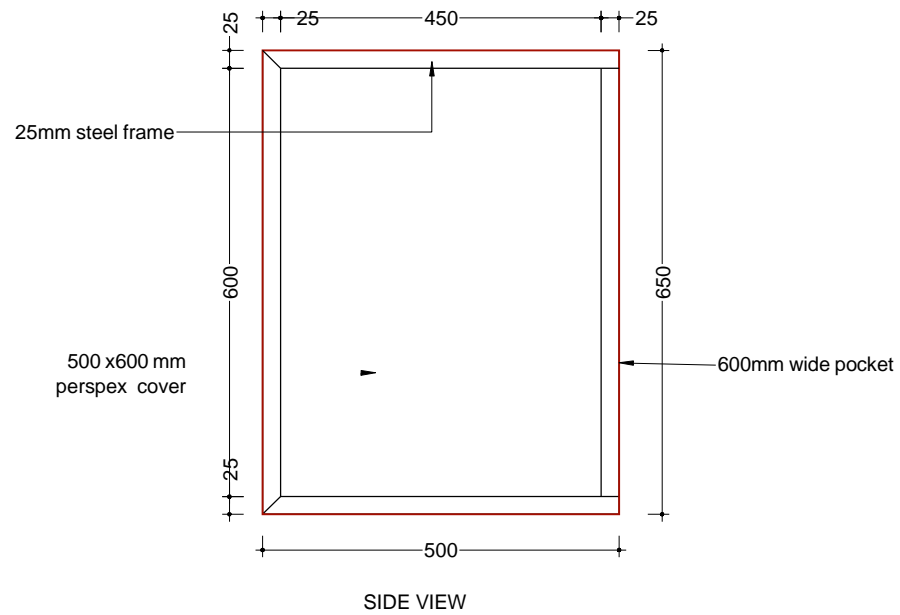
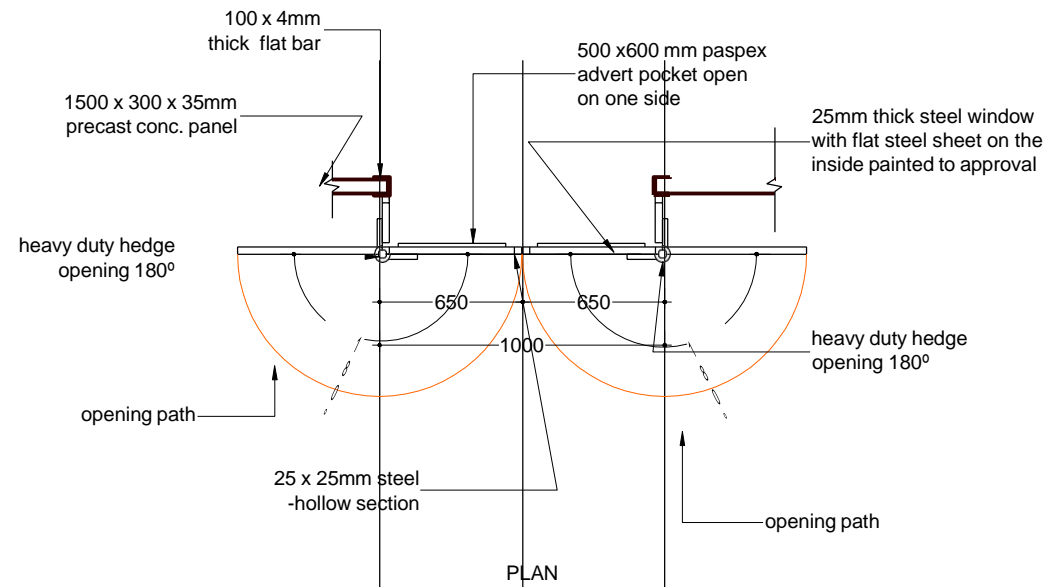
**DRAWING TITLE:**

STANDARD WATER  
KIOSK TYPE 1  
(SIDE ELEVATION)

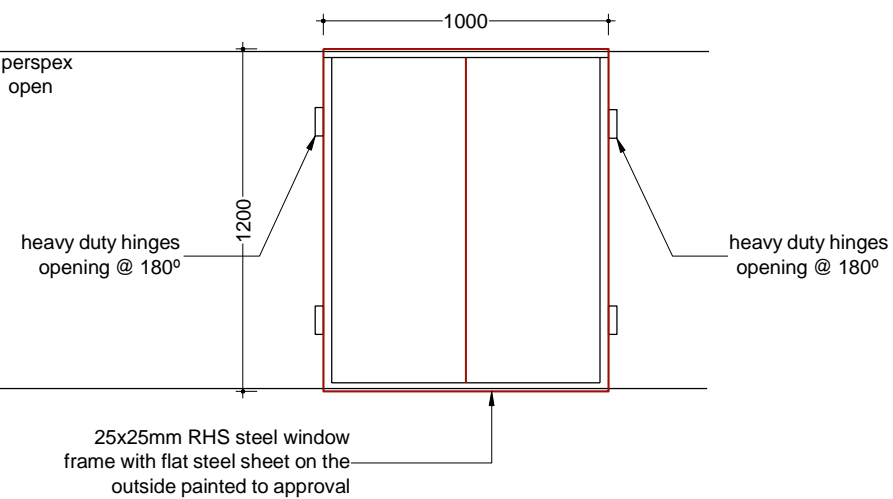
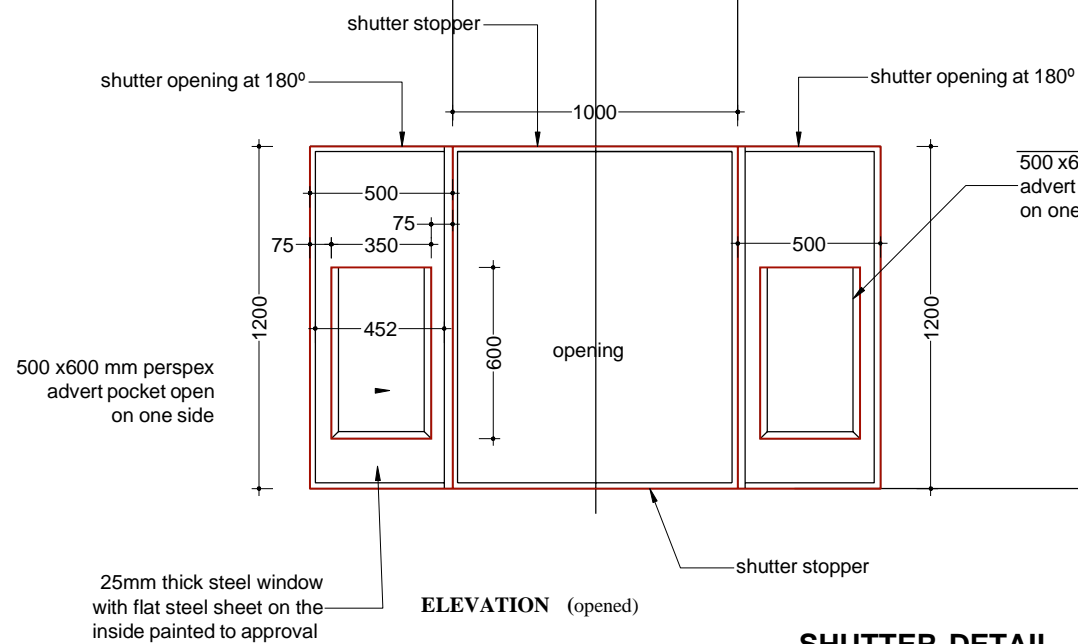
**DRAWING DETAILS:**

Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	3 of 16	Drawing No:	NWWDA/WSDP/001





**ADVERT POCKET DETAIL**



**SHUTTER DETAIL**

**ELEVATION (closed)**

**NOTES:**

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6. Form-work to be fair-finished.
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8. Foundation trenches and concrete works to be treated with approved anti-termite chemical with at least 10 year guarantee.
9. All materials are subject to Engineer's approval before use.

**CLIENT**



NORTHERN WATER WORKS DEVELOPMENT AGENCY

**PROJECT:**

WATER AND SANITATION DEVELOPMENT PROJECT (WSDP)

CONSTRUCTION OF ADMESAJIDA AND ARBAJAHAN WATER SUPPLY PROJECT

**ENGINEER:**

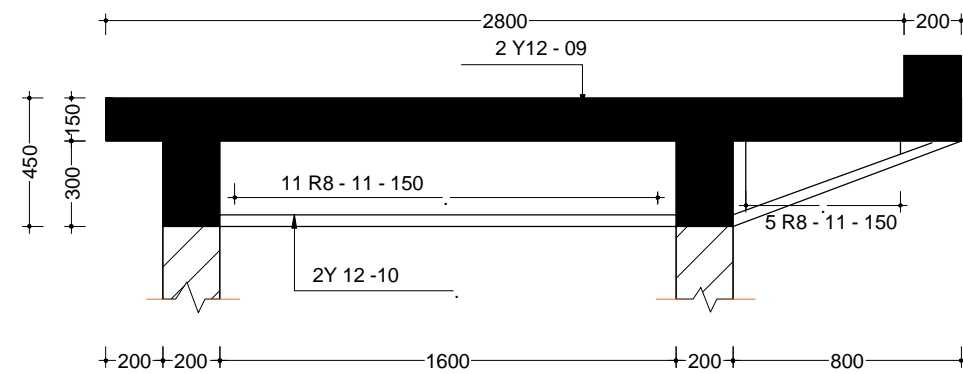
TECHNICAL SERVICES MANAGER  
NORTHERN WATER WORKS DEVELOPMENT AGENCY

**DRAWING TITLE:**

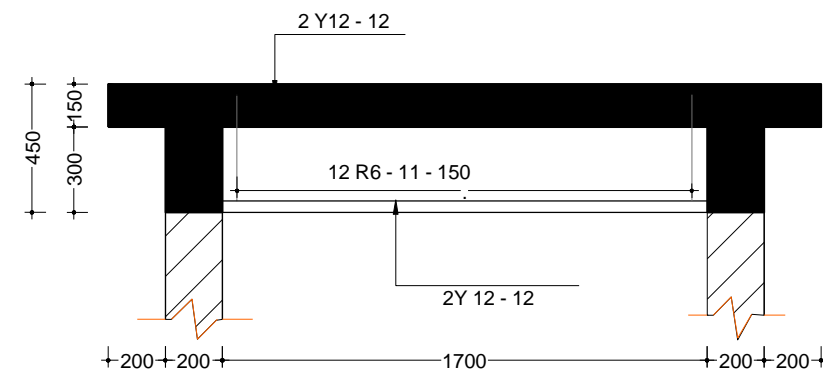
STANDARD WATER KIOSK TYPE 1 (WINDOW DETAILS)

**DRAWING DETAILS:**

Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	14 of 16		
Drawing No:	NWWDA/WSDP/001		



**BEAM A 2No.**  
Scale 1:25



**BEAM B 2 No.**  
Scale 1:25

**NOTES:**

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**CLIENT**



NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

**PROJECT:**

WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)

CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT

**ENGINEER:**

TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

**DRAWING TITLE:**

STANDARD WATER  
KIOSK TYPE 1  
(BEAM DETAILS)

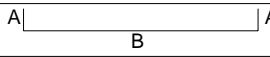
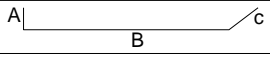
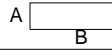
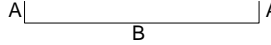
**DRAWING DETAILS:**

Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	9 of 16		
Drawing No:	NWWDA/WSDP/001		

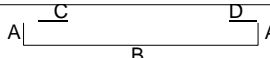
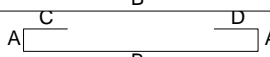
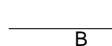


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Item	Description	Bar type	Bar mark	Shape	Dimensions (mm)				Length (mm)	Number	Total length (mm)
					A	B	C	D			
1	<u>Beams</u>	Y12	09	A  A	100	2750			2950	2	5,900
		Y12	10	A  C	100	1975	850		2925	2	5,850
		R 8	11	A  B	150	400			1200	45	55,000
		Y12	12	A  A	100	2050			2250	8	18,000

Length of bar is estimated to be 12,000mm

Item	Description	Bar type	Bar mark	Shape	Dimensions (mm)				Length (mm)	Number	Total length (mm)
					A	B	C	D			
1	<u>Slab</u>	Y10	13	A  D A	100	2,450	1000	1000	5150	16	74,400
		Y10	14	A  D A	100	2,900	1000	1600	5700	12	68,400
		Y10	15	 B		2,200			2200	19	41,800

Length of bar is estimated to be 12,000mm

**CLIENT**

NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

**PROJECT:**

**WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)**

**CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT**

**ENGINEER:**

TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

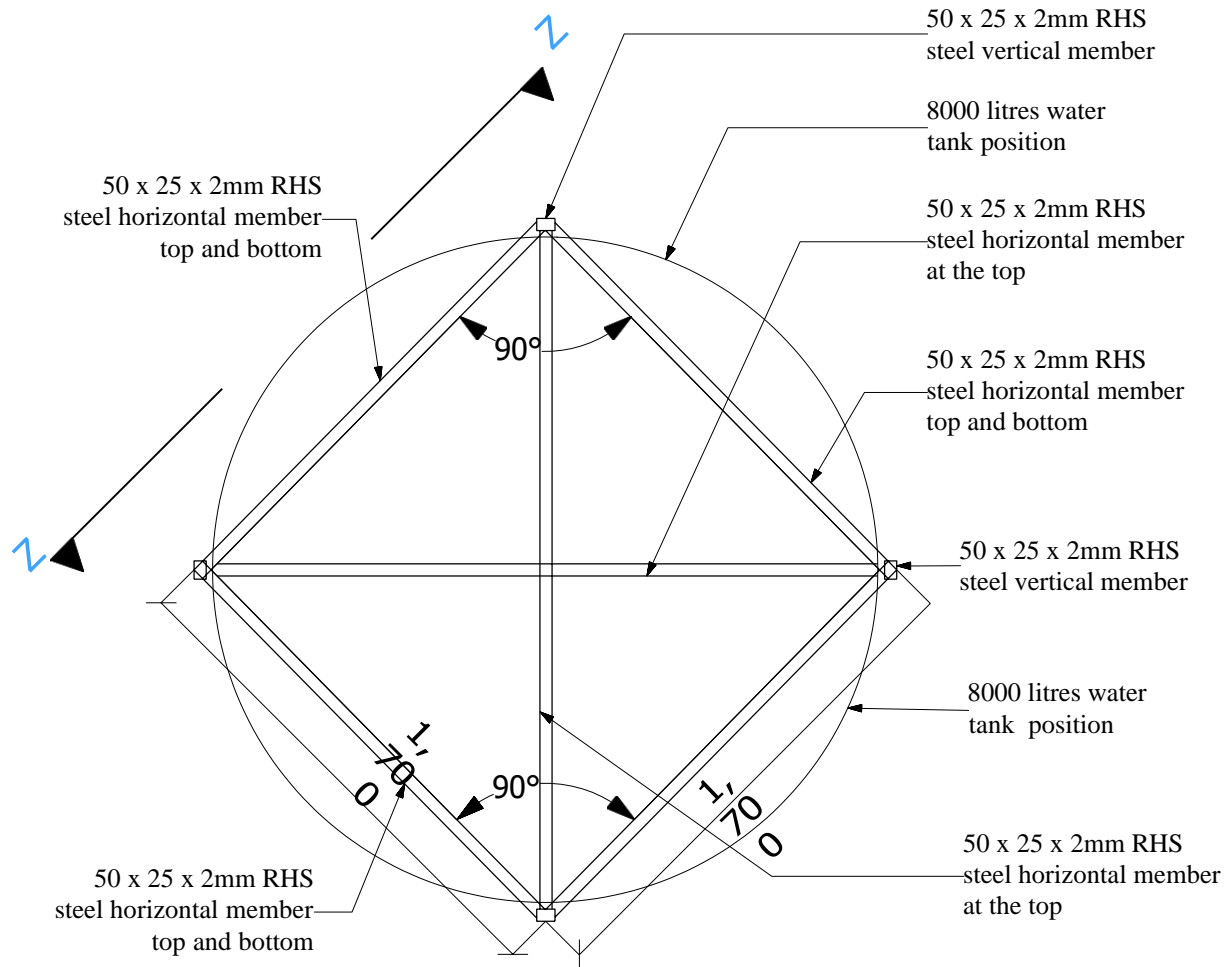
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**STANDARD WATER  
KIOSK TYPE 1  
(BEAMS & SLAB BAR  
SCHEDULE)**

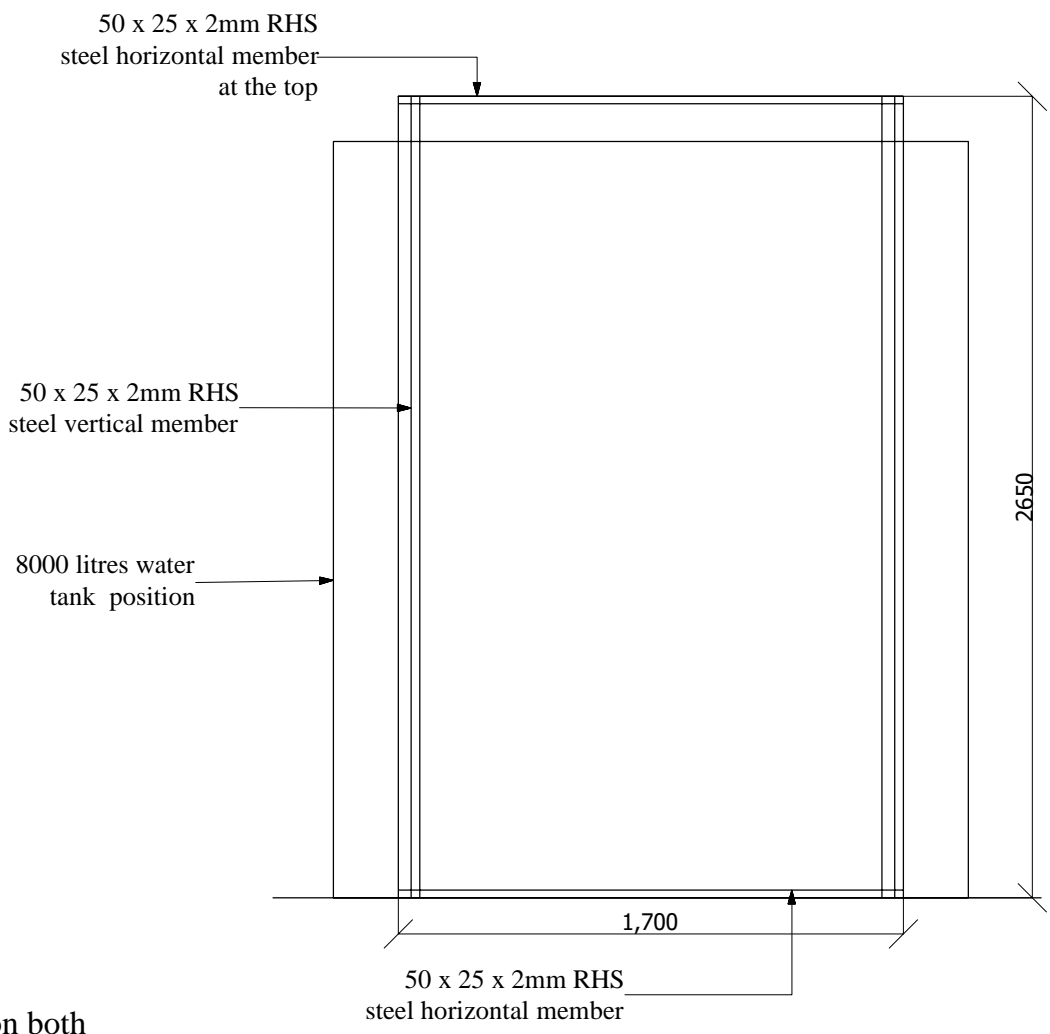
**DRAWING DETAILS:**

Designed by:	Drawn by:
Eng. Peter Ouma	Kurgat D.K.
Revised by:	Approved by:
	Eng. J. Loveday
Scale:	Date:
As Shown	
Sheet No:	11 of 16
Drawing No:	NWWD/WSDP/001

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**TOP VIEW**



**SIDE VIEW X-X**

**NB** the cage to be used on both 8000ltrs and 5000ltrs tanks

**STEEL CAGE DETAIL**

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**CLIENT**



**NORTHERN WATER WORKS DEVELOPMENT AGENCY**

**PROJECT:**

**WATER AND SANITATION DEVELOPMENT PROJECT (WSDP)**

**CONSTRUCTION OF ADMESAJIDA AND ARBAJAHAN WATER SUPPLY PROJECT**

**ENGINEER:**

**TECHNICAL SERVICES MANAGER  
NORTHERN WATER WORKS DEVELOPMENT AGENCY**

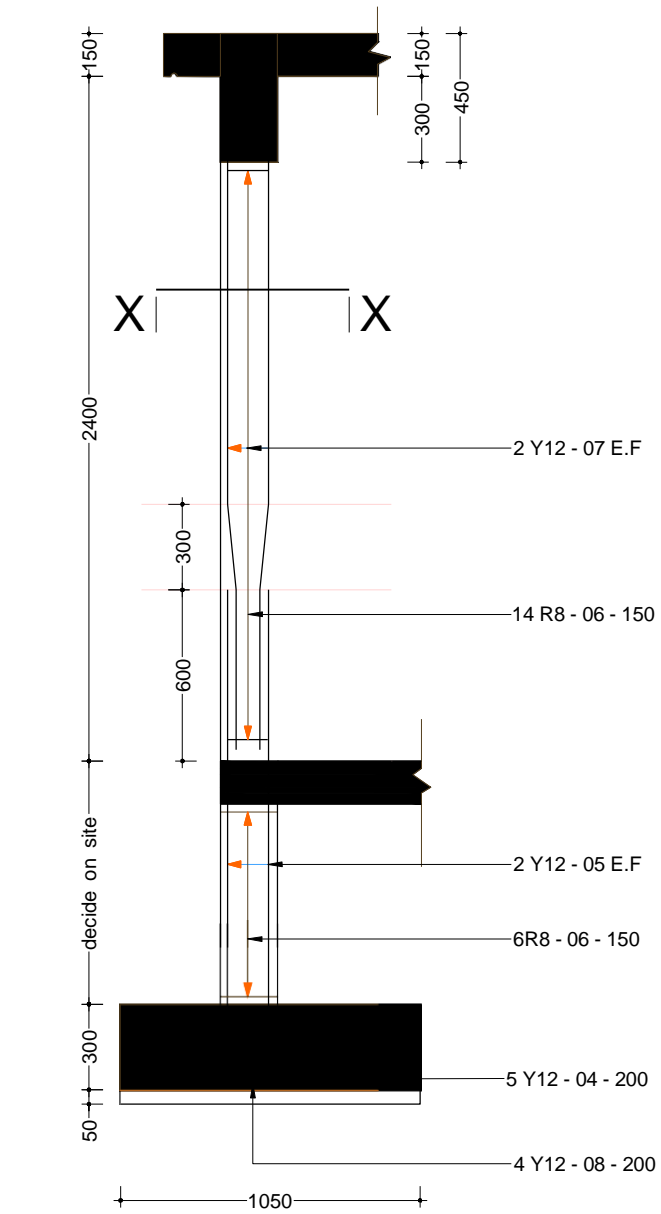
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**STANDARD WATER KIOSK TYPE 1 (GAGE DETAILS)**

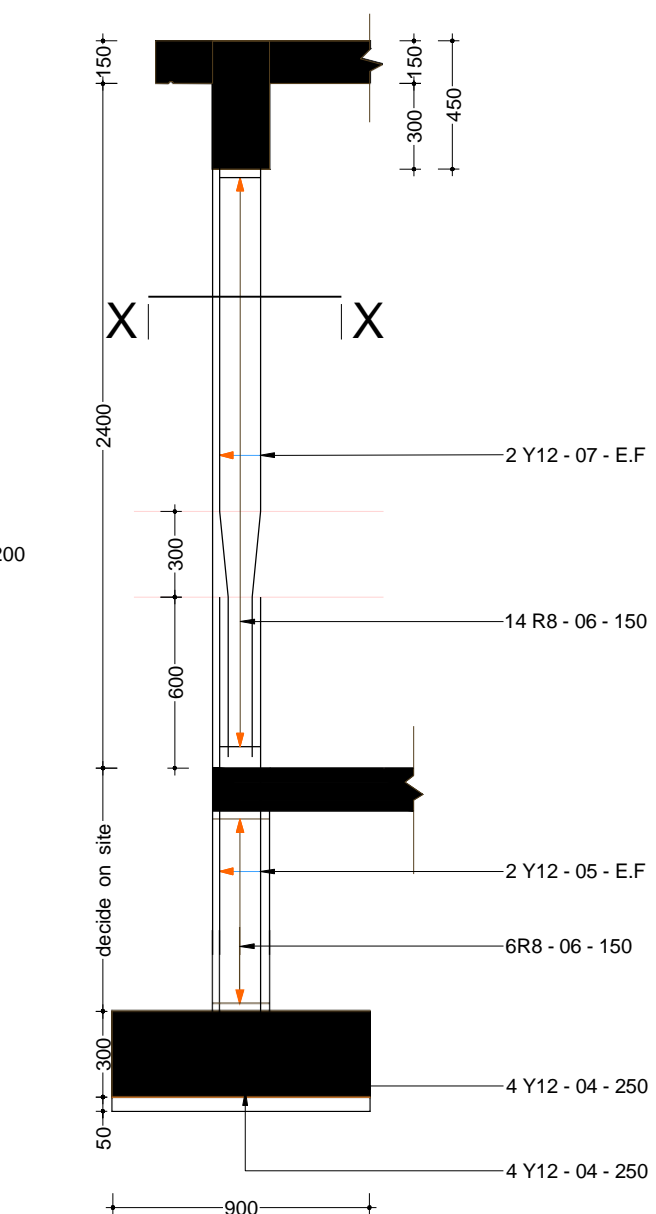
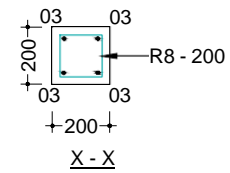
**DRAWING DETAILS:**

Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	16 of 16		
Drawing No:	NWDA/WSDP/001		

N.T.S



**DETAIL FOR COLUMN & COL. BASE  
SHOWN THUS D 2No.  
Scale 1:25**



**DETAIL FOR COLUMN & COL. BASE  
SHOWN THUS C 2No.  
Scale 1:25**

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**CLIENT**



**NORTHERN WATER WORKS  
DEVELOPMENT AGENCY**

**PROJECT:**

**WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)**

**CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT**

**ENGINEER:**

**TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY**

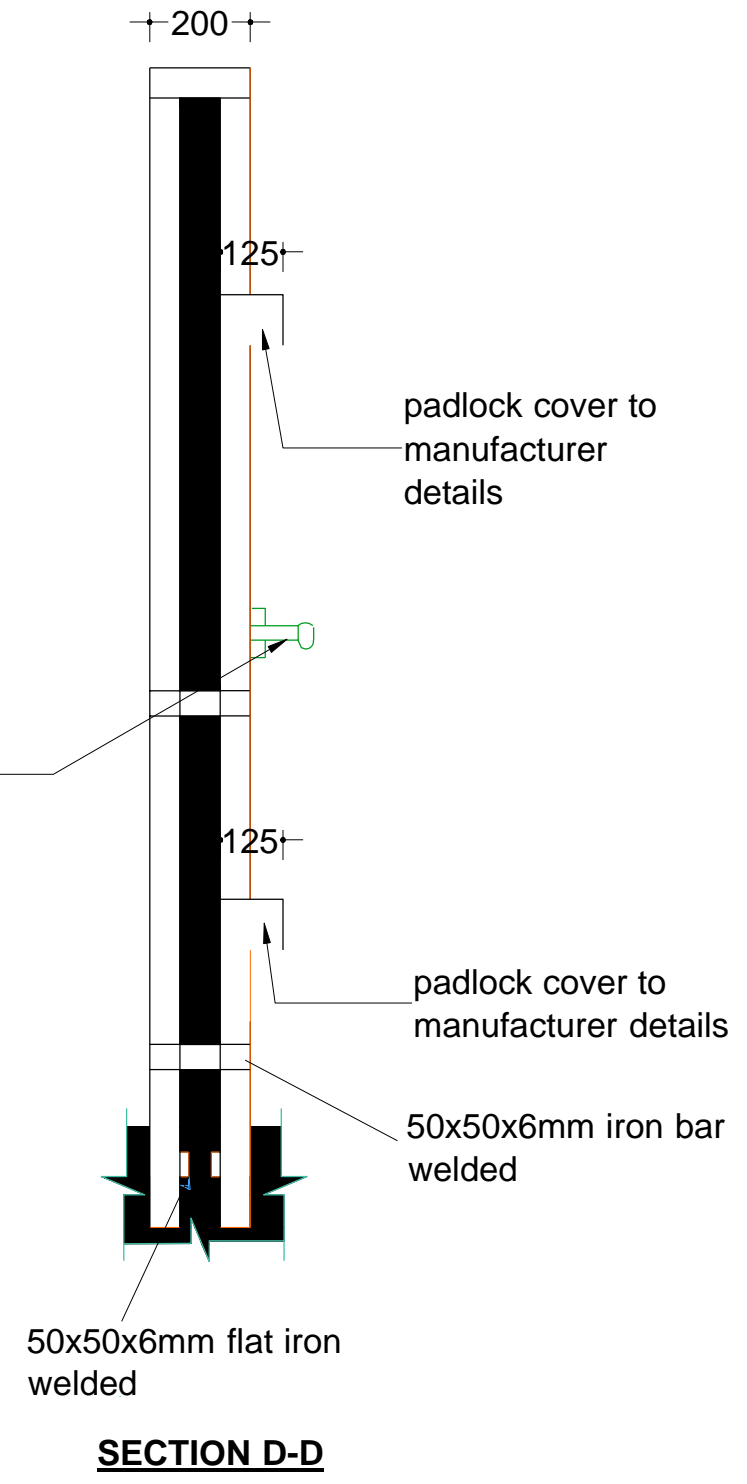
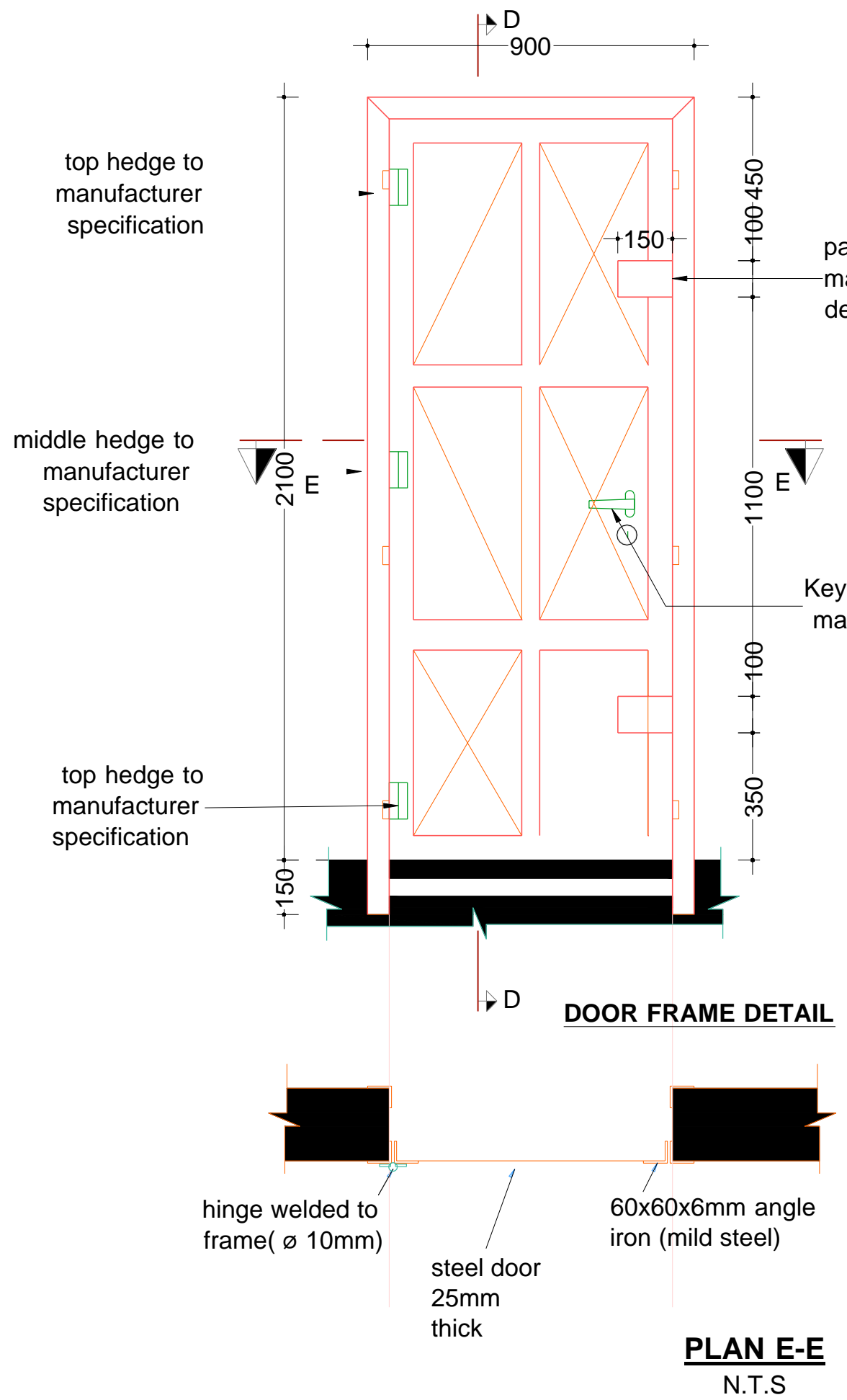
**DRAWING TITLE:**

**STANDARD WATER  
KIOSK TYPE 1  
(COLUMN DETAILS)**

**DRAWING DETAILS:**

Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	8 of 16	Drawing No:	NWWDA/WSDP/001

D:\GEOFFREY PERSONAL LAPTOP\Geoffrey\_Hard Disc\2024\WSSIP\WSDRP\Exploratory Boreholes\NWDA\WSDP\WS-001 - Standard Water Kiosks.dwg -Door Details- Tue, 21 Aug 2023 - 01:44pm User



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**CLIENT**



NORTHERN WATER WORKS DEVELOPMENT AGENCY

**PROJECT:**

WATER AND SANITATION DEVELOPMENT PROJECT (WSDP)  
 CONSTRUCTION OF ADMESAJIDA AND ARBAJAHAN WATER SUPPLY PROJECT

**ENGINEER:**

TECHNICAL SERVICES MANAGER  
 NORTHERN WATER WORKS DEVELOPMENT AGENCY

**DRAWING TITLE:**

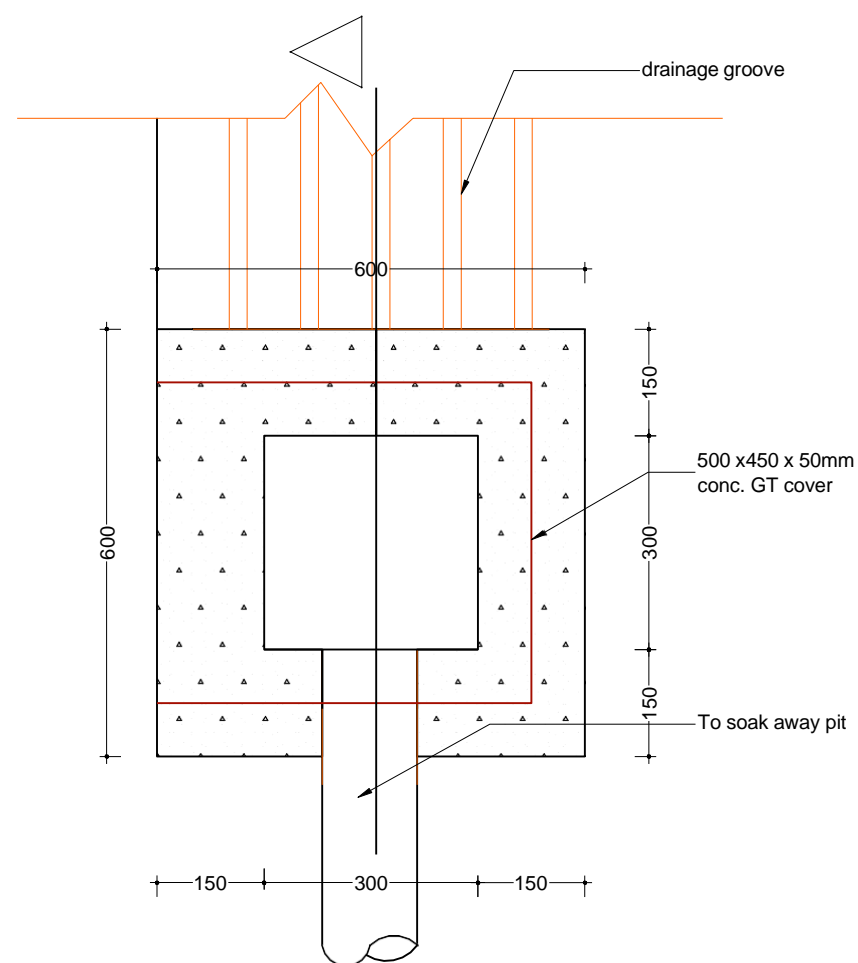
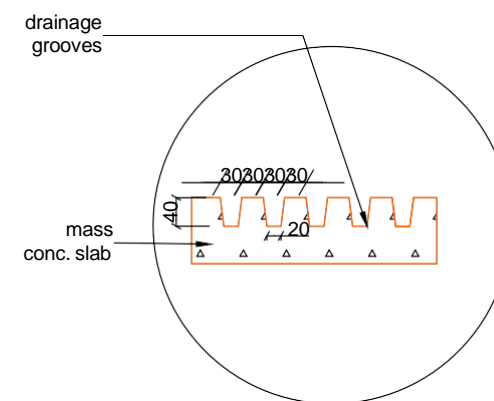
STANDARD WATER KIOSK TYPE 1 (DOOR DETAILS)

**DRAWING DETAILS:**

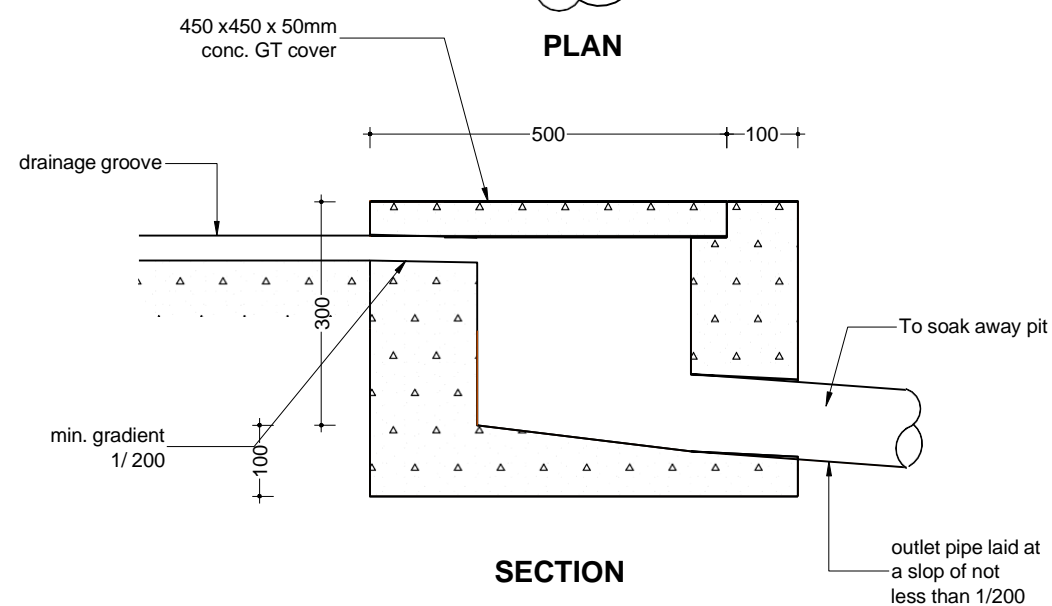
Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	15 of 16		
Drawing No:	NWDA/WSDP/001		

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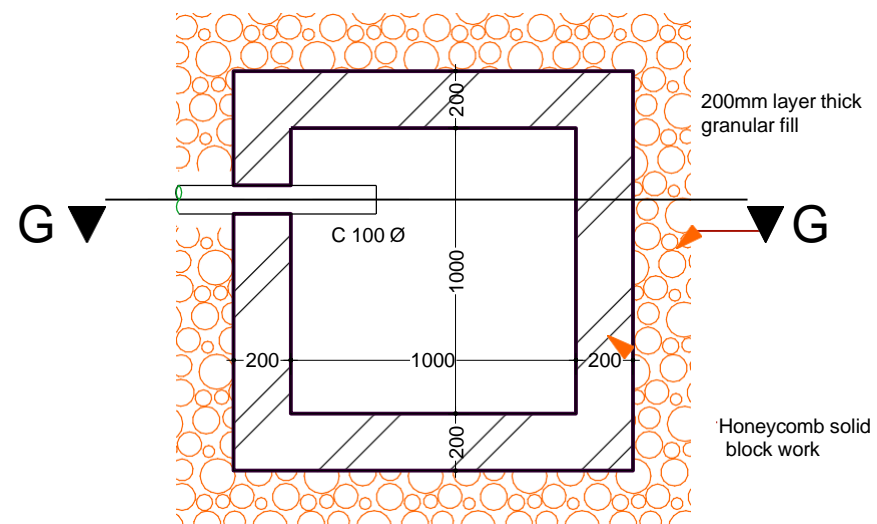


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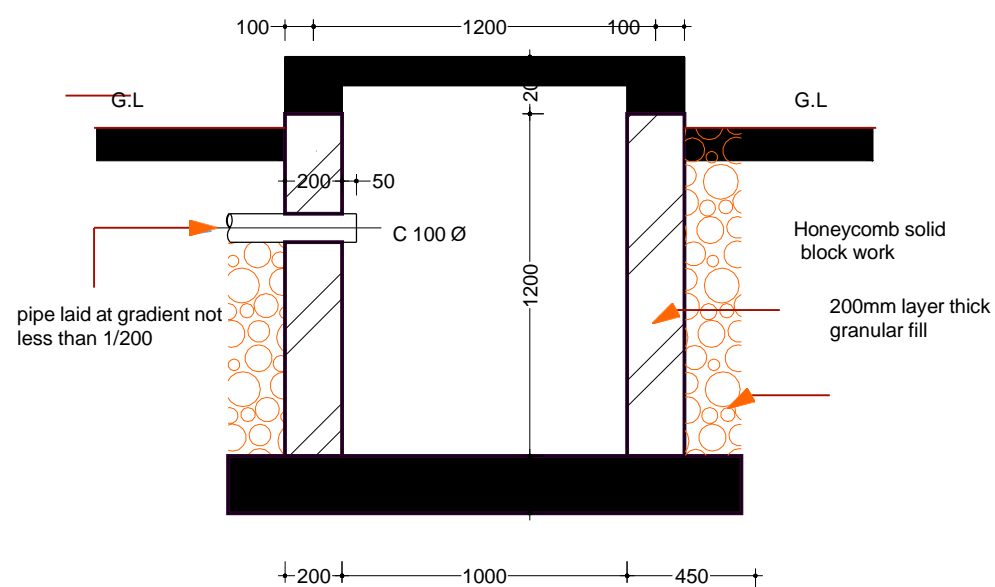


**SECTION**

**GT DETAIL**  
Scale 1:10 (A3)



**SOAK PIT PLAN**



**LONGITUDINAL SECTION THROUGH SECTION G-G SOAK AWAY DETAIL**

Scale 1:25 (A3)

**CLIENT**



NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

**PROJECT:**

WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)

CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT

**ENGINEER:**

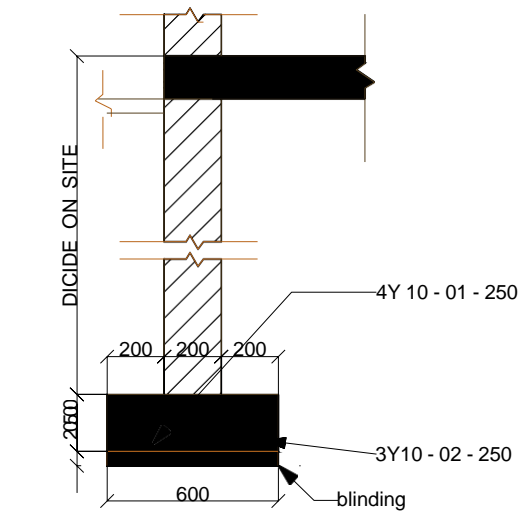
TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

**DRAWING TITLE:**

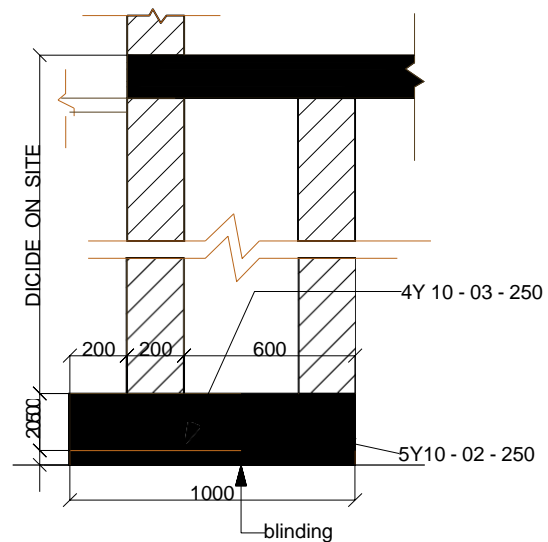
STANDARD WATER  
KIOSK TYPE 1  
(DRAINAGE DETAILS)

**DRAWING DETAILS:**

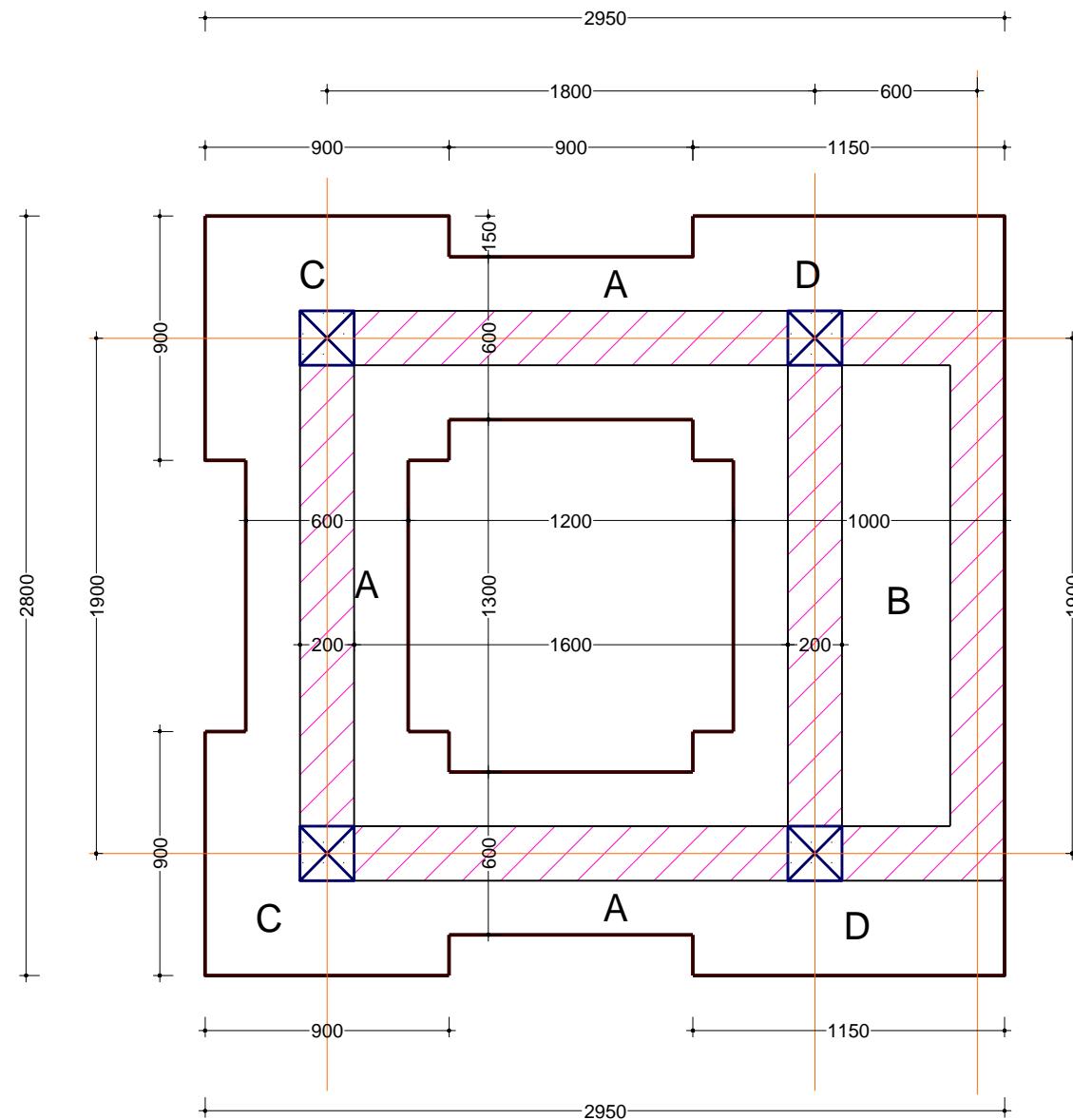
Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	13 of 16		
Drawing No:	NWWDA/WSDP/001		



**DETAIL FOR STRIP FOOTING SHOWN THUS A**  
Scale 1:25



**DETAIL FOR STRIP FOOTING SHOWN THUS B**  
Scale 1:25



**FOUNDATION PLAN**  
Scale 1:25

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**CLIENT**



NORTHERN WATER WORKS DEVELOPMENT AGENCY

**PROJECT:**

WATER AND SANITATION DEVELOPMENT PROJECT (WSDP)

CONSTRUCTION OF ADMESAJIDA AND ARBAJAHAN WATER SUPPLY PROJECT

**ENGINEER:**

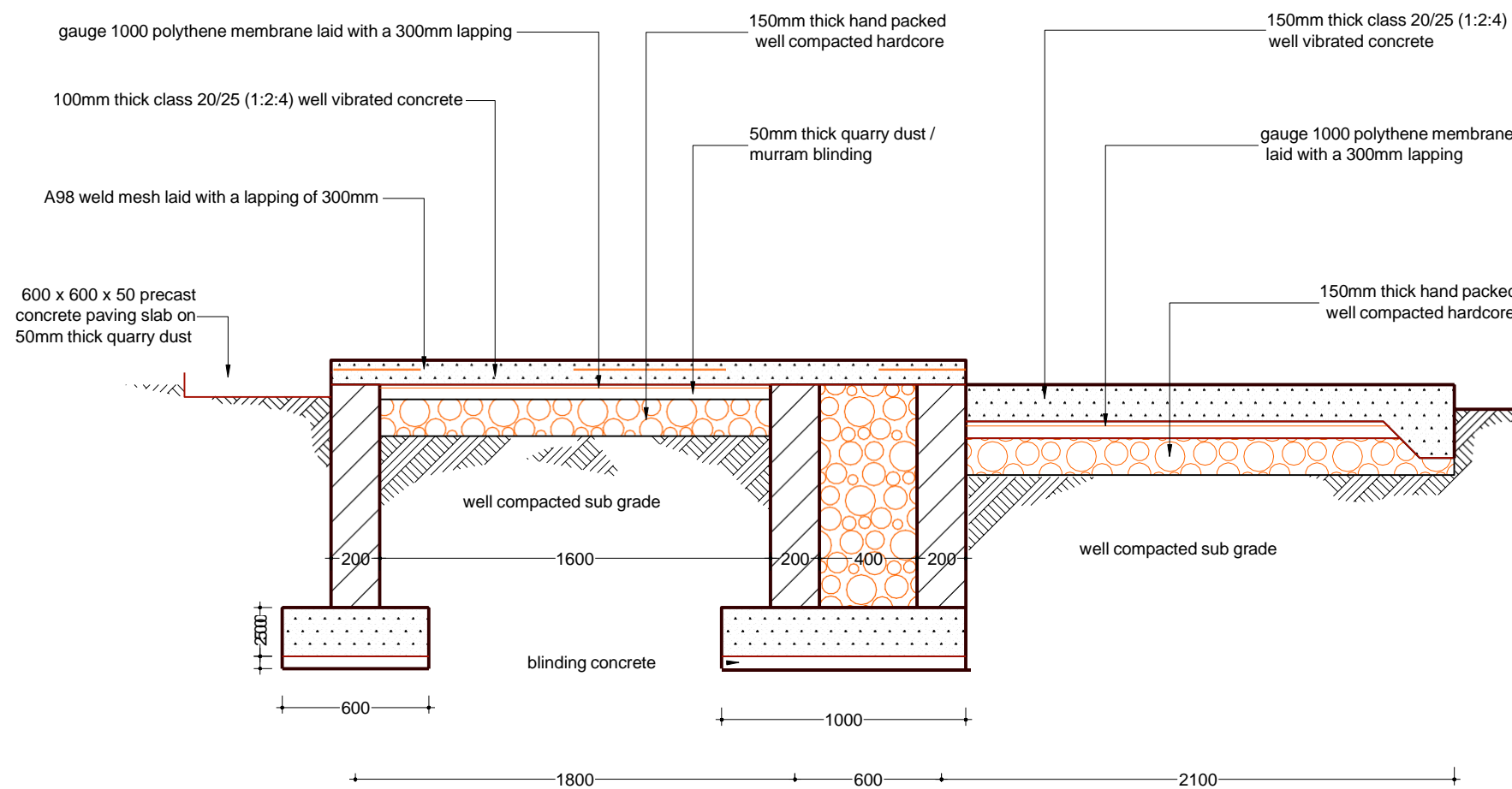
TECHNICAL SERVICES MANAGER  
NORTHERN WATER WORKS DEVELOPMENT AGENCY

**DRAWING TITLE:**

STANDARD WATER KIOSK TYPE 1 (FOUNDATION LAYOUT)

**DRAWING DETAILS:**

Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	4 of 16		
Drawing No:	NWWDA/WSDP/001		



**FOUNDATION SECTION**  
Scale 1:25

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**CLIENT**



**NORTHERN WATER WORKS  
DEVELOPMENT AGENCY**

**PROJECT:**

**WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)**

**CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT**

**ENGINEER:**

**TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY**

**DRAWING TITLE:**

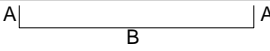
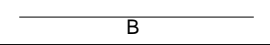
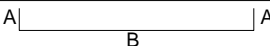
**STANDARD WATER  
KIOSK TYPE 1  
(FOUNDATION SECTION)**

**DRAWING DETAILS:**

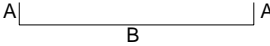
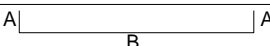
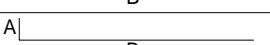

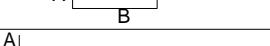
Designed by:	Eng. Peter Ouma	Drawn by:	Kurgat D.K.
Revised by:		Approved by:	Eng. J. Loveday
Scale:	As Shown	Date:	
Sheet No:	5 of 16		
Drawing No:	NWWDA/WSDP/001		

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Item	Description	Bar type	Bar mark	Shape	Dimensions (mm)				Length (mm)	Number	Total length (mm)
					A	B	C	D			
1	Foundation Footing	Y10	01	A  A	100	500			700	18	56700mm
		Y10	02	 B		2000			2000	14	28,000mm
		Y10	03	A  A	100	1050			1250	7	8750mm

Length of bar is estimated to be 12,000mm

Item	Description	Bar type	Bar mark	Shape	Dimensions (mm)				Length (mm)	Number	Total length (mm)
					A	B	C	D			
1	Columns	Y12	04	A  A	100	800			1000	26	26,000
		Y12	08	A  A	100	1050			1250	10	10,000
		Y12	05	A  A	300	1800			2100	16	33,600
		R 8	06	A  B	100	100			500	80	40,000
		Y12	07	A  B C D	100	1500	300	600	2500	16	40,000

Length of bar is estimated to be 12,000mm

**CLIENT**

NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

**PROJECT:**

WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)

CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT

**ENGINEER:**

TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

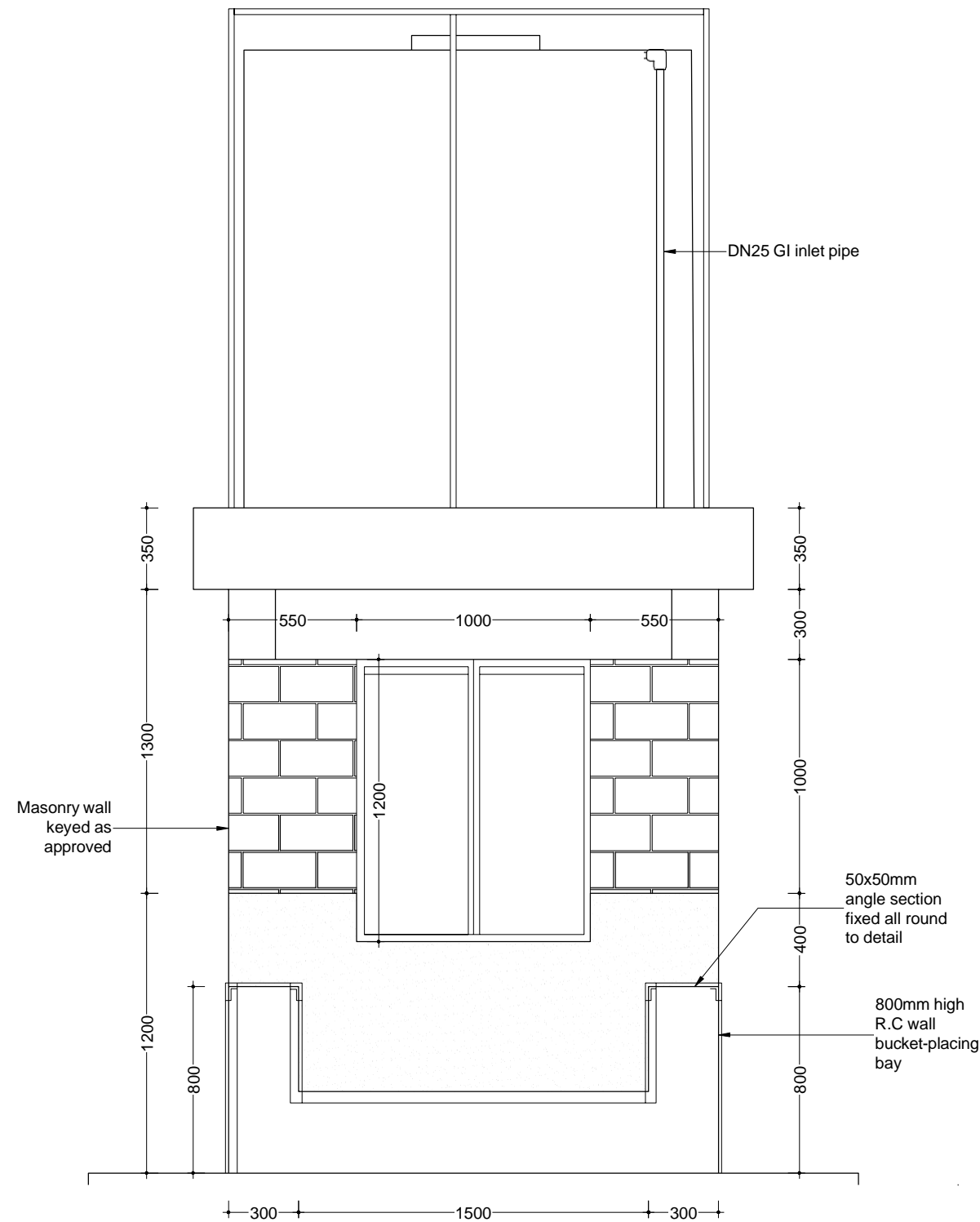
**DRAWING TITLE:**

STANDARD WATER  
KIOSK TYPE 1  
(FOUNDATIONS &  
COLUMN BAR  
SCHEDULE)

**DRAWING DETAILS:**

Designed by:	Drawn by:
Eng. Peter Ouma	Kurgat D.K.
Revised by:	Approved by:
	Eng. J. Loveday
Scale:	Date:
As Shown	
Sheet No:	10 of 16
Drawing No:	NWWD/WSDP/001





**FRONT ELEVATION**  
Scale 1:25 (A3)

**NOTES:**

1. All dimensions are in millimeters unless specified otherwise.
2. All dimensions to be read and confirmed before construction begins and any discrepancy reported to Engineer.
3. Foundation depths to be determined on site but to hard stratum and approved by Engineer on site.
4. All concrete works to be class 20/25.
5. All steel reinforcement to BS4449.
6. Form-work to be fair-finished.
7. Drains under buildings and driveways to be encased in at least 150mm thick concrete.
8. Foundation trenches and concrete works to be treated with approved anti-termite chemical with at least 10 year guarantee. All materials are subject to Engineer's approval before use.
- 9.

**CLIENT**



NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

**PROJECT:**

WATER AND SANITATION  
DEVELOPMENT PROJECT  
(WSDP)

CONSTRUCTION OF ADMESAJIDA  
AND ARBAJAHAN WATER  
SUPPLY PROJECT

**ENGINEER:**

TECHNICAL SERVICES  
MANAGER  
NORTHERN WATER WORKS  
DEVELOPMENT AGENCY

**DRAWING TITLE:**

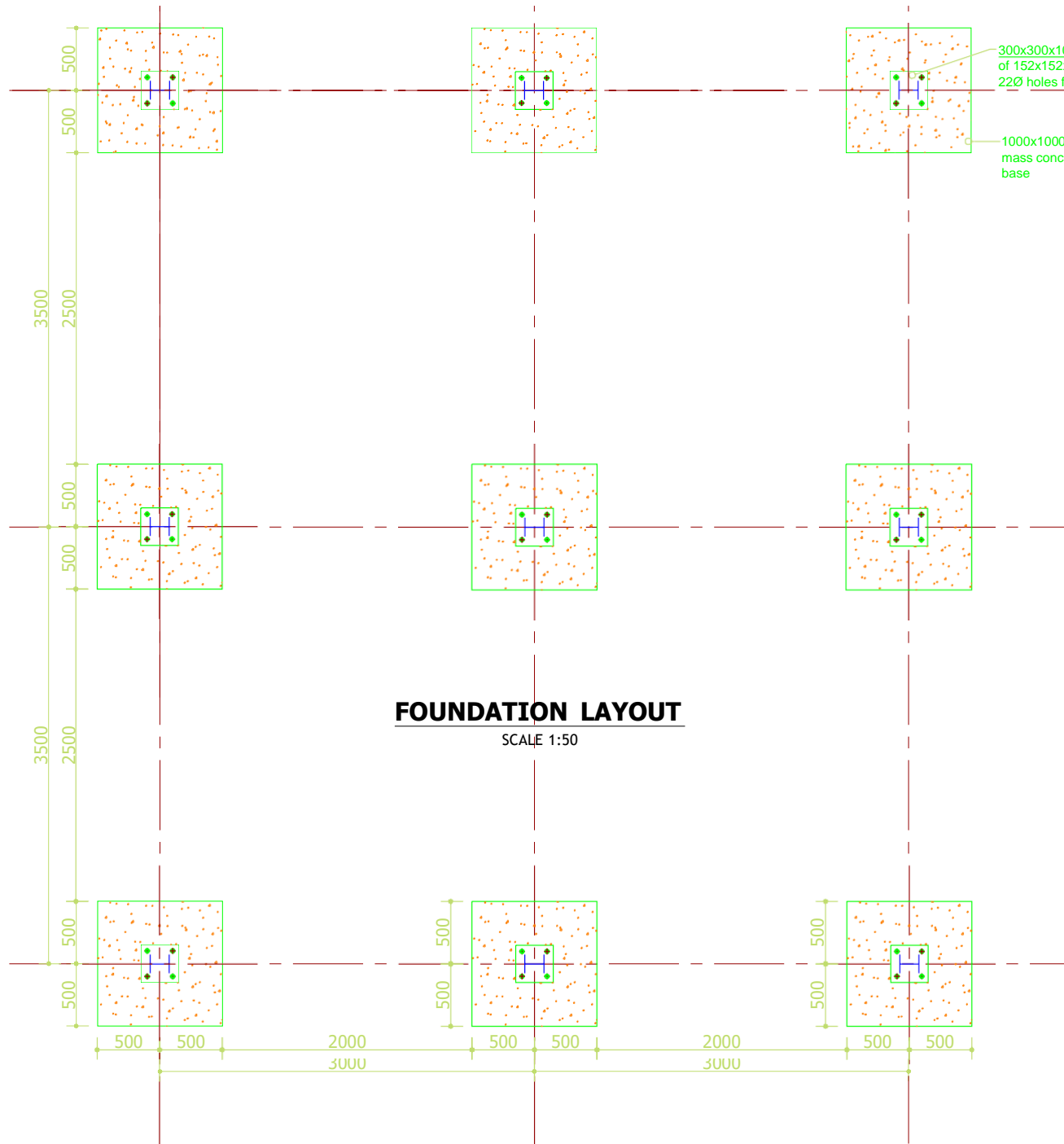
STANDARD WATER  
KIOSK TYPE 1  
(FRONT ELEVATION)

**DRAWING DETAILS:**

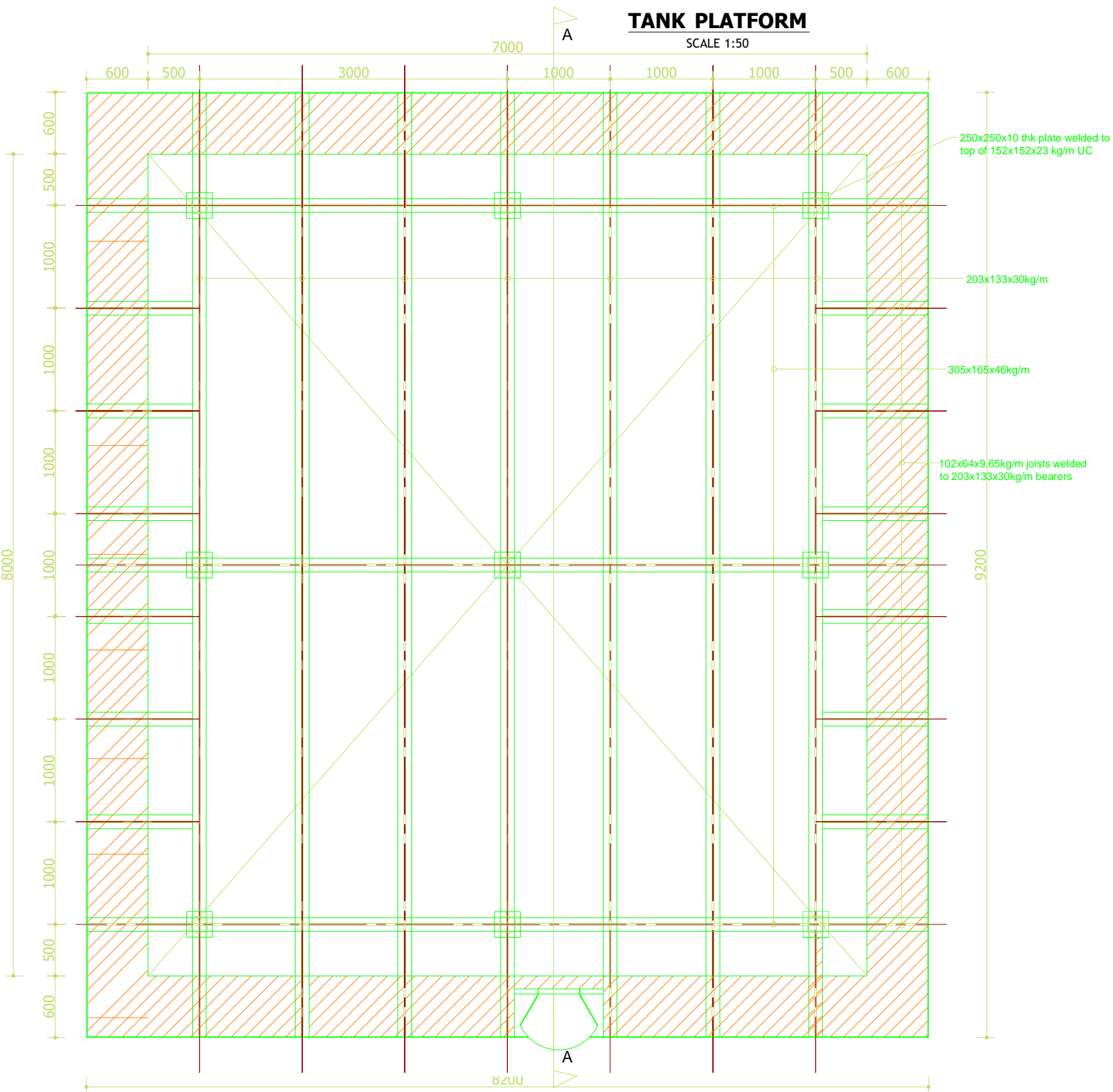
Designed by:	Drawn by:
Eng. Peter Ouma	Kurgat D.K.
Revised by:	Approved by:
	Eng. J. Loveday
Scale:	Date:
As Shown	
Sheet No:	2 of 16
Drawing No:	NWWDA/WSDP/001

100M<sup>3</sup>

**ELEVATED STEEL TANK**



**FOUNDATION LAYOUT**  
SCALE 1:50



**TANK PLATFORM**  
SCALE 1:50

**NOTES**

1. Read this drawing in conjunction with relevant G.A., Services and Architectural drawings. Any discrepancy to be reported to the Engineer.
2. All dimensions are in millimetres unless specified otherwise.
3. All levels are indicated in m unless specified otherwise.
4. All structural concrete to be Class 25 (1:1.5:3) unless stated otherwise.
5. Minimum cover to all reinforcement to be:  
Columns (main bars) = 40mm  
Foundations = 50mm
6. Maximum tolerance on concrete cover is +/- 5mm.
7. All high tensile (Y) and mild steel (R) bars to be in accordance with BS 4449
8. Structural Steel to comply with BS 5950 and Bolts to be Grade 4.8
9. Only figured dimensions to be read, **no scaling** is allowed on this drawing.
10. Nominal aggregate size to be 20mm.
11. Assumed Ground bearing capacity for foundations=200KN/m<sup>2</sup>

REV	REVISIONS	SIGN	DATE	APPROVED
D	EST Foundation plan resized and redrawn	BY Mutori	30/05 2016	
C		BY CHECKED		
B		BY CHECKED		
A		BY CHECKED		

Structure Type:  
**100m<sup>3</sup> ELEVATED STEEL TANK**

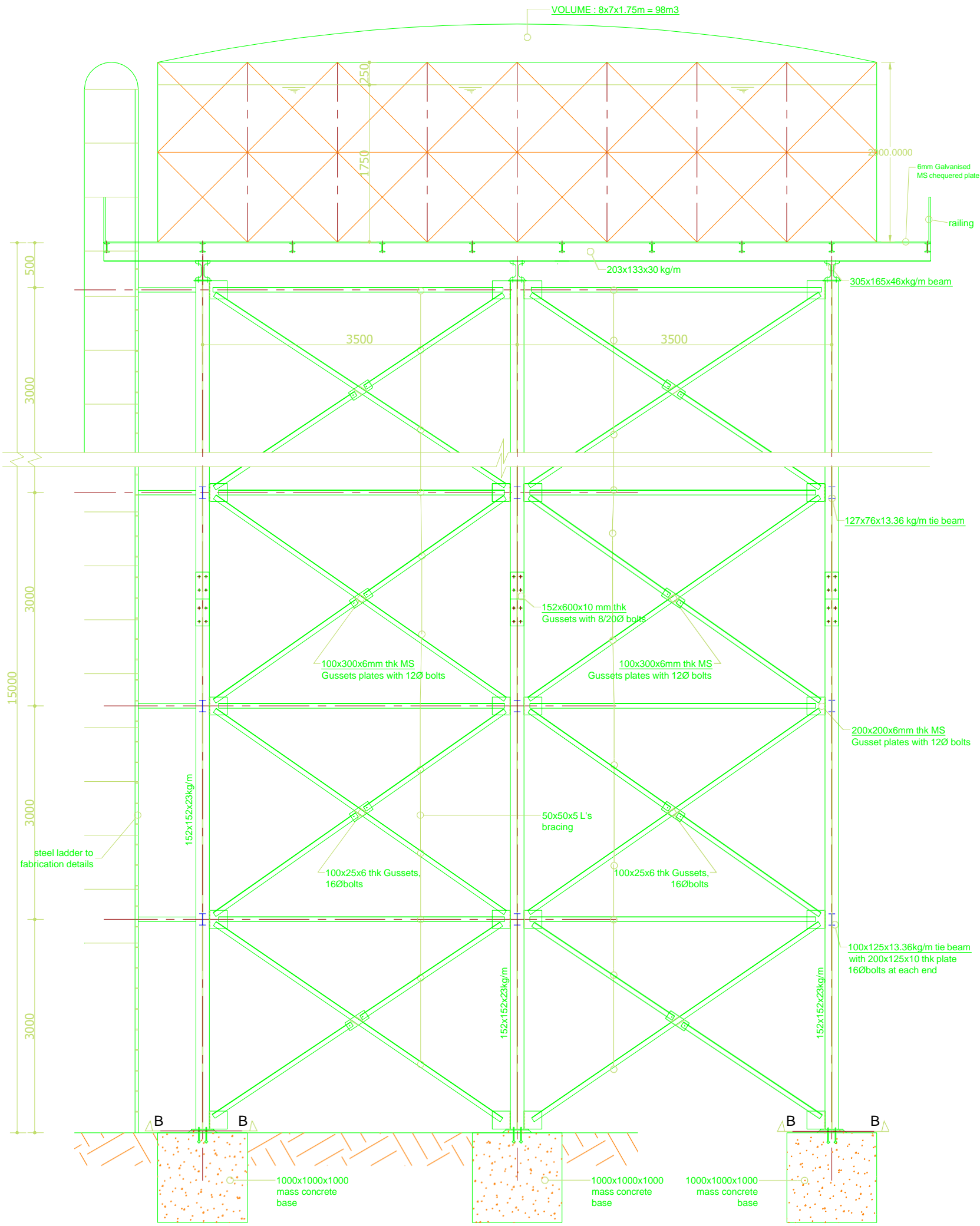
Client:  
The Chief Executive Officer  
Northern Water Works  
Development Agency  
P. O. Box 495-70100,  
GARISSA

Project:  
**WATER AND SANITATION  
DEVELOPMENT PROJECT**

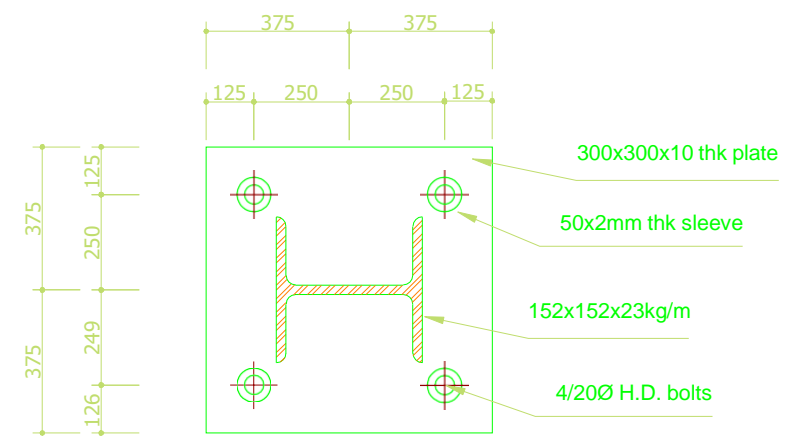
ENGINEER:  
The Technical Services Manager  
Northern Water Works  
Development Agency  
P. O. Box 495-70100,  
GARISSA

Drawing Title:  
**TANK FOUNDATIONS AND  
PLATFORM**

Designed by	C.K.O	Drawn by	J. Muturi
Checked by	Eng Nderi	Approved by	
Scales AS SHOWN		Date: August 2021	
Job No.	Sheet 1 of 2		
P STATUS	DRAWING No.	NWDA/WSDP/002	REV



**SECTION A-A**  
SCALE 1:50



**SECTION B-B**

**NOTES**

1. Read this drawing in conjunction with relevant G.A., Services and Architectural drawings. Any discrepancy to be reported to the Engineer.
2. All dimensions are in millimetres unless specified otherwise.
3. All levels are indicated in m unless specified otherwise.
4. All structural concrete to be Class 25 (1:1.5:3) unless stated otherwise.
5. Minimum cover to all reinforcement to be:  
Columns (main bars) = 40mm  
Foundations = 50mm
6. Maximum tolerance on concrete cover is +/- 5mm.
7. All high tensile (Y) and mild steel (R) bars to be in accordance with BS 4449
8. Structural Steel to comply with BS 5950 and Bolts to be Grade 4.8
9. Only figured dimensions to be read, **no scaling** is allowed on this drawing.
10. Nominal aggregate size to be 20mm.
11. Assumed Ground bearing capacity for foundations=200KN/m²

REV	REVISIONS	SIGN	DATE	APPROVED
D	EST Foundation plan resized and redrawn	BY CHECKED	Muturi 2016	
C		BY CHECKED		
B		BY CHECKED		
A		BY CHECKED		

Structure Type:  
**100m³ ELEVATED STEEL TANK**

Client:  
The Chief Executive Officer  
Northern Water Works  
Development Agency  
P. O. Box 495-70100,  
GARISSA

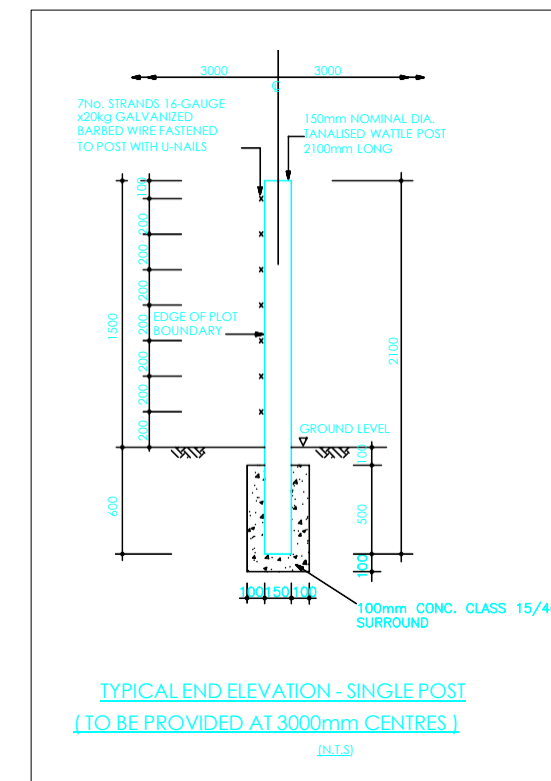
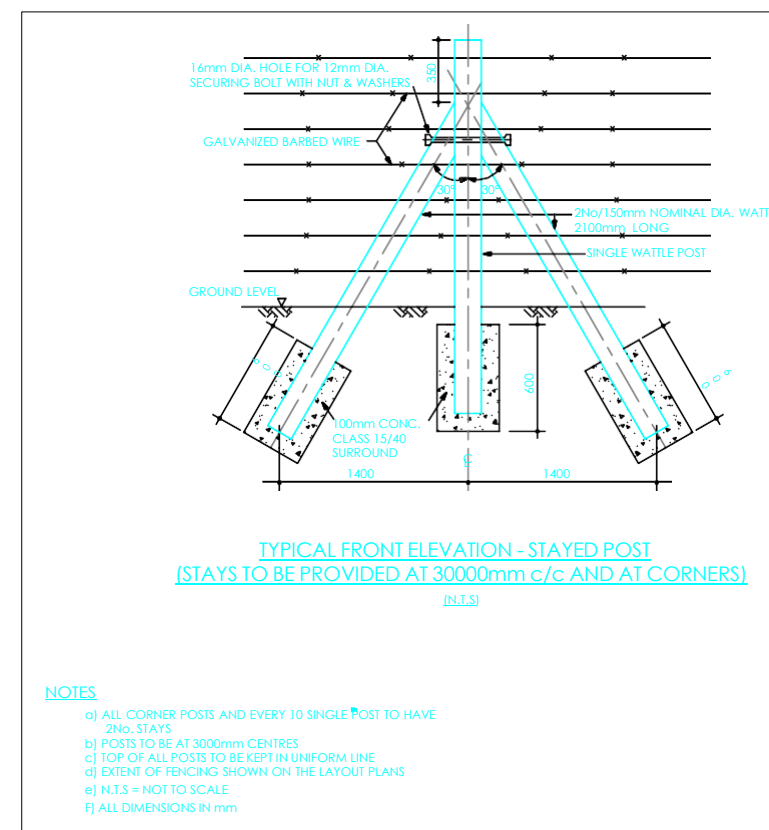
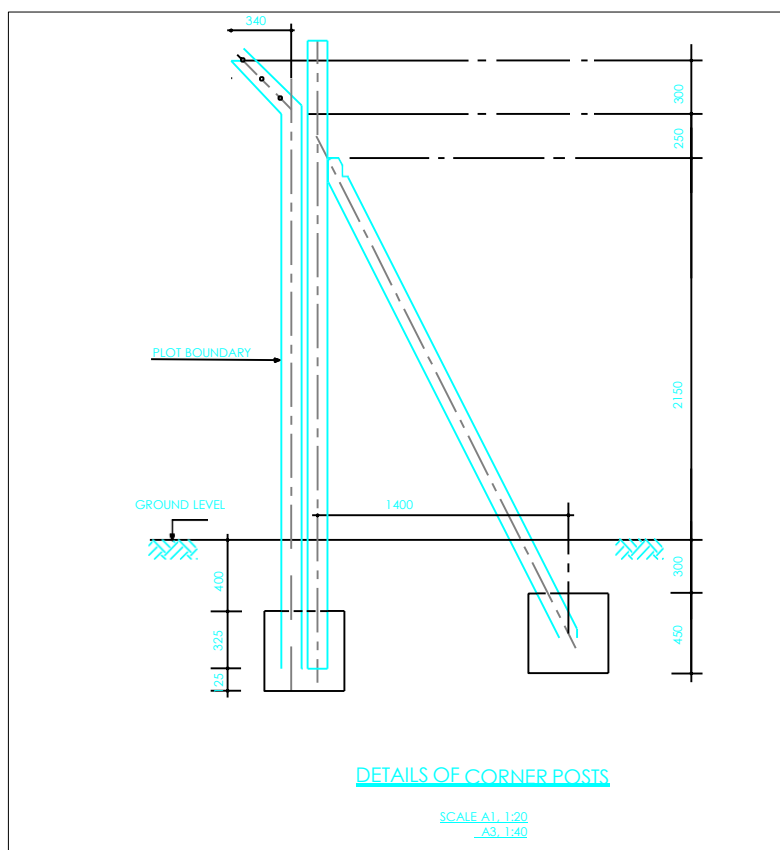
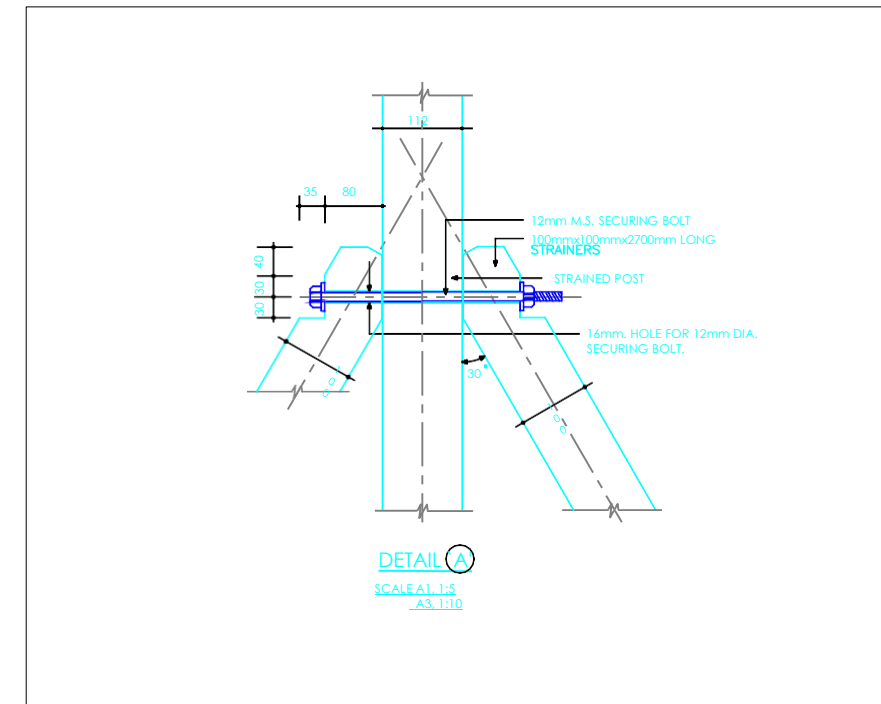
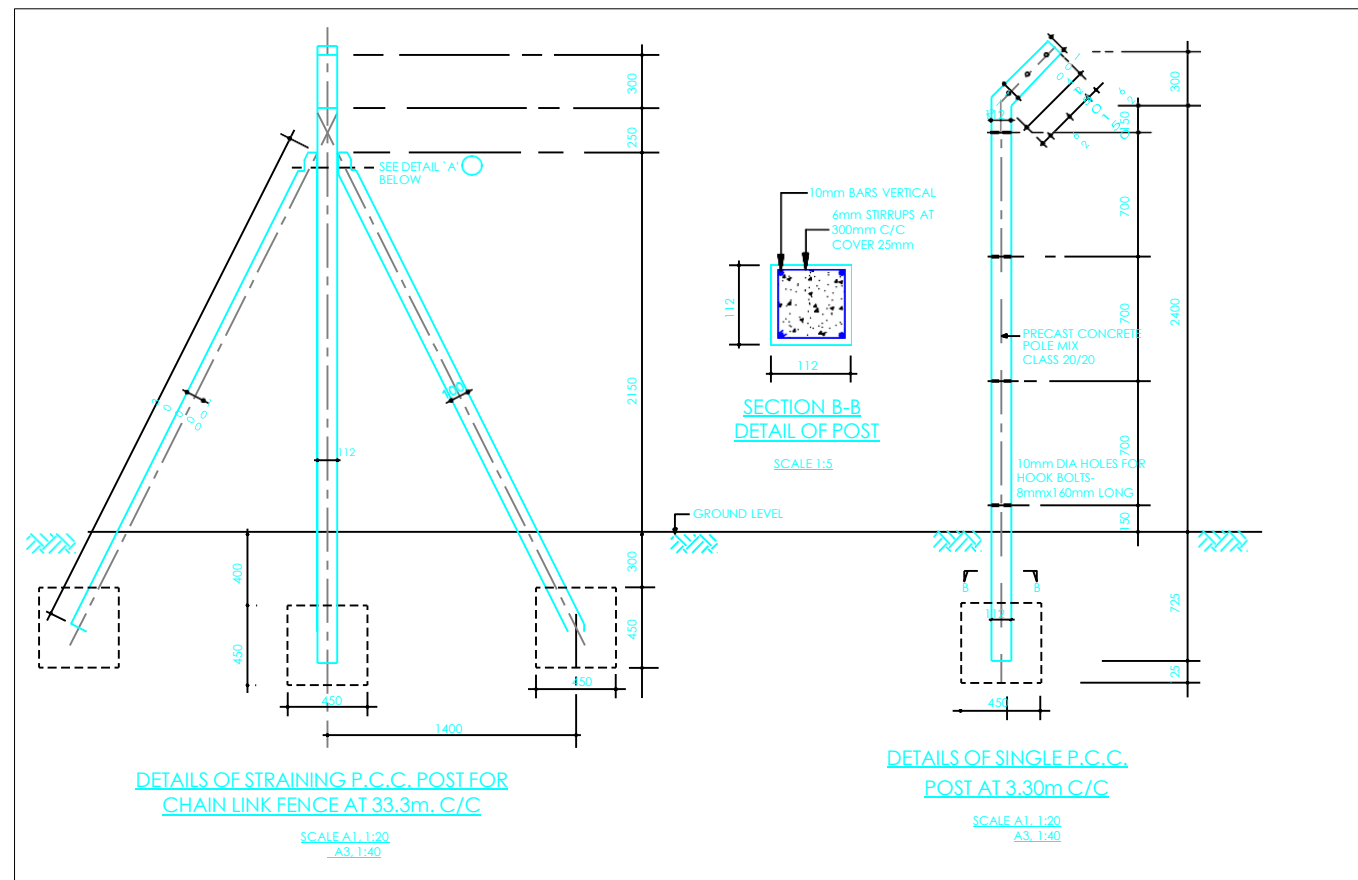
Project:  
**WATER AND SANITATION  
DEVELOPMENT PROJECT**

ENGINEER:  
The Technical Services Manager  
Northern Water Works  
Development Agency  
P. O. Box 495-70100,  
GARISSA

Drawing Title:  
**STEEL TANK ELEVATION AND  
BASE PLATE DETAILS**

Designed by	C.K.O	Drawn by	J. Muturi
Checked by	Eng Nderi	Approved by	
Scales AS SHOWN		Date: May 2016	
Job No.		Sheet 2 of 2	
P STATUS	DRAWING No. <b>NWWDA/WSDP/002</b>		

FENCE



- NOTES**
- APPROXIMATELY EVERY 10th POST TO BE STRAINED
  - POST TO BE AT 3300mm CENTRES
  - TOP OF ALL POSTS TO BE KEPT IN UNIFORM LINE.
  - CONCRETE MIXES FOR:
    - POSTS CLASS 20/20
    - STRAINER POSTS CLASS 20/20
    - FOUNDATION BLOCK CLASS 15/20 CONC.
  - CHAIN LINK TO BE IN GAUGE 12 GALVANISED STEEL WIRE.
  - STRAINING WIRES TO BE 12 GAUGE GALVANISED STEEL PLAIN WIRES.
  - WIRES ON CRANK TO BE 12 GAUGE GALVANISED STEEL BARBED WIRE.
  - ALL STRUCTURAL OPENING DIMENSIONS TO BE CONFIRMED ON SITE BEFORE COMMENCING ANY FABRICATION
  - STRAINING WIRES TO BE FIXED TO POST WITH GALVANIZED HOOK BOLTS 8mm DIA.x60mm LONG
  - WHERE THE POST ENCLOSES ON PRIVATE LAND THE FENCE SHOULD BE ERRECTED WITH CRANK POINTING TOWARDS THE SITE.
  - ALL DIMENSIONS ARE IN mm. UNLESS OTHERWISE STATED.
  - C/C = CENTRE TO CENTRE.
  - CTS. = CENTRES.
  - M.S. = MILD STEEL.
  - P.C.C. = PRECAST CEMENT CONCRETE.

REV	REVISIONS	SIGN	DATE	APPROVED
D	FENCE	BY		
		CHECK D		
C		BY		
		CHECK D		
B		BY		
		CHECK D		
A		BY		
		CHECK D		

**PROJECT**  
WATER AND SANITATION DEVELOPMENT PROJECT

**Client:**  
Northern Water Services Board  
P. O. Box 495-70100,  
GARISSA

**Northern Water Development Agency**  
P. O. Box 495,  
Garissa

**Specific Project:**  
WAJIR W/S PROJECT EXPLORATORY BOREHOLES

**Engineer**  
The Technical Services Manager  
Northern Water Works  
Development Agency  
P. O. Box 495,  
Garissa

**Drawing Title:**

**FENCE DETAILS**

Surveyed by	G. Nyasagare	Drawn by	G. Nyasagare
Checked by	Eng Nderi	Approved by	
Scales	1:1000	Date:	June 2021
Job No.		Sheet	
P STATUS	DRAWING No.NWWDA/WSDP/003	REV	

# **NORTHERN WATER WORKS DEVELOPMENT AGENCY**

## **B I D D I N G   D O C U M E N T S**

**For**

**Contract Name:** Drilling and Equipping 4 No. Exploratory Boreholes in Wajir County

**NCB No. KE-NWWDA-229129-CW-RFB**

**Project:** Water and Sanitation Development Project (WSDP)

**Credit Nr. IDA 6030 KE**

**VOLUME II**

**Specifications and Performance Requirements**

**Standard Reference Numbers (SRN)**

**16<sup>TH</sup> SEPTEMBET 2021**

**Employer:**

Northern Water Works Development Agency

P.O. Box 495, Garissa,

**Kenya.**

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## **GENERAL**

All materials, equipment and testing apparatus etc. to be furnished and Works to be executed by the Contractor in this Contract shall conform to the requirements of the latest Kenya Standards, International Standards Organization (ISO) Standards, DIN, British Standards or other approved applicable Standard in Kenya, unless otherwise specifically stated. Equipment to be purchased shall be from well recognized manufacturers whose products are standardized and controlled by any recognized Standards Organization. All dimensions and measurement units shall be in S.I. units.

**The Contractor may propose to the Engineer an alternative Standard other than specified, in which case he shall submit six (6) copies of the English translation of the proposed Standard and all other information for the materials, equipment and testing, together with written proof from a recognized Standards Organization that the proposed Standard is equivalent in all significant respects to the Standard specified.**

The equipment to be employed by the Contractor shall have sufficient performance capacity and durability as to secure the completion of the Works within the construction period stipulated under the Contract. All materials and equipment shall be subject to inspections or tests by the Engineer at any time and in any state of completion both off-site and on-site as he deems necessary.

**The Contractor shall furnish promptly, without additional charge, all facilities, labor and materials reasonably needed for performing such inspections and tests as may be required by the Engineer.**

The Contractor shall make diligent efforts to procure the specified materials, but when the materials specified are unavailable, for reasons beyond the control of the Contractor, substitutes may be used with prior written approval of the Engineer.

All equipment and furnishings detailed under this Clause shall be provided by the Contractor under item for Resident Engineer's offices under Bill No. 1. All the equipment and furnishings will revert to the Contractor at the end of the Contract. The Contractor shall arrange for the provision of telephones (and if necessary, extensions) with suitable privacy for conversation for the exclusive use of the Resident Engineer and his staff by means of a separate connection to the Telephone Exchange. The Contractor shall include in the sum for provision of the office equipment and furnishings for the charges for installation, maintenance and removal of the telephones. All charges for hiring and telephone calls shall be under the relevant item in Bill No. 1. Provision shall also be made by the Contractor for all necessary gas, electricity, kerosene, water, light, attendance and stationery required in connection with execution of the Contract.

The Resident Engineer's offices shall be regularly and properly cleaned to the satisfaction of the Engineer. A messenger, and tea boy / office cleaner shall be provided by the Contractor exclusively for the Resident Engineer's offices. Also, Security Guards shall be provided for day and night security at these offices. The offices, furniture and equipment shall be insured against fire, theft and natural calamity.

## 101. (a) PROVISION FOR PROJECT ENGINEER'S OFFICES

### The office of the Resident Engineer will be in Habaswein Town

The Contractor shall hire for the Resident Engineer an office on the site to be based in Habaswein and to be approved by the Engineer. The minimum area of the office should be 20m<sup>2</sup>. The office shall be open and attended to at all hours during which work is in progress. The office shall have the following furniture and equipment.

### Office Furniture

#### The following equipment will be required in the quantities indicated

S/Nr	Description	Qty
1	Writing Desk with 3 lockable drawers with side table for printer	2 Nr
2	Writing Desk without Locks	1Nr
3	Fabric, Swivel adjustable height chairs with arm rests	7
4	Wooden Conference Table, 4.8m x 1.2m – Interlinked / Configured system of tables	1
5	Metal Plan Chest suitable for A1 size drawings, Size 886 x 510 x 1315mm	Nil
6	Lockable Steel Cupboard (Size 1m x 1.8m x 0.5m deep)	1Nr
7	Office paper punch	1Nr
8	Pin board 2.4m x 1.2m	1Nr
9	Office Tray (3 tier)	4Nr
10	Office Stapling Machines	1Nr
11	Heavy Duty Stapler	1Nr
12	Steel File Cabinet with locks / 4 drawers ('Mecol' or equivalent approved)	1Nr
13	Casio' or similar small portable scientific electronic calculator	1Nr
14	First Aid kit (for 10 persons) in Metal Box	1Nr
15	Potable Fire Extinguisher (5 litres)	1Nr
16	Small office scissors	1Nr
17	Waste paper baskets	2Nr
18	Electric kettle (capacity to make 12 cups of tea)	1Nr
19	Coffee/Tea making facility including crockery for all supervisory staff 6 Nr. and 12 additional guests	1Nr
20	Pedastal electric fan, size 400mm	1 Nr
21	Samsung' or equivalent approved Refrigerator (0.2 cu.m. capacity)	1 Nr
22	Wooden book shelves with lockable glass frontage 2.0m x 1.5m	1 Nr
23	Desktop – "DELL" or approved equivalent OptiPlex GX520, Intel Pentium Dual Core 3.0 GHz, 80GB HDD, 512MB RAM, DVD R/CD-RW Optical Drive, with 15" Flat Panel Monitor. Win XP Professional and Microsoft Office 2010 or latest Version	1Nr
24	Laptop intel core i7 2.2 GHz, 700GB HDD, 6GB RAM, DVD + RW Optical Drive, 15.4" Wide Screen, WiFi / 56K Modem, Bluetooth, with Win XP Professional and Microsoft Office 2010 or latest Version	Nil
25	HP LaserJet Printer A4	1 Nr
26	HP Colour Inkjet Printer A3	Nil
27	HP Colour LaserJet Printer, 1200 x 1200 dpi, 20ppm, with Largest	Nil



	Supported Paper Size – A3 (Project Office)	
28	Photocopier - Nashua or approved equivalent, A3, 35 pages per minute	Nil
29	Orange/Safaricom modem 1 No each	Nil
30	Digital Camera as specified	Nil
31	Wall Clock	Nil

The Contractor shall provide a Secretary who can speak English and is conversant in the use of above-mentioned software for the duration of the Contract.

Stationery required **may be** as follows:

	Photocopy paper A4	18 Reams
	A3 paper	3 Ream
	Biro pens blue/black	1 Doz.
	Clutch Pencils	1 Doz.
	Box files	2 Nr
	Spring Files	2 Nr
	Document Wallets	2 Nr
	Spirals (various sizes of Reports)	2 Doz.
	Embossed (hardback cover)	2 Doz
	Perspex covers	2 Doz.
	Cellotape (medium)	1 Nr
	Masking tape (medium)	1 Nr
	Staples	2 Pts
	Paper clips (various sizes)	2 Pac.
	Pencil leads (0.5/0.7)	2 Sets
	C-DR (Pack of 12)	1 Pac.
	CD-RW (Pack of 12)	1 Pkt
	Highlighters (set of all colours)	2 Sets
	A6 hardcover notebooks	2 Nr
	Soft Pencil Erasers (Staedtler or equivalent)	3 Nr
	Envelopes (all sizes)	3 Doz.
	A4 Carbon papers 1 Doz. Batteries for flashlights	3 Sets
	Color and Black ink cartridges for the A3 printer	1 Set
	Black ink cartridge/ toner for the A3 printer	3 Nr

Others are:

Supply of clean towels every day, soap, lavatory paper, disinfectant and cleaning materials are to be provided and maintained throughout the Contract Period.

The cost of all the above services shall be included by the Contractor under item for Maintenance and attendance for Resident Engineer's offices. Apart from the consumables, the rest of equipment will revert to the Employer at the end of the Contract.

#### **101. (b) SURVEY EQUIPMENT**

Listed below are the principal items of survey equipment to be made available for use during the whole duration of Project Implementation. All equipment shall be as new and with all necessary carrying containers, manuals, insurances, etc. The Equipment to revert to the Employer at completion of all Works.

##### **Survey Equipment**

- 1) Total Station including tripods, complete with reflectors, poles and brackets (Leica or similar) 1 Nr
- 2) Survey umbrellas 1 Nr
- 3) 5-meter steel tapes 2 Nr
- 4) 100-meter steel tape 1Nr

Supply of pegs, crayons, spray paint, nails and all other items required for setting out and measuring the work. The Contractor shall provide the services of two Chainmen as and when requested for the sole use of the Engineer and Engineer's Representative for the whole period of the Contract. The cost for provision of the above for use of the Resident Engineer is deemed to be covered in the Bidder's Rates.

## **102. OFFICE FOR CONTRACTOR**

The Contractor shall have an office in Habaswein Town which shall require to be approved by the Engineer and which shall be open and attended to at all hours during which work is in progress. Notwithstanding anything contained in Clause 6.1 of the General Conditions of Contract, any notice to be given to or served upon the Contractor shall be deemed and taken to be efficiently given or served by the delivery thereof at such office on the site.

## **103. CONTROL OF TRAFFIC**

In the event of single way traffic becoming necessary on any particular section of the Works, or on the approaches to the Works, the Contractor shall, in maintaining through traffic routes, provide a width of at least 3 metres for single way traffic. He shall also provide approved electrically operated signals for traffic control on each of the affected sections and any additional traffic signs as may be directed in accordance with Clause 106. Signal lights are to be operated by competent operators provided by the Contractor, if and when required by the Engineer. Manually operated "Stop-Go" signs will only be permitted if approved by the Engineer, and shall be of the size, colour and type authorised. The Contractor shall be responsible for liaison with Police.

## **104. TEMPORARY DIVERSION OF TRAFFIC**

Temporary diversion ways, including those listed in any schedule to the Bill of Quantities shall be constructed whenever the site is intersected by existing public and private roads, footpaths, cycle tracks, farm accesses, temporary and accommodation roads. Any diversion way shall be of such a standard of construction that it is suitable in all respects for the class or classes of traffic requiring using it. It shall be constructed in advance of the taking up of the existing way and regularly maintained for so long as required in a satisfactory condition all to the approval of the Engineer.

## **105. TEMPORARY TRAFFIC SIGNS**

The Contractor shall erect and maintain on the Works and at prescribed points on the approaches to the Works, all traffic signs necessary for the warning, direction and control of traffic and the size of all such signs and the lettering and wording thereon shall be reflectorised or adequately illuminated at night by approved means.

## **106. PROTECTION OF WORKS**

The Contractor shall carefully protect from injury by weather all work and materials which may be affected thereby.

## **107. SURVEY BEACONS**

During the progress of the Works, the Contractor shall not remove, damage, alter or destroy in any way whatsoever, any plot or survey beacons. He shall notify the Engineer of the need to interfere with any beacon. The Engineer shall authorize any removal and reinstatement that he considers necessary. Should any beacon be found to be above or below the level of the finished work, the Contractor shall immediately report the same to the Engineer. Should any beacon be damaged or destroyed, the Contractor shall forthwith report the damage to the Engineer and to the Director of Surveys and shall be held liable for the cost of reinstatement thereof.

#### **108. DAMAGE TO LAND**

Except where specified for the proper execution of the Works, the Contractor shall not interfere with any fence, hedge, tree, land or crops within, upon or forming the boundary of the site or elsewhere. In the event of such interference, the Contractor shall make good to the satisfaction of the owner and the Engineer and shall pay to the owner such damages as the Engineer may determine.

#### **109. RIVERS AND DRAINS**

The Contractor shall at all times maintain the free flow of rivers and drains and prevent excavated material from the Works from being deposited in them.

#### **110. REINSTATEMENT OF ROADS AND FOOTWAYS FOR WATER MAINS, STORM WATER AND SEWER CROSSINGS**

Water Mains laid under roads shall be of ferrous material. Sewer Lines laid under roads shall be flexible jointed uPVC or concrete pipes. The Contractor shall allow in his rates for liaison with the relevant Roads Authority and obtain a Road Opening Permit. Statutory fee for road crossings will be paid under relevant Item in the Bills of Quantity. The road crossings shall be constructed in the following specifications and any other requirement stipulated by the Road Authority:

- Excavated width of the trench shall not be less than 1m to ensure compaction to required standard.
- Protective concrete raft slab shall be constructed for sewer pipes as per details given in the drawings.
- Backfilling shall be carried out with suitable selected excavated material up to the top 300mm, in layer thickness not exceeding 150mm at optimum moisture content.
- The top 300mm layer shall be backfilled in two layers of 150mm each comprising of well graded stabilized gravel with 3% cement content at optimum moisture content.
- Tarmac roads shall be reinstated to the original condition using approved asphalt from a recommended supplier.
- The Contractor shall be responsible for all liaisons with the Police for traffic control during execution of the works.

#### **111. TEMPORARY WORKS**

The Contractor shall provide, maintain and remove on completion of the Works all temporary Works including roadways, sleeper tracks and staging's etc., over roads, footpaths, suitable in every respect to carry all plant required for the work or for providing access or for any other purpose. Details of Temporary Works shall be submitted in advance to the Engineer for his

approval and the approval shall not relieve the Contractor of complete responsibility for their safety and satisfactory operation.

## **112. LIGHTING AND GUARDING OF OBSTRUCTIONS**

The details of the method of signing and guarding an obstruction to traffic caused in the course of the execution of the Works shall be submitted to the Engineer for approval before that portion of the Works is commenced. No greater area of the road than the Engineer considers necessary shall be closed at any one time. Temporary traffic signs shall comply with Clause 106.

Generally, the following precautions will be required: -

### **Signing**

An advance warning sign at least 1.22m x 0.92m in size and 70 metres in advance of the obstruction will be required, and where an appreciable change of direction is necessary at the obstruction, a sign (of the arrow or chevron type) at the obstruction itself. At articular danger points more comprehensive signing may be required.

### **Guarding**

The obstruction shall be marked by posts carrying red flags or reflective red markers and by red lamps. The latter shall be spaced at 6 metres intervals in the direction of traffic flow and at 0.9 metres intervals across this direction. At least 3 lamps shall be placed across this direction of traffic flow. The flags and lamps on the traffic side of the obstruction shall be at least 5 metres from it.

### **Footpaths**

Where a footpath is affected by an obstruction in any way it shall be separated from both obstruction and traffic by effective banners and red lamps spaced at 0.9 metres intervals.

## **113. SERVICES**

Before commencing Works which include excavation or ground levelling by manual or mechanical excavation the Contractor shall at his own expenses ascertain in writing from Telkom Kenya, Kenya Power & Lighting Co. Ltd. and all other Public Bodies, Companies and persons who may be affected, the position and depth of their respective ducts, cables, mains, pipes, or other appurtenances. He shall thereupon search for and locate such services.

The Contractor shall at his own expense arrange to have effectually propped, protected, underpinned, altered, diverted, restored and made as may be necessary, all water courses, pipes, cables or ducts, poles or wires or their appurtenances disturbed or damaged during the progress of the Works, or in consequence thereof.

Except that such services as require to be removed or altered by virtue of the layout of the permanent work and not the manner in which the work is carried out, shall be so removed or altered at the direction and at the expense of the Employer. The Contractor shall be liable for the cost of repairs to any services damaged as a result of carrying out the Works and execution of these Works.

## **114. PRIVATELY OWNED OR PUBLIC SERVICES**

If any privately owned or public services passing through the site will be affected by the Works, the Contractor shall provide at his own expense a satisfactory alternative service in full working order to the satisfaction of the owner of the services and the Engineer, before the cutting of the

existing service. Any damage to private or public services shall be made good by the Contractor at his cost.

In case the remedial work is not executed promptly by the Contractor, the Engineer may make alternative arrangements for the execution of the work and debit the costs to the Contractor.

### **115. WATER SUPPLY**

The Contractor shall provide for all purposes of the work, an adequate supply of water from a suitable source or sources approved by the Engineer. He must pay the water charges, if any, and make arrangements for supply, transport and distribution.

### **116. ADDITIONAL LAND**

The Contractor shall select and arrange at his own expenses for any temporary occupation of land outside the site which he requires for the efficient execution of the Works. The Contractor must comply fully with all By-laws and Regulations currently in force in the area.

### **117. USE OF HEAVY PLANT**

In the event of the Contractor desiring to use heavy machinery or plant, he shall first satisfy the Engineer that they will be of such size and used in such a manner as not to cause any disturbance or damage in particular to water, electricity, Post Office or other mains, cables and connections or to sewers, culverts etc. or interfere with the line or position of any overhead wires and cables of any sort, telegraph poles, power poles etc. The Contractor will be held liable for any such damage or disturbance and shall pay the full costs of any reinstatement, relaying, repairing or refixing as may be required, as agreed between the Engineer and the owner affected.

### **118. PROVISION OF INSTRUMENTS AND LABOUR**

The Contractor shall provide at his own expenses all instruments, materials, tools and other things which the Engineer considers necessary for his proper supervision of the Works and shall maintain the same in good order. He shall also provide materials, an experienced Surveyor and labour for attendance on the Engineer and his representatives in carrying out operations connected with the supervision of the Works. All charges arising out of such services shall be deemed to be included in his rates in the Bill of Quantities.

### **119. ACCESS TO SITES**

The Contractor shall construct and maintain all temporary accesses required for the execution of the Works. Access roads shall be constructed and maintained up to the site office and Resident / Assistant Resident Engineer's houses. The cost of all these Works shall be deemed to be covered by rates and prices quoted by the Contractor.

### **120. POLLUTION**

The Contractor shall ensure that during the course of his operations no pollution of the atmosphere, rivers, reservoir catchment areas or groundwater is allowed to take place.

### **121. TREE PROTECTION**

Trees within the permanent and temporary easement are the property of owners. Specific trees will be identified by the Engineer, prior to construction, and the Contractor shall neither remove nor cut their roots unless otherwise directed by the Engineer. If the roots of such trees appear within the trench areas, the Contractor shall handle the roots with maximum care so that no

portion of the roots will be damaged. During the excavation of the trench, the exposed roots may be removed to a position that will not damage the roots and will not interfere with the pipe laying. During the construction, the roots shall be thoroughly protected by appropriate cover and wetted as directed. After the pipes are laid, the moved roots shall be placed back to the original locations and backfilled carefully by selected soft soil which can support vegetation.

## **122. GEOLOGICAL DATA**

Any geological data that is made available to the Contractor and is relevant to the Works, will be for his guidance only, and no guarantee is given that other ground conditions will not be encountered. No claims based on the geological data provided shall be entertained by the Engineer. The Contractor shall be deemed to have made any additional investigations required before submission of his Tender.

## **123. WATCHING, FENCING AND LIGHTING**

The Contractor shall arrange to employ watchmen to guard the Works both during the day and night from the commencement of the Works until the substantial completion of the Works. Any excavation or other obstruction likely to cause injury or damage to any person or domestic animals must be fenced off as directed by the Engineer.

## **124. TIPS**

The Contractor shall be responsible for provision of all tips, at his own expense, for disposal of all spoil or other rubbish collected during the construction of the Works. Any surplus excavated material not required shall also be carted away to these tips. The site of the tips must be approved by the Engineer.

## **125. TROPICALISATION**

In choosing materials and their finishes, due regard shall be given to the tropical conditions of the site to which they will be subjected. The Contractor shall submit details of his practices which have proven satisfactory and which he recommends for application on the parts of the Works which may be affected by the tropical conditions.

## **126. MONTHLY SITE MEETINGS**

Throughout the project period, site meetings will be held at the Resident Engineer's office once every calendar month to discuss the progress of the work, schedule for the ensuing month, methods of construction, procurement, transportation, labours, etc. These meetings can be called at any other time intervals at the request of the Contractor or as directed by the Engineer.

## **127. INSPECTION BY ENGINEER DURING DEFECTS LIABILITY PERIOD**

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

## **128. SUBMISSION OF SAMPLES**

Before incorporating in the finished work any materials or articles which he supplies under the terms of the Contract, the Contractor shall submit to the Engineer's Representative for his approval a sample of each respective material or article, and such samples shall be delivered to and kept at his office for reference. All the respective kinds of materials and articles used in and

upon the Works, shall be at least equal in quality to the approved samples. Each and every sample shall be a fair average of the bulk material or of the article which it represents. The Engineer's Representative may decide the method by which each sample to be taken from the bulk material shall be obtained.

### **129. RESPONSIBILITY FOR ORDERING MATERIALS AND MANUFACTURED ARTICLES AND SAMPLES FOR TESTING**

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

With regard to any item in the Bill of Quantities which is the subject of a P.C. Sum, the Contractor shall notify the Engineer of his requirements as early as possible leaving ample time for the Engineer to make any necessary arrangements so that no delay occurs in the progress of the work.

### **130. TESTS OF MATERIALS AND MANUFACTURED ARTICLES BEFORE USE**

Any or all of the materials and manufactured articles supplied by the Contractor for use on any of the Works throughout this Contract shall be subject in advance to tests as may be specified in the relevant Standard Specification as may from time to time be deemed necessary by the Engineer. Samples of all such materials and manufactured articles, together with all the necessary labour, materials, plant and apparatus for sampling and for carrying out of tests on the site on all such materials and manufactured articles shall be supplied by the Contractor at his own expenses. The cost of special tests ordered by the Engineer to be carried out by an independent person at a place other than the site or place of manufacture or fabrication shall be borne by the Contractor.

### **131. REJECTED MATERIALS**

Should any material or manufactured articles be brought on to the site of the Works which are in the judgment of the Engineer unsound or of inferior quality or in any way unsuited for the work in which it is proposed to employ them, such materials or manufactured articles shall not be used upon the Works but shall be branded if, in the opinion of the Engineer, this is necessary and shall forthwith be removed from the site of the Works, all at the Contractor's expense and in each case as the Engineer shall direct.

### **132. QUALITY OF MATERIALS AND WORKMANSHIP**

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

### **133. TEST RUNNING OF THE SCHEME**

Upon substantial completion of the scheme and official inspection which agrees to this, the Contractor shall operate the entire scheme for the test period indicated in the Bill of Quantities. The Contractor shall supply all necessary personnel, electricity, fuels, oils and chemicals for the

test running and together with the Resident Engineer shall compile a list of detailed operating instructions that shall be incorporated into the Operation and Maintenance Manual. The Contractor shall further bring to the attention of the Resident Engineer and of the Employer's operational staff any problem or defects he encounters during this period of test running so that solutions may be found and any necessary alterations made.

#### **134. EQUIPMENT FOR THE RESIDENT ENGINEER**

The Contractor shall provide 1 Nr Digital Camera, Sony or approved equivalent, suitable for Construction Sites with splash and shock proof casing for exclusive use of the Engineer's Representative and his Staff for the purpose of taking record photographs of the progress of the Works. The Cameras should have picture capture resolution of 7.1 megapixels or more, both optical and digital zoom capabilities, storage capacity of 128 MB, downloading facility by means of USB port, neck strap and hard cover pouch.

The Contractor shall further provide 1 Nr suitable photo printer with necessary photo paper and colour ink cartridges for prints production for Monthly, Quarterly Progress Reports as directed by the Engineer's Representative. The cost for this service is deemed to be covered by the Contractor in his rates in the Bills of Quantities.

#### **135. OPERATION AND MAINTENANCE MANUAL**

The Contractor shall prepare and submit to the Engineer for approval, a draft Operation and Maintenance Manual, three month prior to completion of works. This Manual has to be revised and brought to a final draft prior to the test running of the Project. The Contractor is required to provide in triplicate, and in English, details of all the different manufactured plant and components incorporated in the Works including but not limited to all pertinent manufacturers' brochures. Substantial completion of the Project will not be considered until such detailed information as is required has been submitted to and accepted by the Engineer.

#### **136. CONSTRUCTION PROGRAMME**

The Contractor shall submit to the Engineer for approval, a revision of the Construction Programme attached in four (4) copies and after approval to the Employer in two (2) copies in the following manner:

- 1) Within thirty (30) days after receiving the Letter of Acceptance, the Contractor shall submit to the Engineer for approval, a detailed Programme based on the key date stated hereinafter or other dates which are given in the Letter of Acceptance in the form of a Critical Path Method (hereinafter referred to as CPM Network) showing the order of procedure in which he proposes to carry out the Works including design, manufacture, delivery to the site, transport, storage, survey, construction, commissioning and maintenance. This Programme shall indicate clearly all activities and its duration along with the earliest and the latest event, times and the first and last. dates of the submission of the Drawings and each date of shop inspection by the Engineer for the section or portion of the Works. The Programme so prepared shall be rearranged in the form of a Time Bar-chart Schedule of which size shall be 841mm x 594mm (A-1 size). This Time Bar-chart Schedule shall be submitted to the Engineer together with the CPM Network.
- 2) The CPM Network shall be in accordance with commonly accepted practices and shall show graphically the chain of activities / sub-activities and their sequential



relationship with each other from the start of construction to the completion of the Contract. The Time Bar-chart Schedule shown in weeks shall list all main activities and its applicable sub-activities.

- 3) In preparing the CPM Network and the Time Bar-chart Schedule the Contractor shall make due allowances for possible delays. Under no circumstances shall the CPM Network or the Time Bar-chart Schedule show a completion in excess of the "Time for Completion" stated in the Form of Tender.
- 4) The Programme once approved by the Engineer shall thereafter be referred to as the Contractual Programme. The Engineer's approval of such Programme shall not relieve the Contractor of any of his duties or responsibilities under the Contract. The Contractual Programme approved shall supersede all other Programmes and shall be deemed to be the Programme on which the Contractor has based his Contract Sum and in accordance with which he will undertake the execution of the Works. This Programme shall become part of the Contract.

The Contractor shall ensure that all the Works especially Electrical and Mechanical Works which may be carried out by the Electrical/Mechanical Sub-Contractor, are well coordinated with the overall Works under the Contract for the efficient execution of the Works, and shall clearly indicate them on the construction programme. The Contractor shall also describe the conditions of working shifts, if necessary, to execute the Works and whether work needs to be carried out at night and/or on Sundays and holidays. The Contractor should also indicate which particular Works are subject to these timings in his construction programme. Whenever the Contractor proposes to change the Contractual Programme, approval of the revision shall be obtained in writing from the Engineer. If the Contractor has fallen behind the approved Contractual Programme or can foresee delay(s) therein, he shall, immediately after such default or event occurred or foreseen or at the request of the Engineer submit a revision of the Contractual Programme showing the reasons of such a delay and the proposed measures to recover such delay or to complete the Works on time, for the approval of the Engineer.

### **137. AS-BUILT AND RECORD DRAWINGS**

The Contractor shall prepare, and keep up-to-date, a complete set of "As-Built" records of the execution of the works, showing the exact "as-built" locations, sizes and details of the work as executed, with cross references to relevant specifications and data sheets. These records shall be kept on the Site and shall be used exclusively for the purposes of this specification.

Two copies shall be submitted to the Engineers Representative prior to the commencement of the Tests on Completion of Works. In addition, the Contractor shall prepare and submit to the Engineers Representative "as-builtdrawings" of the works, showing all works as executed. The drawings shall be prepared as the works proceed, and shall be submitted to the Engineers Representative for his inspection. The Contractor shall obtain the consent of the Engineers Representative as to their size, the referring system, and other pertinent details.

Prior to the issue of any Taking-Over Certificate, the contractor shall submit to the Engineers Representative one full-size original copy, six printed copies of the relevant "as-builtdrawings" and the corresponding computer files (AutoCAD, Excel, MS Word, etc.) on CDROM and any further Construction Documents specified in the Specifications. The works shall not be considered to be completed for the purposes of Taking-Over until such documents have been submitted to the Engineers Representative. **The compliance of this Clause by the Contractor is deemed to be covered in his rates as quoted in the Bid.**



## **2. CLEARING SITE**

### **201. CLEARING SITE**

The Contractor shall demolish, break up and remove buildings, walls, gates, fences, advertisements and other structures and obstructions, grub up and remove trees, hedges, bushes and shrubs and clear the site of the works at such time and to the extent required by the Engineer but not otherwise, subject to the provisions of Clause 27 of the Conditions of Contract: the materials so obtained shall so far as suitable be reserved and stacked for further use; all rubbish and materials for use shall be destroyed or removed from the site, as directed by the Engineer. Where top soil has to be excavated this shall be removed and stacked on site. After completion of construction, it shall be spread over the disturbed ground, any surplus being disposed of as directed by the Engineer. Underground structures and chambers where required to be demolished, shall be demolished to depths shown on drawings or as directed. They shall be properly cleaned out and backfilled and compacted with suitable material to the direction and approval of the Engineer.

### **202. VEGETATION**

No allowance will be made for the cutting and removal of crops, grass, weeds and similar vegetation. The cost of all such work will be held to be included in the rates entered in The Bill of Quantities.

### **203. BUSHES AND SMALL TREES**

All bushes and small trees, the main stem of which is less than 500mm girth at 1 metre above ground level shall be uprooted (unless otherwise directed by the Engineer) and burnt or otherwise disposed off as directed by the Engineer.

### **204. HEDGES**

Where directed by the Engineer, hedges shall be uprooted and disposed off by burning.

### **205. FELLING TREES**

Where shown on the drawings or directed by the Engineer, trees shall be uprooted or cut down as near to ground level as is possible. The rates entered in the Bill of Quantities shall include for cutting down, removing branches and foliage, cutting useful timber into suitable lengths, loading, transporting not more than 1 km. and stacking or disposing off all as directed by the Engineer. For the purpose of measurement trees cut down shall be classified according to their girth at 1

metre above ground level, the cost of grubbing up roots shall be deemed to be covered by the rate for felling trees.

#### **206. GRUBBING-UP ROOTS**

Stumps and tree roots shall, unless otherwise directed, be grubbed up, blasted, burnt or removed and disposed of in approved dumps to be provided by the Contractor. Where directed by the Engineer, the holes resulting from grubbing up shall be filled with approved materials, which shall be deposited and compacted in layers not exceeding 225mm loose depth, to the same dry density as that of the adjoining soil. For the purpose of measurement, tree roots shall be classified according to the mean diameter of the stump measured across the cut.

#### **207. WEED CONTROL**

The Contractor shall take all necessary precautions against the growth on the site of weeds and remove them as necessary throughout the period of works and maintenance. The finished base of all footways and elsewhere as directed shall be sprayed with an approved persistent total herbicide at the rate recommended by the manufacturer. The application shall be by an even spray in a high volume of water at about 0.7 to 0.11 litres per square metre. After this application the footways shall receive at least two further waterings before the surface is sealed.

### **3. EXCAVATION**

#### **301. DEFINITION AND CLASSIFICATION OF EXCAVATED MATERIALS**

Excavation in the Bills of Quantities shall be classified in two categories: -

##### **1) Common Excavation**

Any material which in the opinion of the Engineer can be excavated by use of pick axes and hand levers shall be classified as common excavation. Water logged material shall be included in this class. Murram in any form shall be classified as common excavation.

##### **2) Rock**

The decision of the Engineer in classifying rock shall be final and binding. Rock in the Bill of Quantities will be itemized in three classes:-

###### **Class 'A'**

Soft rock of the type known locally as 'tuff' which in the opinion of the Engineer cannot be considered as hard rock but which considerably increases the amount of labour needed for its removal shall be known as Class 'A' rock.

###### **Class 'B'**

Very weathered phonolite lava containing many fissures and faults shall be known as hard rock. This type of rock contains stones and boulders of unweathered or incompletely formed blacktrap or lava. A boulder or outcrop of hard rock 1.5 cubic metres or less and grey or green building stone in a formation which is massive and geologically homogeneous, will be deemed to be Class 'B' rock.

###### **Class 'C'**

Phonolite in a formation which is massive and geologically homogeneous shall be known as Class 'C' rock.

#### **302. STORAGE AND HANDLING OF EXPLOSIVES AND BLASTING**

The removal of hard materials by use of explosives will normally be permitted subject to compliance by the Contractor in all respects with the Explosives Laws of Kenya. In the Bill of Quantities hard material is classified as rock where blasting will be permitted subject to this clause. The Contractor shall provide proper buildings or magazines in suitable positions for the storage of explosives in manner and quantities to be approved; he shall also be responsible for the prevention of any unauthorized issue or improper use of any explosives brought on the works

and shall employ only licensed and responsible men to handle explosives for the purpose of the works.

The shots shall be properly loaded and tamped and where necessary, the Contractor shall use heavy mesh blasting nets. Blasting shall be restricted to such periods and such parts of the works as the Engineer may prescribe. If, in the opinion of the Engineer, blasting would be dangerous to persons or property or to any finished work or is being carried out in a reckless manner, he may prohibit it, and order the rock to be excavated by other means and payment will be made at the rate for rock for excavation where blasting is permitted. The use of explosives by the Contractor in large blasts, as in seams, drifts, pits, or large holes, is prohibited unless authorised in writing by the Engineer. In the event of wasting of rock through any such blasting, the Contractor shall if required by the Engineer, furnish an equivalent amount of approved materials for fill, 1 cubic metre of rock in-situ being taken to equal 1.5 cubic metre of material in embankment.

### **303. EXCAVATION FOR FILL**

Where excavation reveals a combination of suitable and unsuitable materials, the Contractor shall, wherever the Engineer considers it practicable, carry out the excavation in such a manner that the suitable materials are placed separately for use in the works without contamination by the unsuitable materials. If any suitable material excavated from within the site is, with the agreement of the Engineer, taken by the Contractor for his use, sufficient suitable filling material to occupy after specified compaction, a volume corresponding to that which the excavated material occupied, shall, unless otherwise directed by the Engineer be provided by the Contractor from his own sources. No excavated material shall be dumped or run to spoil except on the direction or with the permission of the Engineer who may require material which is unsuitable to be retained on site. Material used for haul roads shall not be re-used without the permission of the Engineer.

### **304. COMPACTION OF FILL**

All materials used in fill shall be compacted to specification by plant approved by the Engineer for that purpose. Maximum compacted thickness of such layers shall not be more than 200mm. Work on the compaction of plastic materials for fill shall proceed as soon as practicable after excavation and shall be carried out only when the moisture content is not greater than 2 per cent above the plastic limit for that material. Where the moisture content of plastic material as excavated is higher than this value the material shall be run to spoil and an equal volume of material suitable for filling shall be replaced, unless the Contractor prefers, at his own expense,

to wait until the material has dried sufficiently for acceptance again as suitable material. Nevertheless, if with any material the Engineer doubts whether compaction will be obtained within the above moisture limits he may require compaction to proceed only when the limits of moisture content for the compaction of non-plastic materials are within the range of the optimum moisture content and 3 per cent below the optimum moisture content as determined by the laboratory compaction test method described in British Standard 1377 : Methods of Test for Soil Classification and Compaction. If any such non-plastic material on excavation is too wet for satisfactory compaction and the Engineer orders the moisture content to be lowered or raised, such work shall be treated as included in the rates. All adjustments of moisture content shall be carried out in such a way that the specified moisture content remains uniform throughout compaction. Work shall be continued until a state of compaction is reached throughout the fill, which shall have relative compaction determined according to B.S. 1377 not less than 85% of maximum dry density at optimum moisture contents. For excavation under Roads, House Drives and Car Parks the backfilling shall be compacted in 150mm layer to 100% maximum dry density. If with non-plastic materials the compacted material has become drier in the interval between the completion of compaction and the measurement of the state of compaction, then the moisture content to be used for the calculation of the air content shall be the mean moisture content for the compaction of such materials as specified above.

### **305. EMBANKMENTS OVER SEWERS**

In carrying embankments over sewer pipes, care shall be taken by the Contractor to have the embankments brought up equally on both sides and over the top of any such structures. Earth embankments shall be formed and compacted in layers of 200mm as the Engineer may direct. The filling immediately adjacent to structures shall be deposited and compacted in accordance with the drawings and approved by the Engineer. The cost of these works shall be included in the prices entered in the Bill of Quantities for the excavations from which embankments are formed.

### **306. STONE REVETMENTS (STONE PITCHING)**

Where shown on the drawings, the slopes of embankments, rivers, streams, watercourses and other surfaces shall be protected against water or other action by hand-set stone facing set on end. The larger stones shall be roughly dressed on the bed and face, and roughly square to the full depth of the joints. No rounded boulder shall be used, or stones less than 225mm in depth of 0.05 cubic metre in volume. The stones shall be laid to break bond, and shall be well bedded on to a 75mm layer of gravel or fine rubble rammed to a uniform surface and them whole work

finished to the satisfaction of the Engineer. Where required, a trench shall be excavated at the bottom of the slope to such a depth as will ensure a safe foundation for the revetment.

**307. TIPPED REFUSE ON SITE**

Tipped refuse other than artificial deposits of industrial waste or shale found on the site shall be removed and disposed off in a spoil heap to be provided by the Contractor.

**308. REMOVAL OF INDUSTRIAL WASTE, ETC.**

Artificial deposits of industrial waste or shale found on the site shall be removed and disposed off as directed by the Engineer. Should any particular deposits consist of or contain material which in the opinion of the Engineer is suitable for incorporation in fills, all such material shall be used accordingly and deposited in layers and compacted as specified. The prices entered in the Bill of Quantities for the excavation of the material shall include loading, transportation, disposal and compaction of same as and where directed.

**309. LAND SLIPS**

Remedial works and/or the removal of materials in slips, slides or subsidence's and overbreak's of rock extending beyond the lines and slopes, or below the levels shown on the drawings or required by the Engineer, will not be paid for.

**310. CLASSIFICATION OF MATERIAL FROM SLIPS**

The classification of material from slips or slides will be in accordance with its condition at the time of removal, regardless of prior condition. Measurement of overbreak in rock excavation shall be that of the space originally occupied by the material before the slide occurred and regardless of its subsequent classification.

**311. BORROW PITS**

Where for any reason, it becomes necessary to form borrow pits, these shall be located and the work executed in all respects to the instructions of the Engineer. They shall be regular in width and shape and admit of ready and accurate measurement, and shall be properly graded and drained and finished with neatly trimmed slopes.

**312. STREAMS, WATERCOURSES AND DITCHES**

Excavations carried out in the permanent diversion, enlargement, deepening, or straightening of streams, watercourses, or ditches shall be performed as directed by the Engineer. The rates for



such excavations shall include for excavated materials and all pumping, timbering works, and materials necessary for dealing with the flow of water.

### **313. FILLING OLD WATERCOURSES**

Where watercourses have to be diverted from the sites of embankments or other works, the original channels shall be cleared of all vegetable growths and soft deposits and carefully filled in with approved materials deposited and compacted as directed by the Engineer.

### **314. OPEN DITCHES**

Open ditches for drainage purposes shall be cut where and of such cross section as the Engineer shall direct and where so required by him, they shall be constructed before the cuttings are opened or the embankments begin. The sides shall be dressed fair throughout and the bottom accurately graded so as to carry off the water to the outlet to be provided. The material excavated from the ditches shall be disposed of as directed by the Engineer.

### **315. CLEARING EXISTING DITCHES**

Where directed by the Engineer, existing ditches shall be cleared by removing vegetable growths and deposits. The sides shall be shaped fair throughout and the bottoms properly graded. Material removed from existing ditches shall be disposed of in tips provided by the Contractor. The rates included in the Bill of Quantities for clearing ditches shall include for maintaining and keeping clean until and up to maintenance period.

### **316. EXCAVATION FOR FOUNDATIONS BELOW OPEN WATER**

The rates for excavation for foundations below the water level shall include for the cost of all temporary close timbering and shoring, sheet piling, coffer dams, caissons, pumps and other special appliances required and for the draining of any water in the excavation.

### **317. TRENCHES OF GREATER WIDTH AND DEPTH THAN NECESSARY**

The Contractor shall not be entitled to payment in respect of excavation to any greater extent, whether horizontally or vertically, than is necessary to receive any structure for which the excavation is intended, except where a separate item is provided for additional excavation for working space, timbering, or other temporary work. Excavation to a greater depth or width than directed shall be made good with suitable materials to the satisfaction of the Engineer and at the Contractor's cost.

### **318. SUPPORTS FOR TRENCHES**

The sides of trenches shall where necessary be adequately supported to the satisfaction of the Engineer by timber or other approved means.

### **319. PROVISION OF SPOIL HEAPS**

The Contractor shall provide spoil heaps at his own expense for the disposal of surplus material and all rubbish collected when clearing the site and during the construction of the works. The sites for these shall be approved by the Engineer.

### **320. USE OF VIBRATORY COMPACTION PLANT**

Where vibratory rollers or other vibratory compaction plant is used, the mechanism for vibration shall be kept working continuously during compaction operations, except during periods when the Engineer permits or directs discontinuance of vibration. Unless otherwise permitted by the Engineer, the frequency for vibration shall be maintained within the range of amplitude and frequency recommended by the manufacturers of the plant for the material to be compacted. The frequency shall be recorded by a tachometer indicating speed of rotation of any shaft producing vibrations.

### **321. WATER IN EXCAVATIONS**

All excavations shall be kept free from water, from whatever source, at all times during construction of works until in the opinion of the Engineer, any concrete or other works therein are sufficiently set. The Contractor's rates are deemed to cover compliance with this requirement. The Contractor shall construct any sumps or temporary drains that the Engineer may deem necessary and shall be responsible for the removal and disposal of all water entering the excavations from whatever source and shall deal with and dispose of such water in a manner approved by the Engineer so as to ensure that excavations are kept dry. The Contractor shall provide all plant, labour and materials required for such work and all costs incurred shall be deemed to be included in his rates for excavation

## **4. CONCRETE WORKS UNDER THE REHABILITATION AND EXTENSION PIPELINE**

### **4.1 SCOPE OF SECTION**

This section covers the materials, design of mixes, mixing, transport, placing, compaction and curing of concrete and mortar required in the Works. It also covers formwork and reinforcement for concrete.

### **4.2 DEFINITIONS**

- Structural concrete is any class of concrete which is used in reinforced, prestressed or unreinforced concrete construction, which is subject to stress.
- Non-structural concrete is composed of materials complying with the Specification but for which no strength requirements are specified and which is used only for filling voids, blinding foundations and similar purposes where it is not subjected to significant stress.
- A formed surface is a face which has been cast against formwork.
- An unformed surface is a horizontal or nearly horizontal surface produced by screeding or trowelling to the level and finish required.
- A pour refers to the operation of placing concrete into any mould, bay or formwork, etc. and also to the volume which has to be filled. Pours in vertical succession are referred to as lifts.

### **4.2.1. THE DESIGN OF CONCRETE MIXES**

#### **a) Classes of concrete**

The classes of structural concrete to be used in the works shall be those shown on the Drawings and designated in Table 4.1, in which the class designation includes two figures. The first figure is the nominal strength at 28 days expressed in N/mm<sup>2</sup> and the second figure is the maximum nominal size of aggregate in the mix expressed in millimeters.

#### **b) Design of proposed mixes**

The Contractor shall design all the concrete mixes called for on the Drawings, making use of the ingredients which have been approved by the Engineer for use in the Works and in compliance with the following requirements:-

**Table 4.1 - CONCRETE CLASSES AND STRENGTHS**

Class of Concrete	Nominal Strength N/mm <sup>2</sup>	Maximum Nominal Size of Aggregate Mm	Maximum Water / Cement Ratio		Trial Mixes Target Mean Strength (Clause 401 c) N/mm <sup>2</sup>	Early Works Test Cubes (Clause 401 d)	
			A	B		Any one Cube N/mm <sup>2</sup>	Average of any Group of 4 Cubes N/mm <sup>2</sup>
10/75	10	75	0.6	0.55	13.5	8.5	13.3
15/75	15	75	0.6	0.50	21.5	12.8	20.0
15/40	15	40	0.6	0.50	21.5	12.8	20.0
15/20	15	20	0.57	0.50	21.5	12.8	20.0
20/40	20	40	0.55	0.50	31.5	17.0	27.5
20/20	20	20	0.53	0.48	31.5	17.0	27.5
20/10	20	10	0.50	0.48	31.5	17.0	27.5
25/40	25	40	0.52	0.48	36.5	21.3	27.5
25/20	25	20	0.50	0.46	36.5	21.3	32.5
25/10	25	10	0.48	0.46	36.5	21.3	32.5
30/40	30	40	0.50	0.46	41.5	25.5	37.5
30/20	30	20	0.48	0.45	41.5	25.5	37.5
30/10	30	10	0.47	0.45	41.5	25.5	37.5
40/20	40	20	0.46	0.45	51.5	34	47.5
40/10/	40	10	0.45	0.43	51.5	34	47.5

**NOTES:**

- 1) Under water/cement ratio, column A applies to moderate and intermediate exposure, and column B applies to severe exposure. See NOTE after Table 4.2.
- 2) In case of concrete having a maximum aggregate size of 40mm or less, 150mm cubes should be used.
- 3) In case of concrete having a 75mm or larger aggregate, 200mm cubes should be used.

- i. The aggregate portion shall be well graded from the nominal maximum size of stone down to the 150-micron size.
- ii. The cement content shall be such as to achieve the strengths called for in Table 4.1 but in any case, not less than the minimum necessary for impermeability and durability shown in Table 4.2.
- iii. The workability shall be consistent with ease of placing and proper compaction having regard to the presence of reinforcement and other obstructions.
- iv. The water/cement ratio shall be the minimum consistent with adequate workability but in any case, not greater than that shown in Table 4.1 taking due account of any water contained in the aggregates. The Contractor shall take into account that this requirement may in certain cases require the inclusion of a workability agent in the mix.
- v. The drying shrinkage determined in accordance with BS 1881 shall not be greater than 0.05 percent.

Table 4.2 - MINIMUM CEMENT CONTENT

Minimum Cement Content - kg/m <sup>3</sup> of Compacted Concrete			
Class of Concrete	Moderate Exposure	Intermediate Exposure	Severe Exposure
10/75,15/75	200	220	270
15/40, 20/40, 25/40, 30/40	240	270	290
15/20, 20/20, 25/20, 30/20	260	300	330
40/20	300	320	330
20/10, 25/10, 30/10	300	340	390
40/10	310	340	390

Note: The minimum cement contents shown in the above table are required in order to achieve impermeability and durability. In order to meet the strength requirements in the Specification higher contents may be required. The categories applicable to the Works are based broadly on the factors listed hereunder: Moderate exposure Surface sheltered from severe rain; buried concrete, concrete continuously under water Intermediate exposure Surface exposed to driving rain; alternate wetting and drying; traffic; corrosive fumes; heavy condensation Severe exposure Surface exposed to sea water, moorland water having a pH of 4.5 or less, groundwater containing sulphates.

### **c) Trial mixes**

At least six weeks before commencing placement of concrete in the Permanent Works trial mixes shall be prepared for each class of concrete specified. For each mix of concrete for which the Contractor has proposed a design, he shall prepare three separate batches of concrete using the materials which have been approved for use in the works and the mixing plant which he proposes to use for the Works. The volume of each batch shall be the capacity of the concrete mixer proposed for full production. Samples shall be taken from each batch and the following action taken, all in accordance with BS 1881: -

The slump of the concrete shall be determined.

ii) Six test cubes shall be cast from each batch. In the case of concrete having a maximum aggregate size of 40mm or less, 150mm cubes shall be used. In the case of concrete containing 75mm or larger aggregate, 200mm cubes shall be used and in addition any pieces of aggregate retained on a 53mm BS sieve shall be removed from the mixed concrete before casting the cubes.

iii) Three cubes from each batch shall be tested for compressive strength at seven days and the remaining three at 28 days.

iv) The density of all the cubes shall be determined before the strength tests are carried out. Subject to the agreement of the Engineer, the compacting factor apparatus may be used in place of a slump cone. In this case the correlation between slump and compacting factor shall be established during preparation of the trial mixes. The average strength of the nine cubes tested at 28 days shall be not less than the target mean strength shown in Table 4.1. The Contractor shall also carry out tests to determine the drying shrinkage of the concrete unless otherwise directed by the Engineer. Based on the results of the tests on the trial mixes, the Contractor shall submit full details of his proposals for mix design to the Engineer, including the type and source of each ingredient, the proposed proportions of each mix and the results of the tests on the trial mixes. If the Engineer does not agree to a proposed concrete mix for any reason, the Contractor shall amend his proposals and carry out further trial mixes. No mix shall be used in the works without the written consent of the Engineer.)

Quality control of concrete production

#### **i) Sampling**

For each class of concrete in production at each plant for use in the works, samples of concrete shall be taken at the point of mixing and/or of deposition as instructed by the Engineer, all in accordance with the sampling procedures described in BS 1881 and with the additional

requirements as set out below. Six number 150mm or 200mm cubes as appropriate shall be made from each sample and shall be cured and tested all in accordance with BS 1881, two at seven days and the other four at 28 days. Each sample shall be taken from one batch selected at random and at intervals such that each sample represents not more than 20m<sup>3</sup> of concrete unless the Engineer agrees to sampling at less frequent intervals. Until compliance with the Specification has been established the frequency of sampling shall be three times that stated above or such lower frequency as may be instructed by the Engineer.

ii) Testing

1) The slump or compacting factor of the concrete shall be determined for each batch from which samples are taken and in addition for other batches at the frequency instructed by the Engineer. The slump of the concrete in any batch shall not differ from the value established by the trial mixes by more than 25mm or one third of the value, whichever is the greater. The variation in value of the compacting factor, if used in place of a slump value, shall be within the following limits:

For value of 0.9 or more +0.03

For value of between 0.8 and 0.9 +0.04

For values of 0.8 or less +0.05

2) The water/cement ratio as estimated from the results of (a) above, determined by samples from any batch shall not vary by more than five per cent from the value established during the trial mixes.

3) The air content of air entrained concrete in any batch shall be within 1.5 units of the required value and the average value of four consecutive measurements shall be within 1.0 unit of the required value, expressed as a percentage of the volume of freshly mixed concrete.

4) Until such time as sufficient test results are available to apply the method of control described in (e) below, the compressive strength of the concrete at 28 days shall be such that no single result is less than the value shown in Table 4.1 under the heading early works test cubes' and also that the average value of any four consecutive results is not less than the value shown in Table 4.1 under the same heading. The 7-day cube result may be used as an early strength indicator, at the discretion of the Engineer.

5) When test cube results are available for at least 20 consecutive batches of any class of concrete mixed in any one plant, the average of any four consecutive results at 28 days shall exceed the nominal strength by not less than half the current margin (Table 4.3) and each individual result shall not be less than 85 per cent of the nominal strength. The current margin shall be defined as 1.64 times the standard deviation of cube tests on at least 20 separate consecutive batches produced from one plant over a period exceeding five days but not exceeding six months or on at least 50 separate consecutive batches produced from one plant over a period not exceeding 12 months. If both figures are available, the smaller shall be taken. The current margin shall in any case not be less than the figure given below:-

Table 4.3 - MINIMUM CURRENT MARGIN FOR TEST CUBES

	Minimum Current Margin for		
	10N/mm <sup>2</sup>	15N/mm <sup>2</sup>	20N/mm <sup>2</sup> & Above
After 20 batches	3.3	5	7.5
After 50 batches	1.7	2.5	3.8

Failure to comply with requirements: If any one test cube result in a group of four consecutive results is less than 85% of the nominal strength but the average of the group of which it is part satisfies the strength requirement, then only the batch from which the failed cube was taken shall be deemed not to comply with the Specification. If more than one cube result in a group of four consecutive results is less than 85% of the nominal strength or if the average strength of the group fails to satisfy the strength requirement then all the batches between those represented by the first and last cubes in the group shall be deemed not to comply with the Specification, and the Contractor shall immediately adjust the mix design subject to the agreement of the Engineer to restore compliance with the Specification. After adjustment of the mix design the Contractor will again be required to comply with sub-clauses 401(b) and 401(c)



of this Section of the Specification. The Contractor shall take necessary action to remedy concrete which does not comply with this Specification. Such action may include but is not necessarily confined to the following: -

- i. Increasing the frequency of sampling until control is again established.
- ii. Cutting test scores from the concrete and testing in accordance with SRN 117.
- iii. Carrying out strengthening or other remedial work to the concrete where possible or appropriate.
- iv. Carrying out non-destructive testing such as load tests on beams.
- v. Removing the concrete.

#### **422. MIXING CONCRETE**

Before any plant for batching, mixing, transporting, placing, compacting and finishing concrete is ordered or delivered to site, the Contractor shall submit to the Engineer full details including drawings of all the plant which he proposes to use and the arrangements he proposes to make. Concrete for the Works specifically for Olobanita Pumping Station, Collector Tank, Chlorination Building shall be and mixed using an automatic batching plant in one or more central location. If the Contractor proposes to use ready mixed concrete he shall submit to the Engineer for his approval full details and test results of the concrete mixes. The Engineer may approve the use of ready mixed concrete provided that:

- a) the proposed mixes, the material to be used and the method of storage and mixing comply with the requirements of the Specification; and
- b) adequate control is exercised during mixing. Approval for the use of ready mixed concrete may be withdrawn if the Engineer is not

satisfied with the control of the materials being used and control during mixing. The mixing of concrete shall be carried out at central plant located at a site remote from place of discharge of mixed concrete. The mixed concrete shall be transported from the central plant using transit lorry mixers and/or agitator trucks. Batching and mixing plants shall be modern efficient equipment complying with the requirements of SRN 118 and capable of producing a uniform distribution of the ingredients throughout the mass. Truck mixes shall comply with the requirements of SRN 121 and shall only be used with the prior agreement of the Engineer. If the plant proposed by the Contractor does not fall within the scope of SRN 118, it shall have been tested in accordance with SRN 119 and shall have a mixing performance within the limits specified in SRN 118. All mixing operations shall be under the control of an experienced supervisor. The aggregate storage

bins shall be provided with drainage facilities arranged so that drainage water is not discharged to the weigh hoppers. Each bin shall be drawn down at least once per week and any accumulations of mud or silt removed. Cement and aggregate shall be batched by weight. Water may be measured by weight or volume. The weighing and water dispensing mechanisms shall be maintained in good order. Their accuracy shall be maintained within the tolerances described in SRN 118 and checked against accurate weighs and volumes when required by the Engineer. The weighs of cement and of each size of aggregate as indicated by the mechanisms employed shall be within a tolerance of plus or minus two percent of the respective weights per batch agreed by the Engineer. The Contractor shall provide standard test weights at least equivalent to the maximum working load used on the most heavily loaded scale and other auxiliary equipment required for checking the satisfactory operation of each scale or other measuring device. Tests shall be made by the Contractor at least once a week or at intervals to be determined by the Engineer and shall be carried out in his presence. For the purpose of carrying out these tests, there shall be easy access for personnel to the weigh hoppers. The Contractor shall furnish the Engineer with copies of the complete results of all check tests and shall make any adjustments, repairs or replacements necessary to ensure satisfactory performance. The nominal drum or pan capacity of the mixer shall not be exceeded. The turning speed and the mixing time shall be as recommended by the manufacturer, but in addition, when water is the last ingredient to be added, mixing shall continue for at least one minute after all the water has been added to the drum or pan. The blades of pan mixers shall be maintained within the tolerances specified by the manufacturer of the mixer and the blades shall be replaced when it is no longer possible to maintain the tolerances by adjustment. Mixers shall be fitted with an automatic recorder registering the number of batches discharged. The water to be added to the mix shall be reduced by the amount of free water contained in the coarse and fine aggregates. This amount shall be determined by the Contractor by a method agreed by the Engineer immediately before mixing begins each day and thereafter at least once per hour during concreting and for each delivery of aggregates during concreting. When the correct quantity of water, determined as set out in the Specification, has been added to the mix, no further water shall be added, either during mixing or subsequently. After mixing for the required time, each batch shall be discharged completely from the mixer before any materials for the succeeding batch are introduced. Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before any fresh concrete is mixed and thereafter the first batch of concrete through the mixers shall contain only half the

normal quantity of coarse aggregate. This batch shall be mixed for one minute longer than the time applicable to a normal batch. Mixers shall be cleaned out before changing to another type of cement.

#### **423. HAND-MIXED CONCRETE**

Concrete for structural purposes shall not be mixed by hand. Where non-structural concrete is required, hand mixing may be carried out subject to the agreement of the Engineer. The mixing shall be done on a hard-impermeable surface. The materials shall be turned over not less than three times dry, water shall then be sprayed on and the materials again turned over not less than three times in a wet condition and worked together until a mixture of uniform consistency is obtained. For hand mixed concrete the specified quantities of cement shall be increased by 10% and not more than 0.5 cubic metre shall be mixed at one time. During windy weather efficient precautions shall be taken to prevent cement from being blown away during the process of gauging and mixing.

#### **424. TRANSPORT OF CONCRETE**

The concrete shall be discharged from the mixer and transported to the Works by means which shall prevent adulteration, segregation or loss of ingredients, and which shall ensure that the concrete is of the required workability and consistency at the point and time of placing. The loss of slump between discharge from the mixer and placing shall not exceed 25mm. The mixed concrete shall be transported using agitator trucks or transit truck mixers. The agitating speed of the drum shall be between 2 and 4 rpm. The interval between feeding of water into the mixer drum and final discharging of the concrete shall not exceed one hour. The time elapsed between mixing and placing a batch of concrete shall be as short as practicable and, in any case, not longer than will permit completion of placing and compaction before the onset of initial set. If the placing of any batch of concrete is delayed beyond this period, the concrete shall not be placed in the Works.

#### **425. PLACING OF CONCRETE**

##### a) Consent for placing

Concrete shall not be placed in any part of the Works until the Engineer's consent has been given in writing, and the Contractor shall give the Engineer at least 1 full working day's notice of his intention to place concrete. If concrete placing is not commenced within 24 hours of the Engineer's consent the Contractor shall again request consent as specified above.

##### b) Preparation of surface to receive concrete

Excavated surfaces on which concrete is to be deposited shall be prepared as set out in Section 3 of this Specification. Existing concrete surfaces shall be prepared as set out in Clause 414. Before deposition of further concrete, they shall be clean, hard and sound and shall be wet but without any free-standing water. Any flow of water into an excavation shall be diverted through proper side drains to a sump, or be removed by other suitable methods which will prevent washing away the freshly deposited concrete or any of its constituents. Any underdrains constructed for this purpose shall be completely grouted up when they are no longer required by a method agreed by the Engineer. Unless otherwise instructed by the Engineer surfaces against which concrete is to be placed shall receive a prior coating of mortar mixed in the proportions similar to those of the fines portion in the concrete to be placed. The mortar shall be kept ahead of the concrete. The mortar shall be well worked into all parts of the excavated surface and shall not be less than 5mm thick. If any fissures have been cleaned out as described in Section 3 of this Specification they shall be filled with mortar or with concrete as instructed by the Engineer. The amount of mortar placed at any one time shall be limited so that it does not dry out or set before being covered with concrete.

c) Chutes

In general, transportation of concrete by the use of chutes will not be permitted unless approved by the Engineer. The chute shall have a section with round corners and shall have a proper fixed slope so as to allow the concrete to flow satisfactorily and without segregation. The lower end of chute shall be provided with a drop chute not less than 0.6m in height to avoid segregation of falling concrete. The height of drop shall not exceed 1.5m. Chutes shall be protected from direct sunlight, wind and rain.

d) Concrete pump or placer

The type and capacity of pump shall be determined to meet the specified requirements, taking into account the placing speed, construction schedule, quality of concrete, location to which concrete is poured, etc. Diameter of the delivery pipes shall be not smaller than 3 times of the maximum size of aggregates to be used in the concrete. Delivery pipes shall be so installed as to permit easy removal. Before starting the pump or placer operation, about one cubic metre of mortar with the same proportion of water, admixture, cement and fine aggregate as designated for the regular concrete mix shall be passed through the pipe. The pipe shall be set as straight and horizontally as possible to prevent clogging of the concrete mix in the pipe. The supports of the pipe line shall be stiff enough to fix the pipes firmly without adverse effect on forms and

reinforcing steel already set in position. Care shall be taken to prevent leakage of the concrete mix from the pipe line or any other part. Air boosters shall not be used except in conditions where the outlet of the pipe is completely embedded at least 2 meters in fresh concrete.

e) Placing procedures

The concrete shall be deposited as nearly as possible in its final position. It shall be placed so as to avoid segregation of the concrete and displacement of the reinforcement, other embedded items, or formwork. It shall be brought up in layers approximately parallel to the construction joint planes and not exceeding 500mm in compacted thickness unless otherwise permitted or directed by the Engineer, but the layers shall not be thinner than four times the maximum nominal size of aggregate. Layers shall be placed so that they do not form feather edges nor shall they be placed on a previous layer which has taken its initial set. In order to comply with this requirement, a layer may be started before completion of the preceding layer. All the concrete in a single bay or pour shall be placed in a continuous operation. It shall be carefully worked round all obstructions, irregularities in the foundations and the like so that all parts are completely full of compacted concrete with no segregation or honeycombing. It shall also be carefully worked round and between water stops,

reinforcement, embedded steelwork and similar items which protrude above the surface of the completed pour. All work shall be completed on each batch of concrete before its initial set commences and thereafter the concrete shall not be disturbed before it has set hard. No concrete that has partially hardened during transit shall be used in the Works and the transport of concrete from the mixer to the point of placing shall be such that this requirement can be complied with. Concrete shall not be placed during rain which is sufficiently heavy or prolonged as to wash mortar from coarse aggregate on the exposed faces of fresh concrete. Means shall be provided to remove any water accumulating on the surface of the placed concrete. Concrete shall not be deposited into such accumulation of water. In drying weather, covers shall be provided for all fresh concrete surfaces which are not being worked on. Water shall not be added to concrete for any reason. When concrete is discharged above its place of final deposition, segregation shall be prevented by the use of chutes, downpipes, trunking, baffles or other appropriate devices, as approved by the Engineer. Forms for walls, columns and other thin sections of significant height shall be provided with openings or other devices that will permit the concrete to be placed in a manner that will prevent segregation and accumulations of hardened concrete on the formwork or reinforcement above the level of the placed concrete. When it is necessary to place concrete

under water the Contractor shall submit to the Engineer his proposals for the method and equipment to be employed. The concrete shall be deposited either by bottom-discharging watertight containers or through funnel-shaped tremies which are kept continuously full with concrete up to level above the water and which shall have the discharging bottom fitted with a trapdoor and 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. If the level of concrete in a tremie pipe is allowed to fall to such an extent that water enters the pipe, the latter shall be removed from the pour and filled with concrete before being again lowered into the placing position. During and after concreting under water, pumping or dewatering in the immediate vicinity shall be suspended if there is any danger that such work will disturb the freshly placed concrete.

f) Interruptions to placing

If concrete placing is interrupted for any reason and the duration of the interruption cannot be forecast or is likely to be prolonged, the Contractor shall immediately take the necessary action to form a construction joint so as to eliminate as far as possible feather edges and sloping top surfaces and shall thoroughly compact the concrete already placed in accordance with Clause 406. All work on the concrete shall be completed while it is still plastic and it shall not thereafter be disturbed until it is hard enough to resist damage. Plant and materials to comply with this requirement shall be readily available at all times during concrete placing. Before concreting is resumed after such an interruption the Contractor shall cut out and remove all damaged or uncompacted concrete, feather edges or any other undesirable features and shall leave a clean sound surface against which the fresh concrete may be placed. If it becomes possible to resume concrete placing without contravening the Specification and the Engineer consents to a resumption, the new concrete shall be thoroughly worked in and compacted against the existing concrete so as to eliminate any cold joints.

g) Dimensions of pours

Unless otherwise agreed by the Engineer, pours shall not be more than two metres high and shall as far as possible have a uniform thickness over the plan area of the pour. Concrete shall be placed to the full planned height of all pours except in the circumstances described in sub-clause 405(d). The Contractor shall plan the dimensions and sequence of pours in such a way that cracking of the concrete does not take place due to thermal or shrinkage stresses.

h) Placing sequence

The Contractor shall arrange that as far as possible the intervals between placing successive lifts of concrete in one section of the Works are of equal duration. This duration shall normally be not less than three or more than seven days under temperate weather conditions unless otherwise agreed by the Engineer. Where required by the Engineer to limit the opening of construction joints due to shrinkage, concrete shall not be placed against adjacent concrete which is less than 21 days old. When the drawings call for contraction gaps in concrete, these shall be of the widths and in the locations shown on the drawings and they shall not be filled until the full time interval shown on the drawings has elapsed.

#### **426. COMPACTION OF CONCRETE**

The concrete shall be fully compacted throughout the full extent of the placed layer. It shall be thoroughly worked against the formwork and around any reinforcement and other embedded items, without displacing them. Particular care shall be taken at arises and other confined spaces. Successive layers of the same pour shall be thoroughly worked together. Concrete shall be compacted with the assistance of mechanical immersion vibrators, unless the Engineer agrees to another method. Immersion vibrators shall operate at a frequency of between 7,000 and 10,000 cycles per minute. The Contractor shall ensure that vibrators are operated at pressures and voltages not less than those recommended by the manufacturer in order 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, standby vibrators shall be available for instant use at each place where concrete is being placed. Where the concrete contains aggregate with a nominal size of 75mm or more, vibrators with a diameter of 100mm or more shall be used. 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. Vibrators shall not be used to move concrete laterally and shall be withdrawn slowly to prevent the formation of voids. Vibration shall not be applied by way of reinforcement nor shall vibrators be allowed to touch reinforcement or other embedded items. The vibrators shall be inserted vertically into the concrete to penetrate the layer underneath at regular spacing. The spacing shall not exceed the distance from the vibrator over which vibration is visibly effective.

## **427. CURING OF CONCRETE**

### **a) General**

Concrete shall be protected during the first stage of hardening from loss of moisture and from the development of temperature differentials within the concrete sufficient to cause cracking. The methods used for curing shall not cause damage of any kind to the concrete. Curing shall be continued for as long as may be necessary to achieve the above objectives but in any case for at least seven days or until the concrete is covered by later construction whichever is the shorter period. The above objectives are dealt with in sub-clause 407(b) and (c) but nothing shall prevent both objectives being achieved by a single method where circumstances permit. The curing process shall commence as soon as the concrete is hard enough to resist damage from the process, and in the case of large areas or continuous pours, shall commence on the completed section of the pour before the rest of the pour is finished. Details of the Contractor's proposals for curing concrete shall be submitted to the Engineer before the placing of concrete commences in the Works. Formed surfaces may be cured by retaining the formwork in place for the required curing period. If the use of the foregoing methods is inappropriate, surfaces which will not have further concrete bonded to them and which are not to receive an application of a finish may be cured by the application of a curing compound having an efficiency index of at least 90 percent. Curing compounds shall contain a fugitive dye to enable the extent of the spread to be seen easily. Curing compound is used on surfaces exposed to the atmosphere shall contain sufficient finely divided flake aluminum in suspension to produce a complete coverage of the surface with a metallic finish when applied at the rate recommended by the manufacturer. Curing compounds shall become stable and impervious to the evaporation of water from the concrete surface within 60 minutes of application. The material shall not react chemically with the concrete surfaces for at least the first four days of the curing period. If instructed by the Engineer, the Contractor shall, in addition to the curing provisions set out above provide a suitable form of shading to prevent the direct rays of the sun reaching the concrete surfaces for at least the first four days of the curing period.

### **b) Loss of moisture**

Exposed concrete surfaces shall be closely covered with impermeable sheeting, properly secured to prevent its removal by wind and the development of air spaces beneath it. Joints in the sheeting shall be lapped by at least 300mm. If for some reason it is not possible to use impermeable sheeting, the Contractor shall keep the exposed surfaces continuously wet by



means of a water spray or by covering with a water absorbent material which is kept wet, unless this method conflicts with sub-clause 407(c). Water used for curing shall be of the same quality as that used for concrete mixing as stated in sub-clause 702(g).

c) Limitation of temperature differential

The Contractor shall limit the development of temperature differentials in concrete after placing by any means appropriate to the circumstances including the following:

- i) limiting concrete temperatures at placing as set out in sub-clause 409(b);
- ii) use of low heat cement, subject to the agreement of the Engineer;
- iii) insulation of exposed concrete surface by insulating blankets. Such blankets shall have an insulation value at least equivalent to 50mm of dry mineral wool;
- iv) leaving formwork in place during the curing period. Steel forms shall be suitably insulated on the outside;
- v) preventing rapid dissipation of heat from surfaces by shielding from wind;
- vi) avoiding the use of water sprays when such use would cause rapid cooling of the surface.

**428. PROTECTION OF FRESH 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 these causes. 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 Works shall not be subjected to any loading until it has attained at least its nominal strength as defined in Clause 401. If the Contractor desires to impose 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.

**429. CONCRETING IN HOT WEATHER**

a) General

The Contractor shall prevent damage to concrete arising from exposure to extreme temperatures, and shall maintain in good working order all plant and equipment required for this purpose. In the event that conditions become such that even with the use of the equipment the requirements cannot be met, concrete placing shall immediately cease until such time as the requirements can again be met.

b) Concrete placing in hot weather

During hot weather the Contractor shall take all measures necessary to ensure that the temperature of concrete at the time of placing in the Works does not exceed 30 degrees centigrade and that the concrete does not lose any moisture during transporting and placing. Such measures may include but are not necessarily limited to the following: -

- i) Shielding aggregates from direct sunshine.
- ii) Use of a mist water spray on aggregates
- iii) Sun shields on mixing plants and transporting equipment.
- iv) Cooling the mixing water. If ice is used for this purpose it should preferably be in flake form. Lump ice shall not be allowed to enter the tank supplying the mixer drum.
- v) Covering skips closely with polythene sheet so that the latter is in contact with the concrete. Areas in which concrete is to be placed shall be shielded from direct sunshine and rock or concrete surfaces shall be thoroughly wetted to reduce absorption of water from the concrete placed on or against them. After concrete in any part of an area has been placed, the selected curing process shall be commenced as soon as possible. If any interval occurs between completion of placing and start of curing, the concrete shall be closely covered during the interval with polythene sheet to prevent loss of moisture.

#### **430. FINISHES ON UNFORMED SURFACES**

Horizontal or nearly horizontal surfaces which are not cast against formwork shall be finished to the class shown on the drawings and defined hereunder.

##### **UF 1 Finish**

All surfaces on which no higher class of finish is called for on the drawings or instructed by the Engineer shall be given a UF 1 finish. The concrete shall be levelled and screened to produce a uniform plain or ridged surface, surplus concrete being struck off by a straight edge immediately after compaction.

##### **UF 2 Finish**

This is a floated finish for roof or floor slabs and other surfaces where a hard trowelled surface is not required. The surface shall first be treated as a Class UF 1 finish and after the concrete has hardened sufficiently, it shall be floated by hand or machine sufficiently only to produce a uniform surface free from screed marks.

##### **UF 3 Finish**

This is a hard trowelled surface for use where weather resistance or appearance is important, or which is subject to high velocity water flow. The surface shall be floated as for a UF 2 finish but to the tolerance stated below. When the moisture film has disappeared and the concrete has hardened sufficiently to prevent laitance from being worked to the surface, it shall be steel trowelled under firm pressure to produce a dense, smooth uniform surface free from trowel marks.

Table 4.4 - SURFACE TOLERANCES

Class of Finish	Tolerance in mm. See notes		
	A	B	C
UF 1	N/A	10	+20 or -10
UF 2	Nil	10	+ 20 or -10
UF 3	Nil	5	+12.5 or -7.5

Notes:

1. Col. A is the maximum allowable value of any sudden change of level in the surface.
2. Col. B is the maximum allowable value of any gradual irregularity of the surface, as indicated by the gap between the surface and a three metre long straight edge or correctly shaped template placed on the surface.
3. Col. C is the maximum allowable value of the difference in level or position between a three-meter-long straight edge or correctly shaped template placed on the surface and the specified level or position of that surface. Where dimensional tolerances are given on the drawings or in this Special Specification they shall take precedence over those given in Table 4.4.

### **431. MORTAR**

This clause covers mortar for use ahead of concrete placing, and other uses not covered elsewhere in the Specification. Mortar shall be composed of fine aggregate complying with sub-clause 724(c) and ordinary Portland cement complying with SRN 103. The mix proportions shall be as stated on the drawings or elsewhere in this Specification or if not stated shall be one part of cement to two parts of fine aggregate by weight. Small quantities of mortar may be hand mixed but for amounts over 0.5 cubic metre a mechanical mixer shall be used. The water content of the mortar shall be as low as possible consistent with the use for which it is required but in any case the water/cement ratio shall not be more than 0.5. Mortar which is specified as 'dry pack' shall be mixed with sufficient water for the mix to become cohesive but not plastic when squeezed in

the hand. Dry pack mortar shall be rammed into the cavity it is required to fill, using a hand rammer with sufficient force to ensure full compaction.

### **432. CONCRETE FOR SECONDARY PURPOSES**

a) Non-structural concrete (NS concrete) shall be used only for non-structural purposes where shown on the drawings. NS concrete shall be composed of ordinary Portland cement complying with SRN 103 and aggregates complying with SRN 108-111 including all-in aggregate within the grading limits of SRN 109 and SRN 111. The weight of cement mixed with 0.3 cubic metres of combined or all-in aggregate shall not be less than 50 kg. The mix shall be proportioned by weight or by volume. The maximum aggregate size shall be 40mm nominal. The concrete shall be mixed by machine or by hand to a uniform colour and consistency before placing. The quantity of water used shall not exceed that required to produce a concrete with sufficient workability to be placed and compacted where required. The concrete shall be compacted by hand or by mechanical vibration.

b) No Fines concrete (NF concrete) is intended for use where a porous concrete is required and shall only be used where shown on the drawings or instructed by the Engineer. The mix shall consist of ordinary Portland cement complying with SRN 115. The aggregate size shall be 40mm to 10mm only. The weight of cement mixed with 0.3 cubic metre of aggregate shall not be less than 50 kg. The quantity of water shall not exceed that required to produce a smooth cement paste which will coat evenly the whole of the aggregate.

### **433. RECORDS OF CONCRETE PLACING**

Records, in a form agreed by the Engineer, shall be kept by the Contractor of the details of every pour of concrete placed in the Works. These records shall include class of concrete, location of pour, date of pour, ambient temperature and weather conditions during mixing and placing and concrete temperature at time of placing, moisture contents of aggregates, details of mixes, batch numbers, cement batch number, results of all tests undertaken, location of test cube sample points and details of any cores taken. The Contractor shall supply to the Engineer four copies of these records each week covering work carried out the preceding week. In addition he shall supply to the Engineer monthly histograms of all 28 day cube strengths together with accumulative and monthly standard deviations and any other information which the Engineer may require concerning the concrete placed in the works.

#### **434. CONSTRUCTION JOINTS**

Whenever concrete is to be bonded to other concrete which has hardened, the surface of contact between the sections shall be deemed a construction joint. Where construction joints are shown on the drawings, the Contractor shall form such joints in those positions. The location of joints which the Contractor requires to make for the purpose of construction shall be subject to the agreement of the Engineer. Construction joints shall be in vertical or horizontal planes except in sloping slabs where they shall be normal to the exposed surface or elsewhere where the drawings require a different arrangement. Construction joints shall be so arranged as to reduce to a minimum the effects of shrinkage in the concrete after placing, and shall be placed in the most advantageous positions with regard to stresses in the structures and the desirability of staggering joints. Feather edges of concrete at joint shall be avoided and any feather edges which may have formed where reinforcing bars project through a joint shall be cut back until sound concrete has been reached. The intersection of horizontal or near horizontal joints and exposed faces of concrete shall appear as straight lines produced by use of a guide strip fixed to the formwork at the top of the concrete lift, or by other means acceptable to the Engineer. Construction joints formed as free surfaces shall not exceed a slope of 20 per cent from the horizontal. The surface of the fresh concrete in horizontal or near horizontal joints shall be thoroughly cleaned and roughened by means of high pressure water and air jets when the concrete is hard enough to withstand the treatment without the leaching of cement. The surface of vertical or near vertical joints shall be similarly treated if circumstances permit the removal of formwork at a suitable time. Where concrete has become too hard for the above treatment to be successful, the surface whether formed or free is to be thoroughly scabbled by mechanical means or wet sand blasted and then washed with clean water. The indentations produced by scabbling shall be not less than 10mm deep and shall not extend closer than 40mm to a finished face. If instructed by the Engineer the surface of the concrete shall be thoroughly brushed with a thin layer of mortar composed of one part of cement to two parts of sand by weight and complying with Clause 411 all as set out in sub-clause 405(b) immediately prior to the deposition of fresh concrete. The mortar shall be kept just ahead of the fresh concrete being placed and the fresh layer of concrete shall be thoroughly and systematically vibrated to full depth to ensure complete bond with the adjacent layer. No mortar or concrete may be placed in position on or against a construction joint until the joint has been inspected and passed by the Engineer.

#### **435. EXPANSION AND CONTRACTION JOINTS**

Expansion and contraction joints are discontinuities in concrete designed to allow thermal or other movements in the concrete. Expansion joints are formed with a gap between the concrete faces to permit subsequent expansion of the concrete. Contraction joints are formed to permit initial contraction of the concrete and may include provision for subsequent filling. Expansion and contraction joints shall be formed in the positions and in accordance with the details shown on the drawings or elsewhere in the Specifications.

#### **436. WATERSTOPS**

All references to waterstops include groutstops. Waterstops shall be of the material and form shown on the drawings. No waterstop material shall be brought on the site until the Contractor has submitted full details of the materials he proposes to use, including samples, and these have been tested and approved by the Engineer. All samples shall be of adequate length for testing. Waterstops shall be made of materials which are resistant to chlorides, sulphates, or other deleterious substances which may be present in the environment of the Works. Rubber waterstops may be of natural rubber and shall have an elongation at breaking stress of at least 500 percent at 25 degrees centigrade and shall allow a joint movement of at least 50mm. Polyvinyl chloride (PVC) waterstops shall be extruded from an unfilled plasticised PVC polymer or copolymer which does not contain any reclaimed or scrap PVC. PVC waterstops shall have an elongation at breaking stress of at least 225 percent at 25 degrees centigrade and shall allow a joint movement of at least 10mm. Low modulus waterstops shall be of rubber or PVC as described above but shall have an elongation of at least 200 percent at 25 degrees centigrade under a tensile stress of 6 N/mm<sup>2</sup> and shall allow a joint movement of at least 50mm. Waterstops shall be supplied in lengths as long as possible consistent with ease of handling and construction requirements. In rubber or plastic materials, joints other than butt joints shall be supplied ready made by the manufacturer. Butt joints shall be made on site in accordance with the manufacturer's instructions and with equipment supplied for the purpose by the manufacturer. Waterstop material shall be stored carefully on site to avoid damage and contamination with oil, grease, or other pollutants. Rubber and plastic waterstops shall be stored in cool well ventilated places away from direct sunlight. Rubber and plastic waterstops which are embedded in one side of a joint more than one month before the scheduled date of placing concrete on the other side, shall be protected from the sun. Waterstops shall be firmly fixed in the formwork so that they cannot be displaced during concrete placing and shall be completely free of all dirt, grease, oil, etc., before placing concrete. Where eyelets are provided these shall be fully wired to the

reinforcement and be the only means whereby the waterstop is fixed. In no circumstances shall a waterstop be punctured with nails etc. as a means of fixing. Concrete shall be placed carefully round waterstops so as to avoid distortion or displacement and shall be fully compacted. Where waterstops lie in a horizontal or nearly horizontal plane the Contractor shall ensure that no voids are left on the underside of the waterstop. Formwork around waterstops shall be carefully removed to avoid damage. If waterstops suffer any damage which cannot be properly repaired in-situ the Engineer may require a section of concrete to be removed and the waterstop replaced.

#### **437. GROUTING OF POCKETS AND HOLES AND UNDERPINNING OF BASEPLATES**

Pockets and holding-down bolt holes shall be thoroughly cleaned out using compressed air and water jet. Holes drilled by a diamond bit shall be roughened. The pockets and holes shall be filled with grout consisting of cement and clean fresh water mixed in proportion of two parts by weight of cement to one part by weight of water. The pouring of liquid grout shall cease as soon as each hole is filled and any excess grout on the surface of the concrete foundation shall be completely removed and the surface dried off before the next operation proceeds. The space between the top surface of foundation concrete and the underside of the baseplates shall be filled with a special mortar made up in the following proportions: -

- Portland Cement ..... 50 kg.
- Fine aggregate ..... 50 kg.
- An additive acceptable to the Engineer to counteract shrinkage in proportions recommended by the manufacturer. The special mortar shall be mixed with the lowest water-cement ratio which will result in a consistency of mix of sufficient workability to enable maximum compaction to be achieved. The special mortar shall then be well rammed in horizontally below the baseplate and from one edge only until it is extruded from the other three sides. The mortar which has extruded shall then be rammed back to ensure complete support without voids.

#### **438. REMEDIAL WORK TO DEFECTIVE SURFACES**

If on stripping any formwork the concrete surface is found to be defective in any way, the Contractor shall make no attempt to remedy such defects prior to the Engineer's inspection and the receipt of any instructions which the Engineer may give. Defective surfaces shall not be made good by plastering. Areas of honey combing (of a mild nature) which the Engineer agrees may be repaired shall be cut back to sound concrete or to 75mm whichever is the greater distance. In the case of reinforced concrete the area shall be cut back to at least 25mm clear

distance behind the reinforcement or to 75mm, whichever is the greater distance. The cavity shall have sides at right angles to the face of the concrete. After cleaning out with water and compressed air, a thin layer of cement grout shall be brushed on to the concrete surface in the cavity and it shall then be filled immediately with concrete of the same class as the main body but with aggregate larger than 20mm nominal size removed. A form shall be used against the cavity, provided with a lip to enable concrete to be placed. The form shall be filled to a point above the top edge of the cavity. After seven days the lip of concrete shall be broken off and the surface ground smooth. Surface irregularities which are outside the limits of tolerance set out in Clause 410 shall be ground down in the manner and to the extent instructed by the Engineer. Severe honeycombing and defects other than those mentioned above shall be dealt with as instructed by the Engineer.

#### **439. BENDING REINFORCEMENT**

Unless otherwise shown on the drawings, bending and cutting shall comply with SRN 129. The Contractor shall satisfy himself as to the accuracy of any bar bending schedules supplied and shall be responsible for cutting, bending, and fixing the reinforcement in accordance with the drawings. Any discrepancies should be brought to the attention of the Engineer prior to ordering the reinforcement Bars shall be bent cold by the application of slow steady pressure. At temperatures below 5 degrees centigrade the rate of bending shall be reduced if necessary to prevent fracture of the steel. After bending, bars shall be securely tied together in bundles or groups and legibly labelled as set out in SRN 129. Reinforcement shall be thoroughly cleaned and all dirt, scale, loose rust, oil and other contaminants removed before it is placed in the Works.

#### **440. FIXING REINFORCEMENT**

Reinforcement shall be securely fixed in position within a dimensional tolerance of 20mm in any direction parallel to a concrete face and within a tolerance of 5mm at right angles to a face, provided that the cover is not thereby decreased below the minimum shown on the drawings, or if not shown shall be not less than 25mm or the diameter of the bar, whichever is the greater. Cover on distribution steel shall not be less than 15mm or the diameter of the bar whichever is the greater. Unless otherwise agreed by the Engineer, all intersecting bars shall either be tied together with 1.6mm diameter soft annealed iron wire and the ends of the wire turned into the body of the concrete, or shall be secured with a wire clip of a type agreed by the Engineer. Spacer blocks shall be used for ensuring that the correct cover is maintained on the



reinforcement. Blocks shall be as small as practicable and of a shape agreed by the Engineer. They shall be made of mortar mixed in the proportions of one part of cement to two parts of sand. Wires cast into the block for tying in to the reinforcement shall be 1.6mm diameter soft annealed iron. Alternatively, another type of spacer block may be used subject to the Engineer's agreement. Reinforcement shall be rigidly fixed so that no movement can occur during concrete placing. Any fixings made to the formwork shall not be within the space to be occupied by the concrete currently being placed. No splices (laps) shall be made in the reinforcement except where shown on the drawings or agreed by the Engineer. Splice lengths shall be as shown on the drawings. Reinforcement shall not be welded except where required by the Contract or agreed by the Engineer. If welding is employed, the procedures shall be as set out in SRN 937 for gas welding or SRN 919 for metal arc welding. Full strength butt welds shall only be used for steel complying with SRN 126, and if used on high yield deformed bars complying with SRN 126 the permissible stresses in the vicinity of the weld shall be reduced to those applicable to plain bars complying with that Specification. Mechanical splices shall not be used unless the Engineer agrees otherwise. The Contractor shall ensure that reinforcement left exposed in the Works shall not suffer distortion, displacement or other damage. When it is necessary to bend protruding reinforcement aside temporarily, the radius of the bend shall not be less than four times the bar diameter for mild steel bars or six times the bar diameter for high yield bars. Such bends shall be carefully straightened before concrete placing continues, without leaving residual links or damaging the concrete around them. In no circumstances will heating and bending of high yield bars be permitted. Bars complying with SRN 127 or other high tensile bars shall not be bent after placing in the Works. Before concrete is placed in any section of the Works which includes reinforcement, the reinforcement shall be completely clean and free from all contamination including concrete which may have been deposited on it from previous operations. The Engineer's approval for concrete placing is to be sought in writing for each pour, leaving adequate time to inspect and rectify any defects noted in the formwork, falsework, reinforcement, scaffolding, concreting arrangements, etc.

## **5. FORMWORK**

### **501. FORMWORK FOR CONCRETE**

#### Definitions

Formwork means the surface against which concrete is placed to form a face, together with all the immediate supports to retain it in position while concrete is placed. Falsework means the structural elements supporting both the formwork and the concrete until the concrete becomes self-supporting. A formed face is one which has been cast against formwork. An exposed face is one which will remain visible when construction has been completed.

### **502. CONSTRUCTION OF FORMWORK AND FALSEWORK**

Before construction begins, the Contractor shall submit to the Engineer, drawings showing details of the proposed formwork and falsework. Formwork and falsework shall be so constructed that they will support the loads imposed on them by the fresh concrete together with additional stresses imposed by vibrating equipment and by construction traffic, so that after the concrete has hardened the formed faces shall be in the positions shown on the drawings within the tolerances set out in Clause 506. Ground supports shall be properly founded on footings designed to prevent settlement. Joints in formwork for exposed faces shall, unless otherwise specified, be evenly spaced and horizontal or vertical and shall be continuous or form a regular pattern. All joints in formwork including formwork for construction joints shall be tight against the escape of cement, water and fines. Where reinforcement projects through formwork, the form shall fit closely round the bars. Formwork shall be so designed that it may be easily removed from the work without damage to the faces of the concrete. It shall also incorporate provisions for making minor adjustments in position if required, to ensure the correct location of concrete faces. Due allowance shall be made in the position of all formwork for movement and settlement under the weight of fresh concrete. Where overhangs in formwork occur, means shall be provided to permit the escape of air and to ensure that the space is filled completely with fully compacted concrete. Formwork shall be provided for concrete surfaces at slopes of 30 degrees to the horizontal or steeper. Surfaces at slopes less than 20 degrees may be formed by screeding. Surfaces at slopes between 20 degrees and 30 degrees shall generally be formed unless the Contractor can demonstrate to the satisfaction of the Engineer that such slopes can be screeded with the use of special screed boards to hold the concrete in place during vibration. Horizontal or inclined formwork to the upper surface of concrete shall be adequately secured against uplift due

to the pressure of fresh concrete. Formwork to voids within the body of the concrete shall also be tied down or otherwise secured against floating. The internal and external angles on concrete surfaces shall be formed with fillets and chamfers of the sizes shown on the drawings unless otherwise instructed by the Engineer. Supports for formwork for non-water retaining structures may be bolted to previously placed concrete provided the type of bolt used is acceptable to the Engineer. If metal ties through the concrete are used in conjunction with bolts, the metal left in shall not be closer than 50mm to the face of the concrete. Supports for formwork for water retaining structures may be bolted to previously placed concrete provided the type of bolts and positions of fixing are acceptable to the Engineer. After concreting the Contractor shall remove all support bolts and seal all holes with well rammed cement/sand mortar containing approved waterproofing cement additive. Metal ties which would be left in the concrete shall not be permitted. Formwork shall not be re-used after it has suffered damage which in the opinion of the Engineer is sufficient to impair the finished surfaces of the concrete. Where circumstances prevent easy access within the form for cleaning and inspection, temporary openings for this purpose shall be provided through the formwork. Shear keys shall be provided in all construction joints of the size and shape indicated on the drawings. Where precast concrete elements are specified for use as permanent formwork, or proposed by the Contractor and agreed by the Engineer, they shall comply with the requirements of the Specification. Such elements shall be set true to line and level within the tolerances prescribed for the appropriate class of finish in Clause 506 and fixed so that they cannot move when concrete is placed against them.

**503. PREPARATION OF FORMWORK**

Before any reinforcement is placed into position within formwork, the latter shall be thoroughly cleaned and then dressed with a release agent. The agent shall be either a suitable oil incorporating a wetting agent, an emulsion of water suspended in oil or a low viscosity oil containing chemical agents. The Contractor shall not use an emulsion of oil suspended in water nor any release agent which causes staining or discoloration of the concrete, air holes on the concrete surface, or retards the set of the concrete. In order to avoid colour difference on adjacent concrete surfaces, only one type of release agent shall be used in any one section of the works. In cases where it is necessary to fix reinforcement before placing formwork, all surface preparation of formwork shall be carried out before it is placed into position. The Contractor shall not allow reinforcement or prestressing tendons to be contaminated with formwork release agent. Before placing concrete all dirt, construction debris and other foreign matter shall be removed

completely from within the placing area. Before concrete placing commences, all wedges and other adjusting devices shall be secured against movement during concrete placing and the Contractor shall maintain a watch on the formwork during placing to ensure that no movement occurs.

#### **504. 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 Table 5.1 and apply to ambient temperatures higher than 10 degrees centigrade. At lower temperatures or if cement other than ordinary Portland are involved, the Engineer may instruct that longer periods be used. Alternatively, formwork may be removed when the concrete has attained the strength set out in Table 5.1, provided that the attained strength is determined by making test cubes and curing them under the same conditions as the concrete to which they refer. Compliance with these requirements shall not relieve the Contractor of his obligation to delay removal of formwork until the removal can be completed without damage to the concrete.

**Table 5.1 - MINIMUM PERIODS FOR FORMWORK REMOVAL**

Position of Formwork	Min. period for temp over 10 degrees Centigrade	Strength to be attained
Vertical or near vertical faces of mass Concrete	24 hours	0.2 C
Vertical or near vertical faces of reinforced walls, beams and columns	48 hours	0.3 C
Underside of arches, beams and slabs (formwork only)	) 4 days	0.5 C
Supports to underside of arches, beams and slabs	14 days	C
Arched linings in tunnels and underground	works 24 hours	4 N/mm <sup>2</sup>

**Note:** C is the nominal strength for the class of concrete used.

If the Contractor wishes to strip formwork from the underside of arches, beams and slabs before the expiry of the period for supports set out above, it shall be designed so that it can be removed without disturbing the supports. The Contractor shall not remove supports temporarily for the purpose of stripping formwork and subsequently replace them. As soon as the formwork has been removed, bolt holes in concrete faces other than construction joints which are not required for subsequent operations shall be completely filled with mortar sufficiently dry to prevent any slumping at the face. The mortar shall be mixed in the same proportions as the fine aggregate and cement in the surrounding concrete and with the same materials and shall be finished flush with the face of the concrete.

### **505. SURFACE FINISHES ON FORMED SURFACES**

#### Classes of finish

The surface finish to be achieved on formed concrete surfaces shall be as shown on the drawings and defined hereunder:-

#### a) Class F1 finish

This finish is for surfaces against which backfill or further concrete will be placed. Formwork may be sawn boards, sheet metal or any other suitable material which will prevent the loss of fine material from the concrete being placed.

#### b) Class F2 finish

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 Class F2 finish shall be faced with wrought thickened 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.

#### c) Class F3 finish

This finish is for surfaces which will be in contact with water flowing at high velocity, and for surfaces prominently exposed to view where good appearance is of special importance. To achieve this finish, which shall be free of board marks, the formwork shall be faced with plywood complying with B.S. 1088 or equivalent material in large sheets. The sheets shall be arranged in an approved pattern. Wherever possible, joints between sheets shall be arranged to

coincide with architectural features or changes in direction of the surface. 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. Unfaced wrought boarding or standard steel panels will not be permitted for Class F3 finish. The Contractor shall ensure that the surface is protected from rust marks, spillages and stains of all kinds.

d) Curved surfaces

For curved surfaces where F2 or F3 finishes are called for, the formwork face shall be built up of splines cut to make a tight surface which shall then be dressed to produce the required finish. Alternatively, single curvature surfaces may be faced with plastic or plywood linings attached to the backing with adhesive or with escutcheon pins driven flush. Linings shall not bulge, wrinkle or otherwise deform when subjected to temperature and moisture changes.

### 506. TOLERANCES

All parts of formed concrete surfaces shall be in the positions shown on the drawings within the tolerances set out in Table 5.2. In cases where the drawings call for tolerances other than those given in Table 5.2 the tolerances shown on the drawings shall take precedence. Where precast units have been set to a specified tolerance, further adjustments shall be made as necessary to produce 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 5.2 - TOLERANCES**

Class of finish	Tolerances in mm (See Note)		
	A	B	C
F1	10	10	+25 to -10
F2	5	10	+ or -15
F3	2	5	+ or -10

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

1. Column A is an abrupt irregularity in the surface due to misaligned formwork or defects in the face of the formwork.
2. Column B is a gradual deviation from a plane surface as indicated by a straight edge 3m long. In the case of curved surfaces, the straight edge shall be replaced by a correctly shaped template.

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

## **6. MASONRY WORKS**

### **601. GENERAL**

All masonry work shall be constructed from building stone as specified in Clause 725. 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.

### **602. WORKMANSHIP**

The Contractor shall provide and use proper setting out rods for all work. Stones shall be well soaked before use and the tops of walls shall be kept wet as the work proceeds. The stones 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 shall be bedded, jointed and pointed in mortar 1 to 3 in accordance with Clause 729 with beds and joints 9mm thick flushed up and grouted solid as the work proceeds. All masonry work shall be cured in accordance with the relevant requirements of Clause 407.

### **603. CAST STONEMWORK**

Cast stone shall be as specified in Clause 735. Facing stones shall be brought up in courses to a height not exceeding 1 metre at a time, the concrete backing being then brought up and well incorporated into and round the backs of the stones and the projecting metal ties to ensure a complete bond. The stones shall be bedded and jointed as shown on the drawings. All materials, moulds, mixing, casting and surface treatment, setting, jointing and pointing, and all centering, scaffolding and labour required to complete the cast stonework specified or as shown on the drawings, shall be included in the rates for such work.

## 7. MATERIALS

### 701. GENERAL

The approval in writing or otherwise by the Engineer of any materials shall not in any way whatsoever relieve the Contractor from any liability or obligation under the Contract and no claim by the Contractor on account of the failure, insufficiency or unsuitability of any such materials will be entertained.

- a) All items shall be suitable for water works purposes and for use with cold water installation and operation being in a tropical climate.
- b) All items hereinafter specified shall be to such other Standard or Specification which in the opinion of the Engineer provides for a quality of material and workmanship not inferior to the Standard Reference Number (SRN) quoted. The Standard or Specification must be submitted to the Engineer for approval before commencement of work.
- c) All ferrous pipes and fittings shall be coated with a protective paint suitable for use in and transport through a tropical climate.
- d) The Contractor shall supply to the Employer a certificate stating that each item supplied has been subjected to the tests hereinafter laid down and conforms in all respects to the said Specification.
- e) The Contractor shall provide adequate protection to all piping, flanged items and valves so as to guard effectively against damage in transit and storage and ingress of foreign matter inside the valves.
- f) All pipework and fittings shall be subjected to a works hydrostatic test pressure which shall be not less than twice the maximum operating pressure.
- g) The Contractor should exercise diligence to provide the best material.
- h) Where applicable the manufacturer's Specification should accompany all offers. The name of the manufacturer must in every case be stated.
- j) Where necessary the Contractor shall provide rubber gaskets to comply with SRN 208 and all other bolts, nuts, washers, etc. to undertake jointing at fittings etc.
- k) Any articles required under this Contract which are found to be faulty due to a crack, flaw or any other reason or is not in accordance with the Specification stipulated will not be accepted nor will the Employer be liable for any charges in respect of such an article. Where any such rejected article can, in the opinion of the Engineer, be rendered usable, the Contractor may deal with it



accordingly and include it in the Contract at a price to be mutually agreed. Straight pipes which have been cut will be accepted at the discretion of the Engineer, provided the length is not less than 4 metres or two thirds of the standard length whichever is the lesser and will be priced pro-rata.

l) Wherever possible, samples of pipes and fittings shall be submitted for approval of the Engineer prior to the Contractor obtaining the total requirements.

### **702. GALVANISED PIPES AND SPECIALS**

All piping shall conform to SRN 823 and SRN 903 for “Medium” Piping. The pipes shall be screwed and socketted, coupled or flanged. All specials shall be of such dimensions as will mate with the piping supplied. Screwdown stopvalves shall conform to SRN 826. Barrel nipples shall conform to SRN 823 and all other specials shall conform to SRN 824. All pipes supplied shall be certified by the manufacturer to have been tested in accordance with the relevant Standard Specification.

### **703. DUCTILE IRON AND CAST IRON PIPES AND SPECIALS**

All cast iron piping and fittings shall conform to the requirements of SRN 200. Ductile iron pipes and fittings shall comply with SRN 202. Where required the pipes shall be protected as specified by the manufacturer of the pipes and shall be used as recommended by the manufacturer of the pipe. Where the requirements include for the supply of flexible couplings the Contractor shall submit for approval by the Engineer full details of the type of joint offered and a full description of the method of jointing prior to arranging for the delivery of goods on site. All flexible couplings shall be protected from corrosion by wrapping with Denso paste and tape or by some similar approved material. 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. All piping and fittings shall be coated internally with cement mortar lining to SRN 211. Cement mortar lining shall not contain any constituents soluble in water nor any ingredient which could impart any taste or odour whatsoever to the water after sterilization and washing out of the mains. External protection to be as specified in SRN 258. The flanges of straight pipes shall be at right angles to axis of the pipe and the faces of the flanges shall be parallel and machine finished. The faces of the flanges of fittings shall be at right angles to the directional axis. The bolt holes shall be concentric with the bore and located symmetrically off the centre line. In flanged pipework the holes in one flange shall be located in line with those in

the other. All flanges shall be drilled to SRN 207, unless otherwise detailed. The weights of the pipe and fittings shall comply with the Specification in the relevant Standard.

**704. ASBESTOS CEMENT PIPES AND SPECIALS**

All piping and bends shall be plain ended suitable for use with flexible couplings and shall comply with the requirements of SRN 401. Fittings shall be of asbestos cement or cast iron complying with requirements of SRN 201, or mild steel complying with SRN 210. Where possible, fittings shall have plain ends of an external diameter equal to that of the asbestos cement pipes and shall be suitable for use with asbestos cement, cast iron or mild steel mechanical joints. Where compatible external diameters of fittings and pipes cannot be supplied, suitable stepped couplings of approved manufacturer shall be used. Flexible couplings shall be supplied complete with bolts, nuts, washers and joint rings as may be required. All metal parts of the joints shall be adequately protected with rust-proof paint. The couplings shall, if required by the Engineer, be protected from corrosion by wrapping with Denso paste and tape or by some similar approved material. The Contractor shall submit full details of the type of joint and a full description of the method of jointing. The lengths of piping supplied shall be in accordance with SRN 401. All pipes and bends supplied shall be certified by the manufacturer to have been tested in accordance with the relevant clauses of Standard Specification. Unless specified, the pipes, joints and bends shall be coated internally with cement mortar lining complying with SRN 212. This lining should not impart any taste or odour to the water. External protection for pipes, joints and bends to be as specified in SRN 212. Precautions shall be taken to avoid damage to the pipes and fittings during handling and storing and during laying, all to the satisfaction of the Engineer. Where ferrules are tapped into the piping, saddles should be used, otherwise service connections can be incorporated by use of suitable long collar joints.

**705. STEEL PIPES AND SPECIALS**

All piping shall be plain ended unless otherwise specified and suitable for use with flexible mechanical couplings. The grade of steel used shall comply with the requirements of SRN 213. The pipes shall be welded or seamless and shall conform to SRN 210. All the pipes shall be internally protected with cement mortar lining in accordance with SRN 212. External protection to be as specified in SRN 241. All joints shall be of the flexible mechanical type and shall be supplied complete with all bolts, nuts, washers and joint rings as may be required. All metal parts of joints shall be adequately protected with rust-proof paint. The joints shall be protected from

corrosion by wrapping with Denso paste and tape or by some similar approved material. All fittings and specials shall be of such dimensions as will mate up with the piping supplied. Flanged adaptors shall be pieces suitable for connecting a flanged gate valve etc. to the type of piping supplied and shall be supplied complete with all bolts, nuts, washers and joint rings. The spigot ends of all Tees shall be suitable for connection to the pipework supplied using the aforementioned flexible mechanical joints. Branches shall be flanged with flanges drilled to NP 16 or NP 25, as specified in the drawings in accordance with SRN 207, unless otherwise detailed. All flanges on specials shall conform to NP 16 or NP 25, as specified in the drawings in accordance with SRN 207, unless otherwise detailed. All flanged joints shall be protected from corrosion by wrapping with Denso paste and tape or some similar approved material.

#### **706. UNPLASTICISED uPVC PIPES**

Unplasticised PVC piping shall be in accordance with SRN 300. The maximum sustained working pressures to which the pipes and fittings will be subjected is based on water at a temperature of 20 degrees centigrade. The Contractor shall submit full details of the pipes he intends to supply. 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 Contractor shall supply sufficient quantity of the cleaner and adhesive which shall be required to make the joints with the pipes. The pipes of 50mm diameter and over shall consist of a grooved socket at one end of the pipe. The socket shall be designed to give a clearance fit on the outside diameter of the parent pipe. The sealing medium which shall seat in the groove shall be a rubber ring. If the formation of the socket and groove results in the thinning of the original wall thickness of the pipe, it shall be compensated for by shrinking on to the outside of the socket area a reinforcing sleeve of the same material as the pipe. The socket and groove shall incorporate no sharp angles where the stress points are created. The joint shall take 10% deformation of the spigot at the point where it enters the socket without leakage from the pipe when subjected to the test pressure specified for the pipe. Thermal expansion of the pipe shall be accommodated in the joint. The joint shall be capable of linear deflection up to 3 degrees. The sealing ring shall be of first grade natural rubber and the physical properties of the mix shall meet the requirements of SRN 222.

The Contractor shall supply sufficient quantity of any lubricant or other material which shall be needed to make the joint which shall be assembled by hand. The Contractor shall submit full

details of the type of joint offered and a full description of the method of jointing. The fittings shall have the same type of joint as for the pipes to be used. The Contractor shall submit full details of the materials dimensions and test pressures of the fittings offered. Precautions shall be taken to avoid damage to the pipes and fittings. In handling and storing the pipes and fittings, every care shall be taken to avoid distortion, flattening, scoring or other damage. The pipes and fittings shall not be allowed to drop or strike objects. Pipe lifting and lowering shall be carried out by approved equipment only. Special care shall be taken in transit, handling and storage to avoid any damage to the ends. Pipes and fittings shall be marked at not greater than one metre intervals showing their class and diameter.

### **707. G.R.P. PIPES AND SPECIALS**

Glass Reinforced Plasting piping shall be in accordance with SRN 317.

### **708. GATE VALVES**

Gate valves shall comply with the requirements of SRN 501. The gate valves shall be suitable for use in pipelines and for the operating pressure to a head of 160 metres or 250 metres of water (NP 16) or NP 25. The gate valves shall be double flanged. The dimensions and drilling of flanges shall be in accordance with SRN 207. Flanges shall be machined flat. Flanges shall be NP 16 / NP 25 complying with SRN 207. Spindles of the gate valves shall be provided with cast iron caps conforming to the requirements as specified under “Valve Caps” in SRN 501 or handwheels if so specified. The spindles of the gate valves shall be of the non-rising type and screwed so as to close the valves when rotated in a clockwise direction. The direction of closing shall be clearly cast on the valve cap or handwheel. The gate valves shall be subject to “Closed End Tests” in accordance with the procedure set out in SRN 501. The gate valves shall be suitable for opening and closing against an unbalanced head by manual operation.

### **709. FIRE HYDRANTS**

Fire hydrants shall be in accordance with SRN 509. They shall be for installation underground and shall be in accordance with SRN 509. The spindle shall be provided with a cast iron cap conforming to dimensions under “Spindle Cap” in SRN 501. The spindle of the fire hydrant shall be of the non-rising type and screwed so as to close the hydrant when rotated in a clockwise direction viewed from above. The direction of closing shall be clearly cast on the valve cap. The flanged outlet of the outlet bend shall have a Bayonet Joint Outlet for a 63mm standpipe. The outlet of the hydrant shall be of the hooked type with hooks 112mm apart. The outlet shall have a

gun metal standpipe seating and be covered by a loose cast iron cap which shall be attached to the hydrant by means of a chain. Both flanges shall be 63mm drilled to requirements of SRN 207. The outlet bends shall be subject to a hydrostatic test in accordance with procedure set out in SRN 509 and shall be water-tight against a test pressure of 1.85 Pa. head of water.

#### **710. AIR VALVES**

The Contractor shall provide air valves to suit the site on which the main is located and the maximum water pressure specified. The body and cover of air valves shall comply with SRN 906 and SRN 916. The body, cover, splash cowl and joint support ring of the air valve shall be of mechanite cast iron with flanges drilled to SRN 207. The internal screwed isolating valve shall have the valve and seating of gun metal, operating screws of bronze, nuts of gun metal, and glands and cap of mechanite. The large orifice valve shall have a vulcanite covered ball closing on a moulded dexine seat ring. The bush may be in gun metal. The double orifice type of air valve shall comprise a small and large orifice unit with common connection to the main and screwdown isolating valve to permit inspection of the valve. The spindle of the isolating valve shall be screwed so as to close the valve when rotated in a clockwise direction and be provided with a Spindle Cap to dimensions as specified in SRN 501. Design of the air valves shall be such that the balls do not blow shut under any working or test conditions when large volumes of air are being released.

#### **711. WATER METERS**

All water meters upto 50mm size shall be of the rotary piston positive action type with all moving parts composed of non-corrosive material. 75mm diameter and over meters shall be of the inferential helix full flow type. The body of the 12mm to 25mm size of meter shall be of brass, the larger sizes in cast iron. The external surface of the brass bodies shall be coated with baked enamel and the cast iron bodies shall be painted to suit. The working chamber of the rotary type meter shall be made of bronze or similar noncorrosive material and the piston shall be in ebonite or similar material. The working parts of the Helix type meter shall facilitate removal for repair or replacement without removing the meter body from the pipeline. The working parts shall be interchangeable and the working chamber so designed as to be full of water under all conditions of flow.

The dial of the meter shall be of the direct reading type registered in cubic metres with suitable lid locking device.

The capacities of the piston type meter shall not be less than the following amounts per month:-

12mm meter	250 cubic metres
18mm meter	350 cubic metres
25mm meter	600 cubic metres
38mm meter	1100 cubic metres
50mm meter	1700 cubic metres

The Helix type meter shall be capable of continuous working with a head loss not exceeding 300mm at the following rates of flow:-

75mm meter	22.5 cu.m./hr
100mm meter	45 cu.m./hr
150mm meter	90 cu.m./hr

All meters shall be accurate to within + 2% over the range of the meter upwards from the minimum flows given for each size:-

12mm	23 litres/hour
18mm	28 litres/hour
25mm	32 litres/hour
38mm	110 litres/hour
50mm	190 litres/hour
75mm	2.5 cu.m./hr
100mm	2.8 cu.m./hr
150mm	4.5 cu.m./hr

Meters above 150mm diameter should conform to manufacturer's specifications approved by the Engineer. The 12mm and 18mm sizes shall be guaranteed to register commencing at 5 litres/hour. The meters shall be tested to a head of not less than 16 bar or as specified.

### **712. STOP VALVES**

All stop valves shall be in accordance with SRN 826. Samples of valves shall be submitted for test and approval to the Engineer.

### **713. CHECK VALVES (DIRECTIONAL VALVES)**

Check valves shall comply with the requirements of SRN 505 with cast iron body and cover, gun metal doors with bronze facing rings and flanged connections in accordance with SRN 207, NP 1

### **714. PENSTOCKS**

Cast iron penstocks shall be all in accordance with SRN 906 and SRN 916. Seating faces shall be gun metal or bronze. Spindles shall be threaded as necessary and non-rising unless otherwise specified. Spindles shall be of aluminium bronze, manganese bronze and extension spindles may be of mild steel. Handwheels shall be of cast iron and words “OPEN” and “SHUT” marked on upper side with appropriate direction arrows.

**715. FLANGED JOINTS**

All flanges on fittings and pipework where flanged connections are required must comply with the requirements of SRN 207 and drilled to NP 16, unless otherwise specified. Inspection gaskets for flanged joints shall be rubber reinforced with cotton, 3mm thick and shall be in accordance with SRN 208. Bolts, washers and nuts for flanged joints shall be of mild steel complying with SRN 914.

**716. FLEXIBLE JOINTS**

All flexible couplings (Viking Johnson or other approved type) shall be supplied complete with rubber gaskets, bolts, nuts and washers. All couplings shall be coated with red oxide primer and bituminous composition suitable for use with potable water.

**717. PRESSED STEEL TANKS AND TOWERS**

The pressed steel tanks (or similar approved), towers and associated materials and fittings shall comply with SRN 909 and SRN 863.

Detailed drawings of the steel tank should be submitted to the Engineer for approval prior to acceptance.

The pressed steel tank to SRN 909 (B.S. 1564 Type A(2) or similar approved) shall be supplied complete with:-

- a) All stays, cleats, bolts, nuts, washers, jointing compound and associated materials and fittings.
- b) Connections for inlet, outlet, washout and overflow.
- c) Galvanised access ladder 450mm wide.
- d) Steel roof cover to fit the tank complete with access manhole and mosquito-proof cowl ventilators.
- e) Water level indicator.

Jointing material to the tank to be a non-toxic plastic compound which does not impart taste, colour nor odour to the water. Connections to the tank shall be welded to the outside of the tank

plate and drilled and tapped to suit flanges to SRN 207, NP 16 unless otherwise stated. The cover to the tank shall be of mild steel cambered for external use and adequately supported by rolled steel or pressed steel bearers or trusses. The tank tower shall be supplied complete with:-

- a) Anchor bolts.
- b) Bolts, nuts, washers and associated materials and fittings.
- c) Access ladder 450mm wide extending from ground level to the top of the tank. Safety rings shall be at 1.2m centres. The supports to the tank shall consist of steel joints designed to carry imposed load under each transverse joint and the two ends of the tank. The columns of the tank shall consist of rolled steel joist sections or similar. Four or more such columns shall be provided with adequate bracing. Internal surfaces of the tank shall be painted with approved non-toxic primer and non-toxic bituminous paint. External surfaces of the tank and tower shall be painted with approved primer and approved bituminous aluminium paint.

### **718. PAINTS**

All priming, undercoating and finishing paints shall be in accordance with SRN 877 or SRN 878 as appropriate. The painting of all building works shall comprise a special paint recommended for external work while all other paints, plastic emulsion coating etc. are to be of an approved manufacturer. All paints, distempers etc. shall be delivered on site intact in the original drums or tins, and shall be mixed and applied in accordance with the manufacturer's printed directions. The only addition which will be allowed to be made will be liquid thinners, driers etc. supplied by the makers for the purpose. All surfaces must be thoroughly cleaned down prior to painting and decorating work and no external painting shall be carried out in rainy weather. All paint must be thoroughly well worked on and excess of paint in any coat must be avoided. All colours will be selected by the Engineer from the standard range of colours.

### **719. MARKER AND INDICATOR POSTS**

Marker posts shall be erected at changes in direction of water mains as directed by the Engineer. Indicator posts shall be erected at valves and other fittings as directed. Marker and indicator posts shall be embedded in concrete as shown on drawings and shall be vibrated precast reinforced concrete as per dimensions shown on drawings. They should be painted in colours as indicated on the drawings.

### **720. POLYETHYLENE (PALOTHENE, PEH) PIPES**



Polyethylene High Density pipes shall comply with SRN 307 for testing, storage, handling, laying and backfilling. Contractor shall conform to requirement indicated for PVC pipes. Joints shall be required to sustain test pressures similar to which the pipe shall be subjected. Contractor shall comply with all instructions issued by the manufacturers and shall submit full details of the type, class, dimensions and test pressures of the brass fittings to the Engineer for approval.

### **721. PRECAST CONCRETE UNITS**

Precast concrete covers to be precast units for use in the works, whether instructed under the Contract or proposed by the Contractor.

#### **a) Formwork for Precast Units**

Moulds shall be so constructed that they do not suffer distortion or dimensional changes during use and are tight against loss of cement grout or fines from the concrete. Moulds shall be set up on firm foundations so that no settlement occurs under the weight of the fresh concrete. Moulds shall be constructed so that units may be removed from them without sustaining any damage. Release agents used for demoulding shall not stain the concrete or affect its properties in any way.

#### **b) Reinforcement for Precast Units**

Reinforcement in precast units shall comply with the requirement of Clauses 736 and 419-420. When preformed cages are used the cages shall be made up on jigs to ensure dimensional accuracy and shall be carefully supported within the mould in such a way that they cannot move when concrete is placed. Reinforcement complying with SRN 126 may be tack welded where bars cross to provide rigidity in the cage but reinforcement complying with SRN 127 shall not be welded. Cover to main reinforcement shall be as shown on the drawings, or if not shown shall be not less than 25mm or the diameter of the bar, whichever is the greater. Cover on distribution steel shall not be less than 15mm or the diameter of the bar whichever is the greater. Bars shall be spaced so that the minimum clear distance between them is the maximum nominal aggregate size plus five millimetres but in any case not less than the diameter of the bars. Bars may be placed in pairs provided that there are no laps in the paired lengths.

#### **c) Casting of Units**

Concrete for precast units shall comply with Clauses 724 and 401-410 using the class of concrete specified on the drawings. If lightweight aggregates are specified, they shall comply with SRN 147. The area in which units are cast shall be adequately protected from the weather so that the process is not affected by rain, sun or drying winds.

d) Curing Precast Units

Requirements for curing shall be generally as set out in Clause 407. The Contractor shall ensure that units do not suffer any loss of moisture or sudden changes of temperature for at least four days after casting. If a water spray is used for curing, the water shall be at a temperature within 5 degrees centigrade of the temperature of the unit being cured. If Contractor proposes curing at elevated temperatures, the method shall be subject to the agreement of the Engineer and shall include means whereby units are heated and subsequently cooled evenly without sudden changes of temperature.

e) Dimensional Tolerances of Precast Units

Units shall be accurately formed to the dimensions shown on the drawings unless closer tolerances are called for by the Engineer.

f) Surface Finish of Precast Units

The formed faces of precast units shall be finished to Class F3 as set out in Clause 505(C) unless another class of finish is specified on the drawings. Free faces shall be finished to Class UF2 unless another class of finish is specified on the drawings. In cases where a special finish is required a trial panel shall be constructed by the Contractor which after approval by the Engineer shall be kept available for inspection at the place of casting and production units shall thereafter match the approved pattern. Those parts of the unit which are to be joined to other units or to in-situ concrete shall be brushed with a stiff brush before the concrete has fully hardened. Alternatively, if the concrete has been allowed to harden, the surfaces shall be roughened by sand blasting or by the use of a needle gun.

g) Handling and Storage of Precast Units

Precast units shall be handled in a manner which will not cause damage of any kind and shall be stored on a hard impermeable base. Prestressed units and large precast normally reinforced units shall be handled and stored so that no stresses shall be induced in excess of those which they will incur in their final positions in the Works unless they have been designed to resist such stresses. Units shall be provided with adequate lifting holes or loops, placed in the locations shown on the drawings or agreed by the Engineer and they shall be lifted only by such holes or loops. Where it is not possible to provide holes or loops, suitable sling positions shall be indicated in paint on the units. Units shall be marked indelibly with the reference number and date of casting and shall be stacked on suitable packers which will not damage the concrete or stain the surfaces. Not more than two packers shall be placed under each unit and these shall be located either at the positions

of the permanent support points or in positions such that the induced stresses in the unit will be a minimum.

**h) Testing Precast Units**

Precast units shall be capable of safely sustaining the loads which they have been designed to carry. The Contractor shall subject units selected by the Engineer to load tests simulating the working conditions. Details of such tests shall be agreed between the Engineer and the Contractor. In the case of units subject to bending loads the test piece shall be supported at full span and a loading equivalent to 1.25 times the sum of the live and dead loads which were assumed in the design shall be maintained for one hour without the appearance of any signs of distress. The recovery one hour after the removal of load shall be not less than 75 per cent of the full load deflection. If the unit fails to meet the above requirements, further tests shall be carried out on two more units. If either of these fail the whole batch of units will be rejected. If the Engineer so requires, a test to destruction shall also be carried out which on units subject to bending shall be as follows:- The units shall be supported at full span and a load applied in increments instructed by the Engineer up to 95 per cent of the designed ultimate load. This load shall be held for 15 minutes without failure of the unit. The deflection at the end of this period shall be not more than 1/40th of the span. The load shall then be further increased until failure occurs. If the unit fails to sustain the required load for the prescribed period or if the deflection exceeds the specified amount, the Engineer may order two further tests, and if either of these fail, the batch of units which they represent may be rejected.

**722. FILTER MEDIA**

The grading of filter media shall be in accordance to the table of gradings shown on drawings. Filter media must be free from fines which would clog the air spaces, and free from dirt, silt and all foreign matter. The media shall be delivered in clean vehicles and if stored it shall be placed on a clean and firm surface and if it is liable to be contaminated, protected with sheets. Different sizes of media shall be kept strictly separate. The uniformity coefficient as indicated in the drawings should be adhered to and Contractor to submit samples and carry out sieve analysis, organic content, friability tests, etc. to the satisfaction of the Engineer. These tests are to be carried out before the media is placed in filters. All costs arising to be borne by the Contractor.

**723. 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 must be willing to admit the Engineer or his representatives, 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. The information regarding the names of the suppliers may be submitted at different times, as may be convenient, but no source of supply shall be changed without the Engineer's prior approval once a supplier, source or material has been approved. 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, otherwise they shall be rejected. No special payment will be made for compliance with clauses specifying tests etc. to ensure quality control etc. unless specifically itemised in Bills of Quantities.

#### **724. MATERIALS FOR CONCRETE**

##### **a) General**

The Contractor shall submit to the Engineer full details of all materials which he proposes to use for making concrete. No concrete shall be placed in the Works until the Engineer has approved the materials of which it is composed. Approved materials shall not thereafter be altered or substituted by other materials without the consent of the Engineer.

##### **b) Cement**

Cement shall comply with the following Kenya Standards:-

SRN 103 for Ordinary Portland cement.

SRN 103 for Rapid Hardening Portland cement plus all special conditions

to its use stipulated by the manufacturer.

SRN 104 for Sulphate Resisting or High Alumina cement. Cement shall be free flowing and free of lumps.

It shall be supplied in the manufacturer's sealed unbroken bags or in bulk. Bagged cement shall be transported in vehicles with effective means of ensuring that it is protected from the weather. Bulk cement shall be transported in vehicles or in containers specially built and equipped for the purpose. Cement in bags shall be stored in a suitable weatherproof structure of which the interior shall be dry and well ventilated at all times. The floor shall be raised above the surrounding

ground level and shall be so constructed that no moisture rises through it. Each delivery of cement in bags shall be stacked together in one place. The bags shall be closely stacked so as to reduce air circulation but shall not be stacked against an outside wall. If pallets are used, they shall be constructed so that bags are not damaged during handling and stacking. No stack of cement bags shall exceed 3 metres in height. Different types of cement in bags shall be clearly distinguished by visible markings and shall be stored in separate stacks. Cement from broken bags shall not be used in the Works. Cement in bags shall be used in the order in which it is delivered. Bulk cement shall be stored in weatherproof silos which shall bear a clear indication of the type of cement contained in them. Different types of cement shall not be mixed in the same silo. The Contractor shall provide sufficient storage capacity on site to ensure that his anticipated programme or work is not interrupted due to lack of cement. Cement which has become hardened or lumpy or fails to comply with the Specification in any way shall be removed from the site. All cement for any one structure shall be from the same source. All cement used in the Works shall be tested by the manufacturer or the Contractor in a laboratory acceptable to the Engineer. The tests to be performed shall be those set out in SRN 103 and the Contractor shall supply two copies of each certificate to the Engineer. Each set of tests carried out by the manufacturer or Contractor shall relate to not more than one day's output of each cement plant, and shall be made on samples taken from cement which is subsequently delivered to the site. Alternatively, subject to the agreement of the Engineer, the frequency of testing shall be one set of tests for every 200 tonnes of cement delivered to site from each cement plant. Cement which is stored on site for longer than one month shall be re-tested in the laboratory of the Materials Branch of the Ministry of Roads, Public Works & Housing or at the Kenya Bureau of Standards or at any other approved laboratory at the rate of one set of tests as shown in SRN 103 for every 200 tonnes, and at monthly intervals thereafter. Cement which does not comply with the Specification shall not be used in the Works and it shall be disposed off by the Contractor. The Contractor shall keep full records of all data relevant to the manufacture, delivery, testing and use of all cement used in the Works and shall provide the Engineer with two copies thereof.

c) Fine Aggregate

Fine aggregate shall be clean, hard and durable and shall be natural sand, crushed gravel sand or crushed rock sand complying with SRN 108. All the material shall pass through a 5mm standard sieve and the grading shall be in accordance with Zones 1, 2 or 3 of SRN 109. In order to achieve an acceptable grading, it may be necessary to blend materials from more than one source. Fine

aggregate for mortar only shall comply with SRN 135. 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 or organic matter unless the Contractor can show by comparative tests, on finished concrete as set out in SRN 117, that the presence of such materials does not adversely affect the properties of the concrete. Other properties shall be as set out below: Content passing a 75 micron standard sieve shall not exceed 3 per cent for natural or crushed gravel sand or 15 per cent for crushed rock sand. 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 SRN 107, subject also to the further restriction given in the note on total chloride content in subclause 724 (d). Sulphates soluble in a 10 per cent solution by weight of hydrochloric acid shall not exceed 0.4 per cent by weight expressed as SO<sub>3</sub>, when tested as set out in SRN 601, subject also to the further restriction given in the note on total sulphate content in subclause 724 (d). Soundness: After five cycles of the test in AASHTO T104 or an approved equivalent, the aggregate shall not show a weight loss of more than 10 per cent.

**Organic impurities:**

If the test for presence of organic impurities in aggregates described below shows that more than a trace of organic impurities is present, the fine aggregate shall not be used in the Works unless the Contractor can show by tests on finished concrete as set out in SRN 117 that the presence of organic impurities does not adversely affect the properties of the concrete. Test for presence of organic impurities in aggregates: This test is designed to indicate the presence of organic impurities in aggregates used for making concrete. A 350 cc graduated bottle shall be filled to the 120 cc mark with a sample of the aggregate to be tested and a 3% solution of sodium hydroxide in water added until the volume of aggregate and liquid after shaking gives a total volume of 200 cc. The bottle shall be stoppered, shaken thoroughly and allowed to stand for 24 hours. If, after 24 hours, the colour of the solution is not darker than a pale brown, the aggregate under test may be deemed satisfactory.

**d) Coarse aggregate**

Coarse aggregate shall be clean, hard and durable crushed rock, crushed gravel or natural gravel complying with the requirements of SRN 110. The material shall not contain any iron pyrites, iron oxides, flaky or laminated material, hollow shells, coal or other soft or porous material, or organic matter unless the Contractor can show by comparative tests on finished concrete as set out in SRN 117 that the presence of such materials does not adversely affect the properties of the

concrete. The pieces shall be angular, rounded or irregular as defined in SRN 107. Coarse aggregate shall be supplied in the nominal sizes called for in the Contract and shall be graded in accordance with SRN 111 for each nominal size. Other properties shall be as set out below:- The proportion of clay, silt and other impurities passing a 75 micron standard sieve shall not be more than one per cent by weight. The content of hollow and flat shells shall be such as will not adversely affect the concrete quality when tested as set out in SRN 117. The total content of aggregate shall not be more than the following:

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

Chlorides soluble in a 10 per cent 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 SRN 107 but subject also to the further restriction under the note on total chloride content hereunder. Sulphates soluble in a 10 per cent solution by weight of hydrochloric acid shall not exceed 0.4 per cent by weight expressed as SO<sub>3</sub> when tested as set out in SRN 601 subject also to the further restriction given in the note on total sulphate content hereunder. Soundness: After 5 cycles of the test in AASHTO T104, the aggregate shall not show a weight loss of more than 12 per cent. When tested in accordance with test C289 of the American Society for Testing of Materials (ASTM), the aggregate shall be non-reactive. Flakiness Index when tested in accordance with SRN 113 shall be as set out hereunder:

- For 40mm stone and above, not more than 40
- For 20mm stone and below, not more than 35

If the Flakiness Index of the coarse aggregate varies by more than five units from the average value of the aggregate used in the approved trial mix, then a new set of trial mixes shall be carried out if the workability of the mixes has been adversely affected by such variation. Impact value: Not more than 45 per cent when tested in accordance with SRN 107. Ten per cent fines value: Not less than 50kN when tested in accordance with SRN 107. Shrinkage: When mixed with other ingredients in the approved proportions for concrete and tested as set out in SRN 117, the shrinkage factor shall not exceed 0.05 per cent. Organic impurities: If the test for presence of organic impurities in aggregates shows that more than a trace of organic impurities is present, the aggregate shall not be used in the Works unless the Contractor can show by tests on finished concrete as set out in SRN 117 that the presence of organic impurities does not adversely affect

the properties of the concrete. Water absorption: The aggregate shall not have a water absorption of more than 2.5 per cent when tested as set out in SRN 112. Aggregate Crushing Value (ACV): Not more than 35 per cent. Los Angeles Abrasion (LAA): Not more than 50 per cent. NOTE: Total chloride and sulphate content:- The total chloride content, expressed as chloride ion, arising from all ingredients in a mix including cement, water and admixtures shall not exceed the following limits, expressed as a percentage of the weight of cement in the mix:- For prestressed concrete, steam cured concrete or concrete containing sulphate resisting or super sulphated cement: 0.05 per cent. For any other reinforced concrete: 0.3 per cent in 95 per cent of all test results provided no result is more than 0.5 per cent. The total sulphate content expressed as SO<sub>3</sub> of all the ingredients in a mix including cement, water and admixtures shall not exceed 0.4 per cent by weight of the aggregate or 4.0 per cent of the weight of cement in the mix, whichever is the lesser.

e) Testing Aggregates

i) Acceptance testing

The Contractor shall deliver to the Engineer samples containing not less than 50 kg of any aggregate which he proposes to use in the Works and shall supply such further samples as the Engineer may require. Each sample shall be clearly labelled to show its origin and shall be accompanied by all the information called for in SRN 107. Tests to determine compliance of the aggregates with the requirements of subclause 724(c) and (d) shall be carried out by the Contractor in a laboratory acceptable to the Engineer. If the tested materials fail to comply with the Specification, further tests shall be made in the presence of the Contractor and the Engineer and acceptance of the material shall be based on such tests. A material shall be accepted if not less than three consecutive sets of test results show compliance with the Specification.

ii) Compliance testing

The Contractor shall carry out routine testing of aggregates for compliance with the Specification during the period that concrete is being produced for the Works. The tests set out below shall be performed on aggregates from each separate source on the basis of one set of tests for each day on which aggregates are delivered to site provided that no set of tests shall represent more than 250 tonnes of fine aggregate nor more than 500 tonnes of coarse aggregate, and provided also that the aggregates are of uniform quality. If the aggregate from any source is variable, the frequency of testing shall be increased as instructed by the Engineer.

□ □ Grading SRN 107



Silt and clay contents SRN 107

Moisture content SRN 107

Check on organic impurities

In addition to the above routine tests, the Contractor shall carry out the following tests at the frequencies stated: Moisture content: As frequently as may be required in order to control the water content of the concrete as required by the Specification. Chloride content: As frequently as may be required to ensure that the proportion of chlorides in the aggregates does not exceed the limit stated in the Specification. The Contractor shall take account of the fact that when the chloride content is variable it may be necessary to test every load in order to prevent excessive amounts of chloride contaminating the concrete. For this purpose, the Contractor shall use the rapid field test (the Quantab test). In the event of disagreement regarding the results of the field test, the chloride content of the aggregate shall be determined in the laboratory as described in SRN 107 (the Volhard test).

f) Delivery and storage of aggregates

Aggregates shall be delivered to site in clean and suitable vehicles. Different types or sizes of aggregate shall not be delivered in one vehicle. Each type or size of aggregate shall be stored in a separate bin or compartment having a base such that contamination of the aggregate is prevented. Dividing walls between bins shall be substantial and continuous so that no mixing of types or sizes occurs. The storage of aggregates shall be arranged so that as far as possible rapid drying out in hot weather is prevented in order to avoid sudden fluctuations in water content. Storage of fine aggregates shall be arranged so that they can drain sufficiently before use in order to prevent fluctuations in water content of the concrete.

g) Water for concrete and mortar

Sea water or brackish water containing more than 1,000 ppm chloride ion or 2,000 ppm sulphate ion shall not be used for mixing or curing concrete. Water shall be clean and free from harmful matter and shall comply with the requirements of SRN 114. The Contractor shall carry out tests in accordance with SRN 114 to establish compliance with the Specification.

h) Admixtures

i) General

The use of the admixtures in concrete may be required under the Contract to promote special properties in the finished concrete or may be proposed by the Contractor to assist him to comply with the Specification. In all cases the Contractor shall submit to the Engineer full details of the

admixture he proposes to use and the manner in which he proposes to add it to the mix. The information provided shall include but not be limited to:-

- a) The typical dosage, the method of dosing and the detrimental effects of an excess or deficiency in the dosage.
- b) The chemical names of the main active ingredients in the admixture.
- c) Whether or not the admixture contains chlorides, and if so the chloride ion content expressed as a percentage by weight of admixture.
- d) Whether the admixture leads to the entrainment of air when used at the manufacturer's recommended dosage, and if so, the extent to which it does so.
- e) Details of previous uses of the admixture in Kenya.

The chloride ion content of any admixture shall not exceed 2 per cent by weight of the admixture nor 0.03 per cent by weight of the cement in the mix. Admixtures shall not be mixed together without the consent of the Engineer. Calcium chloride or admixtures containing calcium chloride shall not be used in prestressed concrete.

ii) Workability agents

Workability agents shall comply with SRN 149 and shall not have any adverse effect on the properties of the concrete.

**725. BUILDING STONE**

All building stone shall be capable of withstanding when wet a crushing stress of 1.4 kg./sq.mm. The source of stone shall be approved by the Engineer and stone supplied there from shall be free from Magadi, overburden, mudstone, cracks, sandholes, 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 SRN 870 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 of weight of not more than 20% of its original weight.

**726. STONE DUST**

Stone dust for blinding shall be blackstrap screened to the following grading:-

Passing 10mm sieve 100%

Passing No. 4 sieve 85% - 100%

Passing No. 100 sieve 5% - 25%

**727. MURRAM**

Murram shall be from an approved source quarried so as to exclude vegetable matter, loam, top soil or clay. The California Bearing Ratio of the murram, as determined for a sample compacted to maximum density (as defined under SRN 601) and allowed to soak in water for four days, shall not be less than 30%. This C.B.R. is a guide to quality only and the compaction in the work will be judged by density.

**728. WATER FOR CEMENT TREATED MATERIALS**

If water for the works is not available from the Employer's supply 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 SRN 114 : Tests for Water for Making Concrete, all to the cost of the Contractor.

**729. CEMENT MORTAR**

Cement mortar shall consist of proportions by volume as specified of Portland Cement and natural sand or crushed natural stone or a combination of both as specified in SRN 135 and SRN 136 : 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.

**730. HYDRATED LIME**

Hydrated lime shall comply with SRN 801 : Building Limes, and shall be of the semihydrated type.

**731. CALCIUM CHLORIDE**

Calcium chloride shall be of good industrial grade, and shall be obtained from an approved source.

**732. LIME MORTAR**

Lime mortar shall consist of proportions by volume as specified of hydrated lime and naturals and/or crushed natural stone or a combination of both as specified for cement mortar in Clause 729. The constituent materials shall be accurately gauged and mixed in an approved manner.

**733. 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 Clause 729. 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. Any mortar which has begun to set or which has been mixed for a period of more than two hours shall be rejected.

**734. 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.

**735. CAST STONE**

Cast stone shall be manufactured by an approved manufacturer to the shapes and dimensions shown on the drawings, and shall conform to the requirements of SRN 871 : Cast Stone. It shall have a dense and even surface of the texture and colour detailed on the drawings or required by the Engineer. Where indicated exposed faces of the stone shall be formed of a specially graded mix. Metal bond ties of approved manufacture shall be cast in with the stone as shown on the drawings. Samples of the completed stone shall be submitted for the Engineer's prior approval. All stones shall be protected from damage during transport and erection by means of cement slurry coatings or by other approved methods.

**736. REINFORCEMENT FOR CONCRETE**

Reinforcement which shall comply with the following Standards, covers plain and deformed bar reinforcement and steel fabric to be cast into concrete in any part of the Works but does not include prestressing tendons or any other embedded steel.

- SRN 126 for hot rolled plain bar and high yield deformed bar
- SRN 127 for cold worked steel bar
- SRN 128 for steel mesh fabric

All reinforcement shall be from an approved manufacturer and, if required by the Engineer, the Contractor shall submit a test certificate from the manufacturer. All reinforcement for use in the Works shall be tested for compliance with the appropriate British Standard in a laboratory acceptable to the Engineer and two copies of each test certificate shall be supplied to the Engineer. The frequency of testing shall be as set out in the relevant Standard. In addition to the testing requirements described above, the Contractor shall carry out additional tests as instructed by the Engineer.

Any reinforcement which does not comply with the Specification shall be removed from site. All reinforcement shall be delivered to site either in straight lengths or cut and bent. No reinforcement shall be accepted in long lengths which have been transported bent over double. Any reinforcement which is likely to remain in storage for a long period shall be protected from the weather so as to avoid corrosion and pitting. All reinforcement which has become corroded or pitted to an extent which, in the opinion of the Engineer, will affect its properties shall either be removed from site or may be tested for compliance with the appropriate Standard at the Contractor's expense.

**Dowel Bars**

Dowel bars and tie bars shall consist of mild steel, or deformed bars of high yield steel all complying with SRN 126 and they shall be free from oil, paint other than bond-breaking compound, dirt, loose rust and scale. Dowel bars and tie bars shall be of sizes as shown on the drawings and directed by the Engineer, and shall be straight, free from burred edges, or other irregularities and shall have their sliding ends sawn or, if approved, sheared. Bond breaking compound for dowel bars shall consist of 66 per cent of 200 pen bitumen blended hot with 14 per cent light creosote oil and, when cold, brought to the consistency of paint by the addition of 20 per cent solvent naphtha or other approved compound meeting the following requirements.

- i) It shall not retard or in any other way affect the setting of concrete.
- ii) The average bond stress on bars coated with the compound with half their length cast into concrete specimens and subject to pull out tests at 7 days shall not exceed 0.14 newtons per square millimetre and the total movement of the dowel bar relative to the concrete shall not be less than 0.25 millimetres at that stress. The concrete specimens shall be 150 millimetres by 150 millimetres in section and 0.45-meter-long and made with the same mix proportions as used in the Works.

**737. STRUCTURAL STEEL FOR WELDED WORK**

Structural steel for riveted and welded work shall comply with the requirements of SRN 125 : Structural Steel, SRN 126 : The Use of Structural Steel in Building and for Welded Work, SRN 125 : High Yield Stress and High Tensile Structural Steel, High Tensile (Fusion Welding Quality) Structural Steel for Bridges, etc. and General Building Construction.

**738. WATERPROOF UNDERLAYS**

Waterproof underlay shall consist of either waterproof paper complying with SRN 856 : Waterproof Building Paper, containing approved fibrous reinforcement, or 500 gauge polythene sheeting as stated in the Bill of Quantities.

**739. PREFORMED JOINT FILLER**

Preformed joint filler shall be of the thickness shown on the drawings or as stated in the Bill of Quantities. The material comprising joint filler shall be as stated on the drawings or approved by the Engineer.

**740. JOINT PRIMER**

Joint priming compound shall be entirely in accordance with the manufacturer’s recommendations for the joint sealant to be used.

**741. JOINT SEALING COMPOUND**

Poured joint sealing material shall consist of an approved rubber-bitumen compound, complying with the requirements of SRN 879, or a two component, cold applied compound complying with SRN 879 as stated in the Bill of Quantities. Test Certificates, prepared by an approved testing laboratory, shall be supplied by the Contractor to show that the material does in fact comply in respect of cone penetration, flow and bond with the under-mentioned requirements:

<b>Test Cone Penetration</b>	<b>Hot-poured Materials</b>	<b>Cold-poured Materials</b>
0.15 kg. for 5 secs. at 25o centigrade using standard grease Cone	Penetration not to exceed 9mm	Penetration to be not less than 5mm not more than 27.5mm
<i>Flow</i>		
On a plane inclined at 75o to the horizontal, 5 hours at 60o	Flow not to exceed 5m	Flow not to exceed 20mm

centigrade		
<i>Bond</i>		
25mm wide joint extended 12mm at rate of 4mm per hour at 180 centigrade. No more than one specimen in three to develop a crack separation or other opening more than 4mm deep	Five cycles of extension and recompression	Three cycles of extension and recompression

Approved hot-poured materials shall also comply with a requirement whereby when heated for a period of 6 hours at a temperature of 80 degrees centigrade above recommended pouring temperature or 30 degrees centigrade below the safe heating temperature whichever is the greater shall still comply with the flow requirements of this clause. In addition to materials complying with SRN 879, the Engineer may approve the use of alternative materials provided that they meet the requirements of this clause relating to coldpoured joint sealing compounds.

**742. CONCRETE PIPES AND SPECIALS**

Concrete pipes and specials shall comply with the requirements of SRN 840. They shall carry the relevant Standards Institution registration certification trade mark, or test certificates shall be furnished by the manufacturers.

**743. CONCRETE POROUS PIPES**

Concrete porous pipes shall comply with the requirements of SRN 410 : Concrete Porous Pipes for Under-drainage.

**744. CONCRETE DRAIN INVERT BLOCKS**

Precast concrete invert blocks shall be manufactured to the detail drawings supplied from concrete Class 20/10 as specified in Table 4.2 using maximum 12mm size aggregates. If required, cube test certificates shall be supplied by the manufacturer.

**745. CONCRETE SLABS FOR OPEN DRAINS**

Precast concrete slabs for lining open drains shall be manufactured to the detail drawings supplied from concrete Class 20/10 as specified in Table 4.2 using maximum 12mm size aggregates. If required, cube test certificates shall be supplied by the manufacturer.

**746. AGRICULTURAL TILES AND PIPES**

Agricultural tiles and pipes shall be best well-burnt earthenware, true and circular in bore and with an external flat bottom and plain ends suitable for laying with open or butt joints.

**747. MANHOLE COVERS AND FRAMES**

Manhole covers and frames shall be basically in accordance with the requirements of SRN 846 : Cast Manhole Covers, Road Gully Gratings and Frames for Drainage Purposes except that the manhole covers shall be constructed of mild steel, concrete filled, in accordance with the 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.

**748. GULLY GRATINGS AND FRAMES**

Gully gratings and frames shall be basically in accordance with the requirements of SRN 846, nominal size 500mm x 350mm except that the gully gratings shall be constructed of mild steel concrete filled in accordance with the standard detail drawings. Where indicated as being kerb inlet type, the gullies shall conform to the shape and dimensions given on the detail drawings supplied, but in respect of materials and workmanship conform to SRN 846.

**749. PRECAST CONCRETE MANHOLES AND INSPECTION CHAMBERS**

Precast concrete manholes and inspection chambers shall comply with the requirements of SRN 854 : Concrete Cylindrical Pipes and Fittings including Manholes, Inspection Chambers and Street Gullies, and they shall carry the relevant Standard Institution registered certification trade mark, or test certificates shall be furnished by the manufacturer.

**750. PRECAST CONCRETE GULLIES**

Precast concrete gullies shall be unreinforced and shall comply with the requirements of SRN 854 : Concrete Cylindrical Pipes and Fittings including Manholes, Inspection Chambers and Street Gullies.

**751. MANHOLE STEP IRONS**

Step irons of general purpose type shall comply in all respects with SRN 845 : Malleable Step Irons.

**752. 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 SRN 872 : Coal Tar Creosote for the Preservation of Timber or an alternative approved timber preservative.

**753. WATER BARS**

Water bars shall be “Dumbell” type and be of natural or synthetic rubber or extruded PVC. They shall be flexible, tough, elastic and durable and of dimensions detailed. They should be unaffected on contact with dilute acids or alkalis. Joints and junctions shall, when possible, be prefabricated by the manufacturer, but if made at site the manufacturer’s instructions including recommended adhesives shall be followed and used. Samples shall be submitted for approval of the Engineer before use of any material.

**754. CONCRETE BLOCKS**

Solid and hollow concrete blocks for walling shall comply with SRN 904 in every respect. All solid and hollow concrete blocks used in the walling must be capable of withstanding a crushing pressure of not less than 0.35 kg per square millimetre after 28 days. The blocks shall be cast in Metric sizes.

## **8. WORKMANSHIP**

### **801. HANDLING OF PIPES AND FITTINGS**

The Contractor shall exercise care in the handling of all pipes, specials, valves etc., to prevent damage to the structure surfaces and to the ends of the pipes.

### **802. LOADING AND UNLOADING**

Normally loading and unloading of small diameter pipes and fittings can be undertaken by hand; where mechanical means are used care should be exercised to ensure that the handling methods do not damage the pipes and fittings.

### **803. STORAGE**

The Contractor shall comply with the manufacturer's specification regarding the storage of pipes, fittings and valves. Where storage dumps are to be provided along the route of the pipeline, these will be subject to the Engineer's approval. The cost of so providing shall be borne by the Contractor and deemed to be covered by his rates in the Bill of Quantities.

### **804. TRANSPORT**

The Contractor shall provide such transport arrangements as will effectively cater for the lengths of pipes provided and the material of the piping. Adequate support shall be provided so as to ensure that the piping and fittings are not subject to excessive movement.

### **805. EXAMINATION OF PIPES AND FITTINGS**

The Contractor shall examine all pipes, valves, fittings and other materials to ascertain that they are in perfectly sound condition before commencing to lay the pipes, valves etc.

### **806. INTERFERENCE WITH FENCES, DRAINS AND OTHER SERVICES**

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

### **807. METHOD OF EXCAVATION**

The Contractor is deemed to have covered in his excavation rates all the work that is necessary in order to comply with the provisions of the Specifications in general and this Clause in particular.

a) The Contractor shall excavate the pipe trenches in the line and to the depths indicated on drawings or as indicated by the Engineer. Except where otherwise indicated on the drawings or directed by the Engineer, it is intended that the trench shall be excavated to such a depth as will allow of a minimum cover of 600mm over the top of the barrel of the pipe when laid. All trenches shall be excavated in open cuttings and for trenching to uPVC piping, shall not be opened too far in advance of pipe laying.

b) For the purpose of measurement, the width of trench shall be taken as the nominated width for the particular size of sewer, irrespective of the width of trench the Contractor may choose to excavate. Nominated trench width for:

75mm main	0.5m
100mm main	0.6m
150mm main	0.6m
200mm main	0.6m
225mm main	0.6m
250mm main	0.6m
300mm main	0.7m
400mm main	0.8m
500mm main	0.9m
600mm main	1.0m
700mm main	1.1m
800mm main	1.2m

For two or more pipes in the same trench the nominated width shall be the distance between the centres of the outer pipes plus the internal radii of the outer pipes plus 400mm.

c) Where the trench passes through grassland, arable land or gardens, whether enclosed or otherwise, the turf, if any, shall be carefully pared off and stacked, and the productive soil shall be carefully removed for a width of 600mm greater than the nominated trench width, or equal to the overall width of track of excavating machine, whichever is greater, and laid aside to be subsequently used in reinstating the surface of the ground after the trench has been refilled.

d) The bottom of the trench shall be properly trimmed off, and all low places or irregularities shall be levelled up with fine material. Where rock or large stones are encountered, they shall be cut down to a depth of at least 100mm below the level at which the bottoms of the barrel of the pipes or flanges are to be laid, and covered to a like depth with fine material, so as to form a fine

and even bed for the pipes. The bottom of trenches to accommodate uPVC piping shall be hardened by tamping in gravel or broken stone in all soft spots. The bedding shall consist of soil which can be properly compacted to provide support for the pipe and to comply with Clause 809 b).

e) Joint holes shall be excavated to suit minimum dimensions as will allow the joints to be well and properly jointed.

f) The pipe trench shall be kept clear of water at all times as per Clause 321 of this Specification.

g) The Contractor shall, wherever necessary, by means of timbering or otherwise, support the sides of the trench so as to make them thoroughly secure, and afford adequate support to adjoining roads, land, buildings and property, during the whole time the trench remains open and shall remove such timbering when the trench has been backfilled. The cost of such timbering or other work shall be deemed to be included in the rates for excavation. In case the Contractor is instructed by the Engineer to leave any portion of such timber in position after backfilling the trench, he will be paid for it accordingly.

h) The clear width inside the timbering shall be at least 150mm in excess of the external diameter of the pipe being laid, in order to allow it to be freely lowered into position, in the trench without damage to the external protection.

i) Should the excavation be taken out to a greater depth than is specified the bottom shall be made good to the correct level with Class 15/20 concrete or other material approved by the Engineer. No payment shall be made for any over excavation carried out by the Contractor nor for the cost of filling up to required levels.

j) If a mechanical excavator is used by the Contractor, he shall indemnify the Employer against all claims for damage which in the opinion of the Engineer, may be caused by the use of this plant.

k) The Contractor shall fix Sight Rails for use with boning rods at intervals of not more than 30 metres and temporary Bench Marks related to the Survey of Kenya Datum shall be provided at such intervals as directed by the Engineer.

### **808. MAIN LAYING**

a) Mains shall be laid in straight lines and/or smooth curves as indicated on the drawings. The vertical profile of the pipe shall be to even gradients. Any pipes not so laid shall be removed if so directed by the Engineer, and re-laid in proper manner at the Contractor's expense. In laying the pipes and specials care shall be taken not to damage the protective linings and the pipes shall be

handled with tackle if so directed by the Engineer. The pipes and specials shall be checked for flaws before they are lowered into the trench. After the pipes or specials have been checked they shall be cleaned and set to proper gradient and line so that there is a continuous rise from each washout to air valve. When laying uPVC pipes, final connection at any fixed joints shall be deferred until the majority of the pipeline has been covered with backfill.

b) Large diameter curves to mains shall wherever possible be formed by allowing for deflection at flexible joints, not exceeding 3 degrees, or as specified by the manufacturers.

c) In jointing of the pipes and specials the Contractor shall comply with the standards adopted for the various types of joints as specified.

d) In laying pipes and specials with flanged joints, flanges shall be brought together and bolted with the faces absolutely parallel. A rubber jointing gasket ring 3mm thick shall be used in each flange joint and one washer with and not provided for each bolt. The bolts shall be tightened up gradually and equally in the customary manner in order to distribute the stress evenly over the flange. If it is found necessary to deviate slightly from the normal run of the flanged piping, the deflection shall be obtained by means of a bevelled gun metal ring washer between the flanges.

e) The Contractor shall fix the gate valves, air valves and washout pipes all in accordance with the drawings.

f) The Contractor shall, subject to approval of the Engineer, cut pipes to such lengths as directed. Pipes should be cut off clean and square with the axis. Cuts should be made with an approved cutting device dependant on the type of pipe specified. Ends of pipes should be tapered by means approved by the Engineer if mechanical joints are to be used.

g) Equipment for tapping off the mains under pressure may be employed in the making of service or branch connections. The Contractor is required to choose a suitable method for fixing of the ferrule to the type of pipe specified, to the Engineer's approval.

### **809. BACKFILLING OF TRENCH**

a) When a section of the main has been jointed, the ends shall be temporarily closed with caps, plugs or flanges to prevent ingress of foreign matter into the pipe to the satisfaction of the Engineer. The trench shall be properly backfilled and rammed for its whole length so that the soil cover to the main shall not be less than 600mm except at joint holes which shall be kept clear of all backfilling, if necessary, by the use of timbering, so that each joint is left fully exposed for the Engineer's inspection. Special care shall be exercised when using surround to A.C. and uPVC

pipes which shall be free from any stones and well compacted in layers to not less than 100mm above the crown of the pipe.

b) The Contractor's attention is drawn to the special requirements for bedding and side fill to uPVC pipes. Clay should not be used. Soils which are of a granular nature and provide adequate support after compaction shall be used. If unavailable from excavated material the Contractor should provide suitable material for which an item in the Bill has been included. With flexible pipes it is important that the side fill should be firmly compacted between the pipe and the soil sides of the trench. The bedding material shall be placed in 75mm layers up to the crown of the pipe with adequate compaction and then to a minimum height of 100mm or two thirds of the pipe diameter. The progress of filling and tamping should proceed equally on either side of the pipe so as to maintain an equal pressure on both sides.

c) Where a main is laid across a road or is in such a position as to interfere seriously with the normal use of the road, the Contractor may, with the consent of the Engineer and at his own risk, fill such holes as may be necessary. Due consideration is to be given to compaction of section of the trench across the road to prevent undue settlement. In the event of damage at this section the Contractor is required to re-excavate and repair the pipeline all at his own expense.

### **810. ANCHOR BLOCKS AND SUPPORTS**

Concrete Class 15/20 shall be placed in anchor blocks at all changes of direction of the pipeline exceeding 6 degrees and wherever else required to withstand thrust resulting from internal water pressure e.g. at blank ends. Concrete in plinths shall be placed where specified.

### **811. CHAMBERS AND SURFACE BOXES**

Gate valves, air valves and fire hydrants etc. shall be provided with suitable chambers or surface boxes in accordance with detailed drawings. In roads and footpaths, the boxes shall have metal covers laid flush with the surface. Indicator posts to suit shall also be provided.

### **812. TESTING**

a) The Contractor shall test as long a section of main as possible subject to the maximum length of open trench approved by the Engineer. The test shall be carried out within 12 working days of the completion of such section of the main.

b) The pipeline shall be adequately anchored during the test at stop ends or valves to prevent movement under the test pressures.

c) The test section shall be filled with water and great care should be taken to drive out all air through air valves, ferrules etc. The test pressure is to be at least 1.5 times the nominal working pressure for the class of pipe being tested and is to be applied for at least 2 hours.

d) The leakage from the mains and connections from each section tested shall be according to SRN 316, i.e. not exceeding 0.02 litres per millimeter of nominal bore per kilometre of pipeline per 24 hour per bar of applied pressure head. To determine the rate of leakage, the Contractor shall furnish a suitable hydraulic test pump, pressure gauge, connections and water meter or other appliance, for measuring the amount of water pumped. The pressure shall be raised to the amount required and specified by the Engineer, and shall be so maintained for a period of not less than two hours or whatever longer period as required by the Engineer to examine every joint to satisfy himself that they are sound. If the leakage is at a greater rate than that specified, the Contractor shall re-excavate the trench where necessary and shall re-make the joints and replace defective work until the leakage shall be reduced to the allowable amount.

e) The Employer shall charge the Contractor the cost of any couplings required to join up tested lengths of main if, in the Engineer's opinion, greater lengths could reasonably have been tested or if failure under test, requires the pipe to be cut, or other methods of laying should have been adopted. Water used in testing the main shall be supplied by the Contractor. The Contractor shall carry out all work which may be necessary for making temporary connections to the existing mains to obtain water for testing at his own expense. In carrying out the test for water tightness the Employer only shall authorize the operation of all valves, but the Contractor shall provide all the necessary labour to assist in the opening and closing of the valves to the Engineer's instructions, and he shall allow in his prices for all his expenses in connection with testing on completion. The Engineer shall be the sole judge of water tightness.

### **813. CLEANING AND STERILISING THE MAIN**

a) When a pipeline is complete and where applicable, has successfully passed the test, it shall be thoroughly washed out, using if possible, an open end. Thereafter it shall be sterilised by being filled with a suitable solution containing not less than 20 p.p.m. of free available chlorine or such other sterilising agent as the Engineer shall approve. After standing for 24 hours the main shall again be washed out and refilled with mains water prior to the taking of bacteriological samples. The Contractor shall provide all necessary stop-ends, fittings and chemicals for this work.

b) Emptying and washing out of the pipes shall be done in such a manner as not to damage the trench or cause undue flooding of the vicinity, and the Contractor shall supply and use piping,

specials and/or hose as may be necessary to facilitate the flow of water to the nearest drain or watercourse. Water used for washing out and sterilizing may be supplied by the Employer when a suitable supply is available but all expenses should be payable by the Contractor. Before any section of the main is put into use, a bacteriological sample or samples will be taken by the Engineer's Representative and only on receipt of a satisfactory certificate from a Medical Research Laboratory or similar organization will the main or section of main be permitted to be put into supply and be considered as having been substantially completed. Any expenditure involved in providing facilities or materials for the taking of samples shall be included in the Contractor's tendered rates and the Engineer will specify and shall be the sole judge as to the number of samples required and the points at which they are to be taken. The cost of the bacteriological examination will be borne by the Employer but if the sample or samples are not satisfactory, the cost of any subsequent analysis will be borne by the Contractor.

**814. CLEARANCE OF SITE**

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

**815. TESTING OF WATER RETAINING STRUCTURES**

As soon as possible after completion of water retaining structures viz. storage reservoirs etc. they shall be tested for water retention by filling to the normal maximum level with water at a uniform rate of not greater than 2m in 24 hours. When first filled, the water level should be maintained by adding of further water for a stabilizing period while absorption and antogenous healing take place. This period may be 7 days after which the level of the water surface should be recorded at 24 hour intervals for a test period of 7 days. The structure shall be considered satisfactory if, during this period the total permissible drop in level, after making due allowance for rainfall and evaporation, should not exceed 1/500th of the average water depth of the full tank, 10mm or another specified amount all in accordance with SRN 102. Water used in testing the structures shall be supplied by the Contractor. Sterilisation of the structures is to be done as specified by the Engineer and sampling of water carried out similar to Clause 813. This test shall be carried out before any backfilling has taken place. In the event of any water retaining structures failing to pass the test, the Contractor shall make good and re-test at his own expense.



### **816. STERILISATION OF WATER RETAINING STRUCTURES**

A strong chlorine solution (about 200 milligrams per litre) shall be sprayed on all interior surfaces of the hydraulic structure. Following this, the structure shall be partially filled with water to a depth of approximately 30 centimetres. During the filling operation, a chlorinewater mixture shall be injected by means of a solutionfeed chlorinating device. The dosage applied to the water shall be sufficient to give a chlorine residual of at least 50 milligrams per litre upon completion of the partial filling operation. Precaution shall be taken to prevent the strong chlorine solution from flowing back into the lines supplying the water. After the partial filling has been completed, sufficient water shall be drained from the lower ends of the appurtenant piping to insure filling the lines with the heavymchlorinated water. Chlorinated water shall be retained in the hydraulic structure and in the associated piping long enough to destroy all non-spore-forming bacteria and, in any event, for at least 24 hours. After the chlorine-treated water has been retained for the required time, the chlorine residual shall be at least 25 milligrams per litre. All valves shall be operated while the lines are filled with the heavily chlorinated water.

## **9. DRAINS, SEWERS AND MANHOLES**

### **901. EXCAVATION FOR DRAINS, SEWERS AND MANHOLES**

The ground shall be excavated to the lines and depths shown on the drawings or to such other lines and depths as the Engineer may direct. Excavations taken out to a greater depth than is necessary shall be filled to the required level with approved material as specified for the pipe bed at the Contractor's own cost. Trenches shall be of sufficient width to enable the pipes to be properly laid and jointed. In case of pipes of greater diameter than 300mm, the width of trench shall be external diameter of pipe, plus 400mm. When any excavation has been taken out and trimmed to the levels and dimensions shown on the drawings or as directed by the Engineer, the Engineer shall be informed accordingly so that he may inspect the completed trench and no excavation shall be filled in or covered with concrete until it has been so inspected and the Contractor has been authorised to proceed with the work. All surplus materials from such excavations not required for refilling shall be carted away to tips, or otherwise disposed of, as directed. All excavations shall be kept dry, and all bailing and pumping, timbering, shoring and supporting of sides that may be required, and any refilling, ramming and disposal of surplus materials necessary in carrying out the excavations and backfilling of trenches shall be taken to provide a solid and even bed for barrels of the pipes and, where a concrete bed is not specified, the floor of the trench shall be properly shaped to receive the sockets and the backfill must be thoroughly rammed along the sides of the pipe. The rate of excavation in the Bill of Quantities shall include for keeping trenches dry and for all bailing, pumping, timbering, shoring and supporting of sides that may be required.

### **902. SUPPORTS FOR PITS, TRENCHES AND OTHER EXCAVATIONS**

The sides of pits, trenches and other excavations shall, where necessary, be adequately supported to the satisfaction of the Engineer, and all such excavations shall be of sizes sufficient to enable the pipes and bedding to be laid accurately, and proper refilling and compacting to be carried out. The Contractor shall take all precautions necessary for the safety of adjoining structures and building by shoring, opening in short lengths or otherwise, during the time the trenches are open.

### **903. ROCK CUTTING IN TRENCHES FOR PIPES AND OTHER EXCAVATIONS**

Where solid rock is met within trenches and other excavations, it shall be cut out to a depth of 100mm below the intended level of the bottom of the pipes, and replaced with 100mm of approved material as specified. In measuring such rock excavation the Contractor will be

allowed a width of 400mm more than the external diameter of the pipes to a level of 100mm below the bottom of the pipes. The price inserted in the Bill of Quantities shall be held to cover all expenses in connection with excavating the rock, backfilling after laying of pipes and disposing of surplus material as directed by the Engineer.

#### **904. WATER IN TRENCHES FOR PIPELINES AND OTHER**

##### **EXCAVATIONS**

Trenches and other excavations shall be kept free from water at all times during construction of works until, in the opinion of the Engineer, any concrete or other works therein are sufficiently set, and the Contractor shall construct any sumps or temporary drains that the Engineer may deem necessary. The Contractor shall be responsible for the removal and disposal of all water entering the excavations from whatever source and shall deal with and dispose of such water in a manner approved by the Engineer so as to ensure that excavations are kept dry while ensuring that the disposal of this water does not cause a nuisance to adjacent plot holders or works. The Contractor shall provide all plant, labour and materials required for such work and all costs incurred shall be deemed to be included in his rates for excavation.

#### **905. LAYING AND JOINTING RIGID JOINTED CONCRETE PIPES**

Concrete pipes as specified in Clause 742, shall be laid true to line and level, each pipe being separately boned between sight rails. For spigot and socket joints, the spigot of each pipe shall be placed home in the socket of the one previously laid, and the pipe then adjusted and fixed in its correct position with the spigot of the pipe accurately centred in the socket. A ring of tarred rope yarn shall next be inserted in the socket of each pipe previously laid and driven home with a wooden caulking tool and wooden mallet, such yarn when in position shall be 25mm in depth. The socket shall then be completely filled with cement mortar 1 to 2 as specified in Clause 729 and a fillet of the same worked all round the side. The fillet shall be levelled off and extend for a length of not less than 50mm from the face of the socket. For 'Ogee' jointed pipes, the joints shall be thoroughly cleaned before laying, and cement mortar, as specified in Clause 729 shall be applied evenly to the ends for jointing so as to completely fill the joint. The pipes shall then be neatly pointed with a band of cement mortar approximately 125mm wide and 20mm thick. The inside of each joint shall also be pointed up as the work proceeds. Special care shall be taken to see that any excess of cement mortar etc. is neatly cleaned off while each joint is being made and any earth, cement or other

material cleaned out of the pipes by drawing a tight-fitting wad through them as the work proceeds, or by other approved means. A properly fitting plug shall be well secured at the end of the last laid pipe and shall be removed only when pipe laying is proceeding. The trenches, pipes and joint holes shall be kept free from water until the joints are thoroughly set. Where shown on the drawings or directed by the Engineer, concrete pipes shall be bedded and haunched or surrounded with concrete as specified in Clause 1019. The price inserted in the Bill of Quantities shall include for providing, laying and jointing of pipes.

**906. PIPES LAID WITH OPEN JOINTS**

O.G. porous concrete pipes as specified in Clause 743 shall be laid unjointed with a space of 12mm between the spigot and the inner end of the socket. All pipes shall be packed and surrounded as directed by the Engineer with approved broken stone, sand or gravel aggregate, to the gradings as shown on the drawings or stated in the Bill of Quantities. The prices inserted in the Bill of Quantities shall include the trench excavation, providing and laying pipes, supplying and placing graded packing material, refilling trench and disposing of surplus all as specified.

**907. CAST IRON PIPES**

Cast iron pipes and special castings, shall be as specified in Clause 703 and shall be supplied, laid and jointed with lead wool properly caulked to form perfectly uniform and watertight joints, and when laid and jointed they shall be true to line and level. Where cast iron pipe drains are laid on unstable ground or ground which is likely to settle appreciably over a period of years they shall be pointed by means of an approved self adjusting or screwed gland joint as directed by the Engineer.

**908. DRAINS TO BE LEFT CLEAN ON COMPLETION**

On completion, all drains, manholes, etc. shall be flushed from end to end with water from an approved source and left clean and free from obstructions.

**909. REFILLING TRENCHES**

Trenches shall be refilled with suitable excavated material of 100mm surround but not before the work has been measured and approved by the Engineer. For pipes which are not surrounded with concrete, the first layer of filling material shall be free from stones and shall not be thrown directly on to the pipes, but shall be placed and packed with care all round them. All filling shall be deposited and compacted in layers, not exceeding 225mm loose depth, to a dry density not less than that of the adjoining soil. The last 450mm of filling must be returned in the order in

which it has been removed. Timber and framing shall be withdrawn ahead of the layer to be compacted, care being taken to keep the sides of the trenches solid and to fill all the spaces left by the withdrawn timber.

#### **910. CONNECTIONS OF EXISTING SEWERS AND DRAINS**

Where shown on the drawings, existing sewers and drains shall be properly extended, connected and jointed to new sewers, culverts, drains or channels. All such connections shall be made during the construction of the main sewer, drain or other work and a record of their positions kept for future use or reference. Where pipe connections are made to a sewer, stone pitched or lined channel, the pipes shall be well and tightly built into the concrete, or masonry work and be so placed as to discharge in the direction of the main sewer, drain or channel and with the end of the pipe carefully cut to the necessary angle. Where the connections are between pipe sewers or drains, special connecting pipes as shown on the drawings shall be supplied and be truly laid and properly jointed.

#### **911. MANHOLES AND INSPECTION CHAMBERS**

Manholes and inspection chambers shall be constructed in accordance with the drawings and in the position shown on the drawings or directed by the Engineer. Foundation slabs shall consist of concrete of the appropriate classes as specified on drawings. The side walls shall consist of similar concrete or building stone as specified in Clause 725 in accordance with the drawings. The side walls shall be fair faced or rendered internally as specified on drawings. They shall be brought up vertically to receive a precast slab formed of concrete of the appropriate classes specified and reinforced all as shown on the drawings. Cast iron manhole covers and frames as specified in Clause 747 shall be provided and frames shall be bedded in cement mortar 1 to 3 and so set that the tops of the covers shall be flush at all points with surrounding surface of the footway, verge or carriageway, as the case may be. Any slight adjustment of the slab level which may be necessary to accomplish this shall be effected by topping the side walls with concrete integral with the slab. If required, half channel pipes, bends and junctions as specified in Clause 742 and Clause 743 shall be laid and bedded in cement mortar 1 to 3 to the required lines and levels, and both sides of the channel pipes shall be benched up with concrete of the appropriate class and finished smooth to the slopes and levels as shown on the drawings or directed by the Engineer. The ends of all pipes shall be neatly built in and finished flush with cement mortar 1 to 3. Where the depth of the invert exceeds 1 metre below the finished surface of the carriageway or

the adjacent ground, iron steps as specified in Clause 751 shall be built in with alternate steps in line vertically and with such additional hand irons as the Engineer may direct. All manholes when completed shall be watertight and to the satisfaction of the Engineer. The prices inserted in the Bill of Quantities shall include for excavation, provision of all materials, construction, refilling and disposal of surplus.

**912. PRECAST CONCRETE MANHOLES**

Precast concrete manholes as specified in Clause 749 shall be supplied and laid generally in accordance with the drawings.

**913. GULLY CONNECTIONS**

Connections from gullies to sewers and surface water drains or ditches shall consist of concrete pipes and fittings as specified in Clause 742 jointed with cement mortar 1 to 3 as specified in Clause 729. All pipes, bends and junctions shall be laid to the lines and levels shown on the drawings or as directed by the Engineer.

**914. SURFACE BOXES, COVERS ETC.**

Surface boxes, manholes and other covers lying within the site of the works, shall be raised, lowered, altered or removed as directed by the Engineer.

**915. GULLIES**

Gullies complete with gratings and with rodding eyes where necessary all as specified in Clause 750 shall be supplied and laid in accordance with the drawings. Where directed by the Engineer, precast concrete gullies shall be laid on and surrounded with 100mm of concrete of the appropriate grade specified in Table 4.2. The concrete surround is to be brought up to the underside of the frame or flush with the top surface as the case may be. Masonry gullies shall be constructed from 225mm building stone and rendered internally. The rates included in the Bill of Quantities shall include for excavation, provision of all materials, construction, making junctions with connections to main drains, accurate setting of frames to line and level, refilling and disposal of surplus materials. Gullies shall be trapped where leading into foul sewers or into combined foul and surface water sewers.

**916. COMPLETION OF DRAINAGE WORKS**

All sub-soil and surface water drains shall be completed in advance of the construction.

**917. TEMPORARY STOPPERS**

Junction pipes which are laid but not immediately connected to gullies shall be fitted with temporary stoppers or seals, and the position of all such junctions shall be clearly defined by means of stakes or training wires properly marked and labeled.

**918. PROVISION FOR FUTURE CONNECTION TO MANHOLES**

Inlet pipes of the required diameters shall be built into the walls of manholes and elsewhere for future use and shall be of the diameters shown on the drawings. The external ends of all such connections shall be sealed off with temporary stoppers, approved by the Engineer. The pipes shall be laid and jointed as specified in Clause 1005 and during the placing of the concrete they shall be adequately supported.

**919. SURROUNDING OR HAUNCHING OF PIPES WITH CONCRETE**

Surrounding or haunching of pipes shall be carried out using concrete of the appropriate grade specified in Table 4.2. In carrying out this work the Contractor shall take care to pack the concrete under and around the pipes to ensure even bedding and solidity in the concrete and the concrete shall not be thrown directly on to the pipes. The upper surface of the concrete shall be struck off with a wooden screed or template and neatly finished off. The rates shall include for any formwork that the Contractor requires to use under this item.

**920. INVERT BLOCK AND STONE-PITCHED DRAINS**

Precast concrete invert blocks and side slabs shall be formed of concrete of the appropriate grade specified in Table 4.2 to the dimensions shown on the drawings. Each course of side slabs required in the Bill of Quantities shall be interpreted as one complete row of side slabs to one side of the channel concerned. Stone used for channels shall be 225mm x 100mm building stone. Drains should not normally be laid to a radius of curvature less than 10 times the actual width of the drain. Invert block and stone-pitched drains shall be constructed in the positions and to the levels and dimensions shown on the drawings and laid to true line and even fall. Where under filling is required it shall be in 100mm maximum thickness layers of compacted murrum. The earth sides to such channels shall be neatly finished to a slope of 1 to 1 or such other slope as the Engineer may direct. Invert blocks and side slabs shall be laid on a 100mm minimum thickness of compacted murrum and be neatly jointed with cement mortar 1 to 3 as the work proceeds. The excavation, murrum bedding, providing, laying and jointing invert blocks or stone, backfilling and disposal of surplus shall all be as specified and all in-situ connections shall be in concrete of the appropriate grade specified in Table 4.2.

**921. TESTING OF JOINTED PIPES AND MANHOLES**

Sealed jointed drains, up to and including 600mm diameter shall be tested in sections (e.g. between manholes) by filling with water under a head of not less than 1 metre. Drains found to be water-tight after a period of 30 minutes will be passed as satisfactory but the water must be retained in the pipes until a depth of at least 450mm of filling has been deposited and compacted on top thereof. Drains failing to stand the test shall be taken out and the pipes re-laid and re-jointed until completely water-tight. Drains exceeding 600mm in diameter shall be tested by means of a smoke test before they are covered up. Both ends of the lengths of drain to be tested shall be sealed to the satisfaction of the Engineer, and smoke shall then be pumped into the section from an approved machine. Should any joint in the section show an escape of smoke, the section shall be taken out and the pipes re-laid and re-jointed until there is no further escape of smoke. Should the Engineer so direct, manholes shall be tested by completely filling with water, and there shall be no appreciable loss over a period of 2 hours. On completion of the works, or at suitable intervals during construction, infiltration tests will be carried out. The permissible amount of infiltration shall be 1 litre per hour per linear metre of nominal internal diameter. The Contractor shall provide all labour and apparatus for the above tests. All testing will be done in accordance with the procedure of the British Standard Code.

**922. PIPES WITH RUBBER RING JOINTS**

Rubber rings complying with SRN 308 will be provided by the Contractor. They will be laid in the socket and the pipes then jointed as specified. The jointing of pipes shall be carried out in accordance with manufacturer's instructions and in conformity with any modifications proposed by the Engineer.

**923. LAYING, JOINTING AND BACKFILLING FOR FLEXIBLE JOINTED PIPES**

The Contractor shall ensure that any hard spots and loose stones are removed from the formation prior to laying of bedding materials. The Contractor shall lay a bed of thickness 100mm consisting of granular material i.e. sand, gravel, or approved soil of friable nature. After laying of pipes the Contractor shall lay bedding material on the sides of the pipe compacted by tamping into soffit of sewer. After completion of this operation the Contractor shall lay the bedding material on top of the pipe in 150mm layers to a thickness of 300mm. The material is to be compacted by tamping. However, precautions are to be taken to avoid excessive tamping on top of the pipe. The remaining trench excavation is to be backfilled to comply with Clause 1009 of



specification. The pipes shall be laid with flexible ring seal joints provided that solvent cement joints could be used for fittings where necessary subject to the approval of the Engineer. Pipes and fittings shall be checked for deformities prior to laying. Deformed pipes and fittings shall not be accepted.

### **Flexible Rubber Ring Joints**

The Contractor shall ensure that the spigot end is free from grit, dust or dirt and sealing rings should be seated evenly in the socket groove. Pipe lengths and fittings are supplied with a chamfer on the spigot. Where pipes are to be cut or are supplied without a chamfer on the spigot end the Contractor shall ensure that the pipe is cut square and then form a chamfer on the spigot end with a medium file to an angle of 15 degrees. Remove saw flashing by scraping with a pen-knife.

### **Expansion Gap**

It is necessary to leave a gap between the edge of the spigot end and the base of the socket to allow for expansion. Molded fittings are supplied with an embossed line indicating the correct depth of insertion. In other cases where the marking is not done, the Contractor shall ensure that an expansion gap of at least 3mm per metre length of pipe or at least 15mm per pipe length is provided. This can be done by marking spigot ends or by pushing spigot fully home, making a small mark on pipe and then withdrawing the pipe by 15mm. After completing jointing the pipe shall be laid on the prepared bed making sure that a suitable depression is created in the bed for the socket.

### **Solvent Cement Joints**

For solvent cement joints make sure that mating surfaces are clean and free of grease and dirt. Roughen mating surface with sandpaper, clean both surfaces with cleansing fluid using a clean cloth. Apply solvent cement on both mating surfaces. Without delay bring mating surfaces together and hold in position firmly for a few seconds. A layer of cement should be visible at the edges. Joints should not be disturbed for at least 10 minutes after assembly.

## **924. WEEPHOLES**

Where shown on the Drawings or directed by the Engineer, the Contractor shall cast weepholes into concrete walls. The Contractor shall provide and place plastic pipes of the diameter shown on the Drawings to form weepholes which will be firmly held in position during the placing of the concrete. A 500mm x 500mm square of approved filter fabric shall be placed, central on the weephole between the concrete wall and backfill material.

## **925. DEBRIS SCREENS**

Where shown on the Drawings, the Contractor shall fabricate and install debris screens across the full width of the drain channel cross-section. The screens shall be fabricated using galvanised mild steel complying with BS 729. They shall be mounted on R.C. supports and incorporate a safe access platform to facilitate manual clearing of debris as shown on the Drawings.

## **10. MISCELLANEOUS**

### **1001. GENERAL**

The Contractor is referred to the drawings as to the general character of the works and he shall allow in his rates for any extra costs he may consider incurred by reason of the work being in detached positions, in small quantities, difficulty of access or for any other cause. He should also make due allowance for specialist installations taking place during the currency of this contract. This section of the Specification refers to miscellaneous items. Clauses elsewhere in the Specification shall also be followed where relevant.

### **1002. BONDING TIES**

Bonding ties shall be 75mm wide x 250mm long galvanised bitumen-coated expanded metal strip, cast 100mm into concrete surfaces in contact with block work. The bonding tie used shall be approved by the Engineer's Representative.

### **1003. PRECAST LINTELS**

All precast items shall be marked with the date of casting and shall not be built into the works until they have matured for 28 days. Ends of bar reinforcement shall be hooked or bent as required. The cover for reinforcement shall be 25mm from internal faces and 38mm from external exposed faces. The 'top' of lintels shall be numbered for identification. Lintels shall have timber or pre-formed inserts cast in for fixing metal windows where required and shall have fair face finish on all surfaces exposed to view and hacked surfaces where plastered.

### **1004. BLOCKWORK**

Building blocks shall be dense concrete blocks complying with the requirements of B.S. 2028, 1364, with faces for plastering and having a compressive strength of 14 N/sq.mm. (Table 2, Type A14). Blocks shall be obtained from an approved manufacturer and shall be equal to sample blocks previously approved by the Engineer's Representative. Blocks shall be carefully handled and stored on site and protected from the weather at all times. Surfaces on which blockwork is to be built shall be kept clean. Blocks shall be well wetted before being laid and the tops of walls where blockwork has been left shall be well wetted before re-commencing. Blockwork shall be built plumb, true to line and level, with all perpendics vertical and in line. Blocks shall be built in half bond and alternate courses shall be block bonded at all junctions, no cut block shall be less

than half a block. Joints in concrete block work shall be well filled with gauged mortar and shall not exceed 10mm in width.

**1005. DAMP-PROOF COURSE (D.P.C.)**

Hessian based metal cored bitumen for damp-proof courses shall be lead cored, complying with B.S. 743 paragraph 4, type D, weighing not less than 4.4 kg. per square metre. Damp-proof course shall be bedded horizontally in mortar as for blockwork with 115mm laps in length and full laps at angles.

**1006. HARDWOOD**

Hardwood for joinery shall be sound, well conditioned and seasoned Mvuli complying with the requirements of B.S. 1186 Part 1, Class 1. A sample of each representative section for use in the work shall be previously submitted by the Contractor for approval by the Engineer's Representative. Moisture content shall be 12% (+ or - 2%).

**1007. PLYWOOD**

Plywood generally shall comply with B.S. 1455. That from sources not included in B.S. 1455 shall be of corresponding grades of veneers and types of bonding. Plywood for flush doors shall be Grade I Mvuli veneered.

**1008. DOORS**

Internal doors shall be hardwood framed solid cored flush doors constructed in accordance with B.S. 459 Part 3, faced both sides with 3mm thick Mvuli veneered plywood and lipped all round with matching hardwood lipping. Moisture content at delivery shall be 12% (+ or - 2%).

**1009. FRAMES AND LININGS**

Door frames and linings shall be Class 1 Mvuli mortice and tenon jointed at angles. Subframes for internal doors shall be Class 1 Mvuli tongued at angles.

**1010. ARCHITRAVES AND STOPS**

Architraves and stops shall be Class 1 Mvuli matching to the frames and linings.

**1011. IRONMONGERY**

All ironmongery shall be obtained from a source approved by the Engineer's Representative. Samples shall be submitted before ordering and the articles ordered shall match up with the approved samples. Screws of a like metal shall be used for all fittings.

**1012. JOINERY**

All exposed joiner's work shall have wrought faces. The prices of all joiner's work shall include for slightly rounded arises. Where the term 'framing' or 'framed' is made use of, it shall be understood to mean all halvings, dovetails, tenons and hardwood pins and the best known means of putting the work together. All framed work shall be put together loosely and stacked under cover where a free current of air can circulate and is not to be wedged and glued until it is required for fixing. All joinery, when brought on the works, shall be stacked under cover. The Engineer or his representative, shall have full right of access to the joinery works and power to condemn any work not approved and any approval expressed or implied is not to relieve the Contractor from his responsibility and liability to make good any shrinkage or other defects that may appear after the work is fixed. All joinery to be painted shall be knotted and primed. The Contractor shall provide all materials, labour, framing, fixing, etc., nails, screws and everything necessary for the proper execution and completion of the work.

**1013. FIXING JOINERY**

Doors shall be hung on one or one and a half pairs of butt hinges to give a maximum even tolerance of 2mm all round. Sub-frames shall be fixed to blockwork with three fixing clamps per side and one dowel let 50mm into the floor and 50mm into the foot of each leg. Linings shall be fixed after completion of other finishings by means of screwing and pelling to sub-frames with matching hardwood pellites. Architraves and stops shall be pinned on, heads punched and filled with tinted filler.

**1014. FIXING IRONMONGERY**

The rates for supplying and fixing ironmongery shall include for all sinking, cutting, boring, mortising etc., making good, replacing damaged screws, oiling, adjusting and leaving in good working order and for mastering all keys.

**1015. BOLTS AND NUTS**

Bolts and nuts shall comply with the relevant requirements of the British Standards as set out below:-Black Hexagon Bolts, Screws and Nuts B.S. 4190, Grade 4.6 Metal Washers for General Purpose B.S. 4320 Black Cup and Countersunk Head Bolts and Screws, with Nuts B.S. 4993 The items shall preferably have coarse metric threads but items with B.S.W. threads may be used. Bolt lengths shall be sufficient to ensure that nuts are full threaded when tightened in their final position.

### **1016. STRUCTURAL STEELWORK**

The whole of the structural steelwork and testing shall comply with the relevant clauses of B.S. 449. The Contractor shall include for the preparation of all shop details from the drawings supplied by the Engineer. All such details shall be approved in writing by the Engineer before the work is put in hand. Every drawing shall show the number and sizes of all rivets and bolts, complete details of welds, type of electrodes, welding procedure, whether the welds are to be made in the shop or elsewhere and any other relevant information. The Contractor shall be responsible for the accuracy of his shop details and for shop fittings and site connections. The Contractor shall take the dimensions from the structure and he shall verify all dimensions given on the drawings before the work is put in hand. Any damage to materials on the site due to inadequate precautions being taken during the erection of the steelwork shall be made good to the satisfaction of the Engineer's Representative at the Contractor's expense. The fabrication and erection of the steelwork shall be carried out in accordance with Part 5 of B.S. 449.

### **1017. GALVANISED WORK**

Iron and steel, where galvanised, shall comply with B.S. 729, entirely coated with zinc after fabrication by complete immersion in a zinc bath in one operation and all excess carefully removed. The finished surface shall be clean and uniform.

### **1018. ELECTRICAL INSTALLATION**

The electrical installations will be carried out by Licensed Electrician and complying with the following:-

- a) Regulations for Electrical Equipment of Buildings issued by the Institution of Electrical Engineers.
- b) Electric Power Act.
- c) The K.P.&L. Co. regulations and Bye-Laws.
- d) Relevant current British Standards and Codes of Practice.
- e) All the relevant clauses in this Specification, particularly the clauses in Sections 13 and 14.

### **PLUMBING INSTALLATION**

#### **1019. WATER AUTHORITIES REGULATIONS**

The internal plumbing work shall be carried out to the satisfaction of and in accordance with the regulations of the local Water Authority.

#### **1020. RAINWATER INSTALLATIONS**

Rainwater installation shall be in grey PVC pipework with 'O' ring joints.

**1021. TESTING PLUMBER'S WORK**

The plumbing work and sanitary fittings shall be tested at such times as the Engineer's Representative shall direct and to his entire satisfaction. Gutters and rainwater pipes shall be tested with water to satisfy the Engineer's Representative that gutters are to correct falls, pipes are unobstructed and joints are sound.

**1022. SETTING OUT**

The positions of all pipe runs, including joints and connections, shall be agreed with the Engineer's Representative before work is commenced.

**1023. COPPER TUBES AND FITTINGS**

Light gauge copper tubes shall comply with B.S. 2871 Part 1, Table X. Fittings: Fittings and couplings for jointing pipes shall comply with B.S. 864, Part 2 for capillary and compression type A fittings. Fixing: Tubes shall be fixed clear of walls or soffits with two piece copper spacing clips complying with B.S. 1494 Table 8d, but in metric sizes to suit tubes spaced at not more than 1.2m horizontally and 1.5m vertically for 15mm diameter pipes 2.0m horizontally and 2.5m vertically for 22mm and 28mm diameter pipes.

**1024. PLASTIC PIPES, FITTINGS AND ACCESSORIES**

uPVC soil and ventilating pipes and fittings shall comply with B.S. 4514. Waste pipes and fittings shall be modified unplasticised polyvinyl chloride (MuPVC). Waste traps shall comply with B.S. 3943. Balloon gratings shall be plastic coated steel wire.

**1025. SLEEVES**

Where sleeves are required for pipes passing through concrete or blockwork they shall be of galvanised steel heavy gauge tube of sufficient diameter to give a space of 3mm all round the pipe.

**1026. PIPEWORK GENERALLY**

Pipes shall be in the maximum lengths possible to avoid unnecessary jointing and fixed to sufficient falls to prevent air locks and to enable the system to be drained down.

**1027. BRASSWORK**

Ball Valves: Piston type ball valves shall comply with B.S. 1212, Part 1 for high or low pressure as described. Floats to break feed cisterns shall be copper type complying with B.S. 1968, Class

C. Bib-taps shall comply with B.S. 1010 and shall be of brass with fixed jumpers, chromium plated and colour coded for hot and cold. Pillar valves shall comply with B.S. 1010 and shall be of brass with fixed jumpers, chromium plated and colour coded for hot and cold. Stop valves shall comply with B.S. 1010 and shall be of brass with crutch handles.

**1028. CISTERNS**

Storage cisterns and break feed cisterns shall be galvanised steel cisterns complying with B.S. 417, Grade A.

**1029. SANITARY FITTINGS**

Sanitary fittings shall be manufactured from glazed vitreous china complying with the requirements of B.S. 3402. They shall be supplied by an approved firm and shall pass the requirements of the local Water Authority.

**PLASTERWORK AND OTHER FLOOR, WALL AND CEILING**

**FINISHINGS**

**1030. GENERAL**

All branded materials shall be delivered in the manufacturer's packages bearing the manufacturer's name and the name of the material concerned. Cement, lime, plaster etc shall be stored separately off the ground in dry conditions. All surfaces shall be properly prepared for plastering, rendering and screeding and brushed or cleaned free from dust and all traces of efflorescence and contamination removed. Concrete surfaces shall be thoroughly cleaned free from all traces of mould oil or other formwork coatings and hacked to provide a key. Surface to receive plastering, rendering, screeding etc. shall be wetted sufficiently in advance to ensure the correct conditions for adhesion. Undercoats shall be thoroughly scratched to allow for keying and allowed to dry sufficiently before application of further coats. Dubbing out shall be in the same mix as the subsequent coat and shall not exceed 20mm in thickness in one application.

**1031. METAL LATHING**

Metal lathing shall be light galvanised expanded metal weighing not less than 1.2 kg. per square metre and complying in all other respects with B.S. 1369.

**1032. CEMENT**



Cement shall be Ordinary Portland Cement and shall comply with KS 02-21. White and/or an equivalent approved colored cements shall comply with KS 02-21 and shall be obtained from an approved manufacturer.

**1033. SANDS**

Sand for cement and lime shall comply with B.S. 1199, Table 1 for undercoats and Table 2 for finishing coats. Sand for floor screeds shall comply with B.S. 1199, Table 1.

**1034. LIME PUTTY**

Lime putty shall be prepared from hydrated lime complying with B.S. 890, Table 2. Hydrated lime shall be added to water, stirred to a creamy consistency and left to mature for at least sixteen hours before use. Alternatively, ready slaked lime may be obtained from an approved manufacturer. The lime putty shall be protected from drying out.

**1035. PLASTICISERS**

Plasticisers shall be of the resin type and shall be used only with the approval of the Engineer's Representative in accordance with the manufacturer's instructions.

**1036. WATER PROOFERS**

Water proofers shall be approved integral water proofers and shall be used in accordance with the manufacturer's instructions.

**1037. ANGLE AND CASING BEADS AND RENDER STOPS**

Galvanized steel angle and casing beads and render stops shall be as manufactured by Expamet" or other equal and approved.

**TILE WORK**

**1038. GLAZED CERAMIC WALL TILES**

Glazed and eggshell ceramic wall tiles shall comply with B.S. 1218 and shall be of the colours described. Samples of tiles shall be submitted to the Engineer's Representative for approval.

**1039. ADHESIVE**

Adhesive for fixing wall tiles shall be approved adhesive.

**1040. FIXING WALL TILES**

Tiles shall be wiped clean and fixed dry with the approved adhesive all in accordance with manufacturer's recommendations with straight joints 1.6mm wide, pointed in white cement.

**1041. CERAMIC FLOOR TILES**

Ceramic floor tiles shall be fully vitrified clay tiles complying with B.S. 1286 and having a water absorption not exceeding 0.3%.

**1042. LAYING FLOOR TILES**

For laying of floor tiles the surface of the compacted bedding shall be spread with a 3mm thick cement and sand (1:1) slurry. Floor tiles shall be wiped clean and laid dry, in a square pattern with 3mm wide joints and tapped into the grout. Pointing shall be in an approved proprietary tile grout, tinted to match floor tiles.

**1043. FIXING METAL LATHING**

At junctions of blockwork and concrete where rendering continues over both surfaces a 100mm wide strip of expanded metal lath shall be fixed, centred on the joint.

**1044. FINISH**

Cement-lime-sand undercoats shall be allowed to dry out thoroughly before a further coat is applied and scratched to provide an adequate key for the next coat. The finishing coat shall be finished with a steel float. A neat cut shall be made with the edge of the trowel through all coats of the wall plaster at junctions with concrete columns and soffits.

**1045. INTERNAL RENDERING**

The internal rendering on concrete block panels shall be two coat work, total 20mm finished thickness. The undercoat to be 1:1:5 cement, lime putty, sand by volume, 9mm to 12mm thick and scratched for key. The finishing coat to be 1:1:6 cement, lime putty, sand by volume, 6mm to 9mm thick, trowelled smooth. At junctions of panels to concrete columns and beam soffit, finish the rendering with a clean trowel cutting through both coats of rendering.

**1046. EXTERNAL RENDERING (TYROLEAN)**

The external rendering on concrete blockwork and outer face of in-situ concrete frame shall be two coat work, total 15mm finished thickness. Clean and prepare block and concrete surfaces, shot pin metal lath strip 100mm wide at concrete/blockwork junctions and apply undercoat 10mm finished thickness of 1:1:6 cement, lime putty, sand by volume, floated smooth. The finishing coat shall be approximately 6mm thick off white Culamix Tyrolean open honeycombed texture machine applied to the required thickness by skilled operatives strictly in accordance with the manufacturer's recommendations, manufactured and supplied by Blue Circle Industries Ltd., agents in Kenya, Kencem, P.O. Box 14267, Nairobi, Kenya or other approved alternative.

The undercoat surface shall be sound and clean and free from any loose material. All window and door frames shall be protected by suitable masking.

**1047. EXPANSION JOINTS**

Expansion joints in clay ceramic tile flooring shall be 6mm wide x 50mm deep, unless otherwise described, formed with 6mm wide x 38mm deep butyl rubber or other equal and approved compressible strip pointed with 6mm wide x 12mm deep polysulphide compound to match colour of tiling. All surfaces of concrete or screed in contact with the butyl rubber shall be primed. Expansion joints shall be formed at perimeters and at not less than 4.5 metre centres both ways in the tiled areas.

**1048. PREPARATION**

Concrete floors to receive screeds shall be raked where necessary to remove concrete, plaster or mortar droppings and well brushed to remove all loose particles and dirt. Concrete floors shall be well wetted before the screeds are laid.

**PAINTING AND DECORATING**

**1049. PAINT AND PAINTING**

All paint, including primers, undercoats and finishings, polish, emulsion etc., to be used shall be obtained ready for use from the manufacturer approved by the Engineer. The Contractor shall order direct from the manufacturer and only fresh paint will be allowed to be used. All paints shall be of the qualities, i.e. exterior, interior etc., types and colours scheduled. All coats of paint system shall be obtained from the same manufacturer, shall be ordered for use together and as far as practicable, shall be ordered on one order in sufficient quantity for the whole of the work, particularly in the case of the finishing colour. Where more than one of the three systems (gloss, semi-gloss or flat) is in use, these paints shall be used in strict accordance with their accompanying printed instructions. The Contractor shall use only paints delivered to the site in original sealed containers, not exceeding five litre capacity, stamped and bearing the manufacturer's name of mark, the specification number, method of application (e.g. brushing) colour, quantity, batch number and date of manufacture, and expiry.

Contractor's stocks shall not be accepted unless expressly approved by the Engineer's Representative. The paint, which will be subject to sampling and testing, shall be used exactly as received, after adequate stirring, without the addition of thinners, driers, or adulterating materials of any kind. All tints and shades (including colours of undercoats) shall be selected and approved

by the Engineer's Representative and the Contractor shall allow in his prices for executing the painting work in colour schemes, to be prepared from a wide range of colours. All paints described as oil paint shall be alkyd paint. No painting on exterior work shall be carried out in wet weather or upon surfaces which are not thoroughly dry. Painting shall not proceed in dusty conditions. Each coat of paint shall be thoroughly dry and shall be rubbed down with glass paper before a subsequent coat is applied. Adequate care must be taken to protect surfaces of paintwork, still wet. Lead based priming paints for steelwork shall conform to B.S. 2521 and 2523.

**1050. PREPARATION**

Copper pipes shall be washed with soap and water, roughened with abrasive paper and washed with white spirit. Metalwork - remove all scale from unprimed iron and steelwork, degrease using proprietary solution compatible with paint finish, remove all dirt and rust by brushing with a steel wire brush. Clean all steel delivered primed, of dirt and dust and touch up any damage to primed surfaces in transit or erection. Hardwood - rub down and brush off all dirt and dust, stop any holes or other imperfections with stopping tinted to match pigment finish.

**1051. PROTECTIVE DECORATIVE FINISH**

The protective decorative finish on hardwood joinery shall be PX65 (Pinotex) and Holdex as manufactured and supplied by Sadolins Paints (E.A.), or other equal and approved finish. External frames and doors shall be treated with two coats PX65 (Pinotex) Pigmented before fixing and one coat PX65 (Pinotex) Top Coat after fixing. Internal frames and doors shall be treated with two coats PX65 (Pinotex) Pigmented before fixing and one coat after fixing and finished with two coats of Holdex, Silk Matt Interior Lacquer. Application shall be strictly in accordance with the manufacturer's recommendations. Not more than three months should separate the initial (before fixing) and final (after fixing) coats.

**1052. RENDERED PANELS**

The internal rendered blockwork panels shall be painted with two coats Sandtex Matt resin-based surface coating or other equal and approved coating. Rendered wall surface shall be cleaned down and Sandtex coats laid on by brush or roller in accordance with the manufacturer's recommendations. Spraying wall surfaces will not be allowed.

**1053. IRONMONGERY FURNITURE**

The rates for painting shall include for taking down and refixing ironmongery furniture, kicking plates etc., as necessary.

**ROADS AND FOOTPATHS**

**1054. PREPARATION OF ROAD FORMATION**

After excavation or filling has been completed the road formation shall be shaped to the required contour and compacted with an 8 - 10 tonne roller. If any soft places develop in the formation during compaction they shall be excavated to such depths as the Engineer may direct, refilled with hardcore or other approved granular material, levelled and re-compacted before the sub-base is laid.

**1055. MURRAM SUB-BASE**

The murrum sub-base will be constructed only in poor soil conditions where directed by the Engineer. The murrum shall be from an approved source quarried so as to exclude vegetable matter, loam, topsoil or clay. The California Bearing Ratio (C.B.R.) of the murrum, as determined for a sample compacted to maximum density as defined under B.S. 1377 and allowed to soak in water for four days, shall not be less than 30. This C.B.R. is a guide to quality only and the compaction in the work will be judged by density. The murrum sub-base shall be of the thickness as shown on drawings or stated in the Bill of Quantities. The sub-base shall be evenly spread and compacted using an 8-10 tonne roller for road construction and a 2-4 tonne roller for footpath construction. The Contractor will be required to maintain the selected material at its optimum moisture content to achieve maximum compaction. The roads and footpaths shall be finished to the grades and levels shown on the drawings.

**1056. WATER-BOUND MACADAM BASE**

The base shall consist of crushed building stone mechanically laid in one or more separate layers, so as to give a total compacted thickness as shown on the drawings, or stated in the Bill of Quantities. The first layer shall be placed to produce a thickness of 75mm to 150mm after compaction as specified. Where a greater thickness than 150mm of base is specified the material shall be laid in separate layers each not less than 75mm or more than 150mm in thickness after compaction. The stone shall have the following gradings: -

<u>B.S. Sieve Size</u>	<u>% by Weight Passing</u>
5 in. (125mm) ring	100
3 in. (75mm)	25 - 80

1.5 in. (38mm) 0 - 20

3/4 in. (20mm) 0 - 5

Alternatively, a stone base may be placed by hand. In this case the first stones in each layer, which shall be of a cubical nature, shall be placed to the approximate height of the layer. When an area has been covered in this way a second placing of stones of smaller size shall be positioned by eye in the spaces between these first placed, and wedged home by hammering. A third placing of stones shall follow the second and so on until in the opinion of the Engineer the voids are sufficiently filled to permit compaction. Thorough watering shall be carried out at all stages of compaction. Initial compaction shall be with a light roller. The surface shall then be blinded with quarry dust so as to fill the interstices completely and again rolled, this time using a heavy roller. The base shall then be well watered and brushed and permitted to dry. Further rolling with a heavy roller, blinding with quarry dust, watering and brushing shall be carried on until the whole presents a homogeneous surface and no movement is visible under the action of the heavy roller. On completion of the base, and before any surfacing is laid, the finishing surface shall be maintained free from potholes, ruts and undulations, irregularities, depressions, loose material or other defects, and shall remain true to cross-section, line and level.

**1057. ROLLED ASPHALT HOT PROCESS WEARING COURSE**

Rolled asphalt wearing course shall be made and laid in accordance with British Standard 594 : Rolled Asphalt (Hot Process) and the thickness after compaction shall be as shown on the drawings or stated in the Bill of Quantities. Except where impracticable, the rolled asphalt shall be laid using an approved paver.

Where a base course has been used as part of the surfacing, the wearing course shall be laid thereon as soon as practicable, care being taken that the latter is thoroughly clean. In any case the wearing course should be laid within 3 days of the laying of the base course, unless the Engineer allows otherwise, and no construction or other traffic shall be allowed on the base course.

**1058. BITUMEN MACADAM WEARING COURSE**

Bitumen macadam wearing course shall be made and laid in accordance with British Standard 1621 : Bitumen Macadam with Crushed Rock or Slag Aggregate, using the appropriate Table and Section(s) thereof, other than those for Dense Bitumen Macadam, and nominal size of aggregate all as shown on the drawings or stated in the Bill of Quantities. Except where impracticable the bitumen macadam shall be laid using an approved paver. The maximum

mixing temperature for straight run bitumen of penetration 85-100 is 155 degrees centigrade. For other penetration bitumens the mixing temperature shall be as determined by the Engineer.

**1059. COMPACTION AND SURFACE FINISH**

As soon as rolling can be effected without causing undue displacement of the material, and while the material is above the minimum temperature stated in Table 6.3, it shall be uniformly compacted by an 8-10 tonne roller having a width of roll not less than 18 inches.

**1060. PREPARATION OF THE BASE FOR SURFACING OR SURFACE**

**DRESSING**

Before any binder or coating material is applied to a base the latter shall have been freed from all extraneous material by brushing with mechanical sweepers or stiff brooms. Macadam or murrum bases shall normally receive a priming coat in accordance with the following clause. Concrete, bitumen bound or rolled asphalt bases shall normally receive a tack coat in accordance with the following clause.

**1061. PRIME COAT AND TACK COAT**

When a base is to be sealed before surfacing by means of a prime coat, the surface shall first be prepared in accordance with the preceding clause. Unless otherwise stated in the Bill of Quantities or ordered by the Engineer, the prime coat material shall be bitumen grade M.C.O. at a rate of application of 1.2-1.5 lit./sq.m. It shall be applied with a mechanical bitumen distributor complying with the requirements of British Standard 1707 : Binder Distributors for Road Surface Dressing. The prime coat shall be cured for 48 hours. This period may be relaxed at the discretion of the Engineer who shall be informed and shall give his consent before any surfacing works are commenced. The Contractor shall not permit traffic to run on a prime coat. Where this is unavoidable the Engineer shall order an application of medium sand at a rate of 6 kg./sq.m. which item shall be measured and paid for separately. Where adhesion on an existing surface is to be improved before surfacing by means of a tack coat, the surface shall first be prepared in accordance with the preceding clause. Unless otherwise stated in the Bill of Quantities or ordered by the Engineer, the tack coat material shall be approved bitumen emulsion in accordance with British Standard 434 : Bitumen Road Emulsion containing not less than 55% of bitumen. It shall be mechanically applied at a rate of 0.38 - 0.43 lit./sq.m. The tack coat shall be allowed to cure to a tacky condition and the Engineer's consent obtained before any surfacing works are commenced. Any ponding which has occurred must be brushed out to bring the coverage within

the limits specified. The Contractor shall not permit traffic under any circumstances to run on a tack coat.

**1062. ROLLING OF SURFACE MATERIALS**

The type and weight of roller to be employed on each course of surfacing shall be approved before hand by the Engineer. Notwithstanding this, the Engineer may call for a certified weighbridge ticket in respect of any roller at any time. Roller wheels shall always be clean and even. An adequate water tank shall be provided together with a fully operating roller sprinkler system. The roller shall be operated by a person fully trained and experienced in rolling technique. Rolling shall be generally carried out in a longitudinal direction, working from the edge of the carriageway to the crown or, in the case of a super elevated carriageway, from the low to the high side. The second pass should be precisely on the path of the first, before the roller shifts transversely. Heavy drive wheels should approach the freshly laid material. Reversing should be carried out slowly and smoothly and the reversing points staggered across the carriageway to avoid any wave effect. Rolling should be continued until all roll marks are eliminated and there is no perceptible movement under the roller wheels. Idle standing on freshly laid material is not permitted. If the total surfacing to be compacted exceeds 3,300 sq.m. per day, the Contractor shall provide a second roller. In confined areas where normal rolling is not possible, mechanical tamping will be permitted. The tampers must be employed systematically to give a smooth “as-rolled” finish. No traffic will be permitted on a surfacing course until it has been compacted and in the opinion of the Engineer has acquired a sufficient set.

**1063. TRAFFIC ON NEWLY CONSTRUCTED ROADS**

The Contractor will not be permitted to use a new carriageway at any stage of construction without the written permission of the Engineer’s Representative. Notwithstanding any conditions which the Engineer’s Representative may stipulate at the time of giving his permission, the Contractor will be solely responsible for maintaining the new carriageway, keeping the surface clean and for making good at his own expense any damage or wear so caused.

**1064. LAYING KERBS, CHANNELS AND EDGING BLOCKS**

Kerbs, channels and edging blocks shall be bedded true to line and level in cement mortar on a concrete foundation Grade 15. They shall be haunched with concrete Grade 15. The foundation and haunch shall be laid before the approved sub-base is laid to the dimensions shown on the drawings.



### **1065. CONCRETE BLOCK PAVINGS**

The precast concrete blocks have to be manufactured to the following requirements:-

- i. Depth of block to be 60mm and 80mm.
- ii. The concrete used shall have a maximum aggregate size of 20mm, high workability, and shall be designed to have a 20 day characteristic cube strength of 45 N/sq.mm.
- iii. To ensure that the surface does not polish but retains a micro texture to give good low speed skidding resistance, sands containing more than 25% acid soluble material must not be used.
- iv. To ensure interlock between blocks, they must be manufactured to accurate dimensions, which allows them to be laid with only small spaces between the joints. When laid, the spaces between blocks should not exceed 2 to 3mm.

### **1066. LAYING OF BLOCKS**

The blocks should be laid in such a way so as to develop interlock. The surface course comprises closely fitting paving blocks, the spaces between them being filled with dust and sand particles. The finished surface level shall be within 5mm of the design level. The maximum deformation within the completed surface measured by a 3m straight edge placed parallel to the centre line of the road in parts of the carriageway where vertical curves necessitate a greater deviation. The level of any two adjacent blocks should not deviate by more than 2mm.

### **1067. LAYING COURSE**

The laying course shall consist of 40mm sand as specified containing not more than 3% of silt and clay by weight, and, with no more than 10% retained on a 5mm sieve. It is spread to give a thickness when compacted of 40mm. The profile of the uncompacted sand should be similar to that of the final surface. The required thickness of uncompacted sand forming the laying course will depend upon its moisture content grading, and degree of pre-compaction. The laying course sand needs to be spread to a greater depth than the target compacted depth of 40mm. The amount of surcharge will be of the order of 10 to 15mm but the exact value is best determined by trial. To avoid any need to adjust the surcharge during construction, it is helpful to keep the sand grading and moisture content sensibly constant. Once spread the sand should be screed smooth to level. For roads less than 4.5m wide, the kerbs may be used as screeding guides, but on wide pavements, it is necessary to set temporary screed rails for striking off the laying course. During spreading and screeding, operatives must not stand in the sand, otherwise uneven pre-compaction

will occur causing irregularities in the final road surface. To minimise the risk of disturbance, it is advisable to avoid screeding sand long distances in front of the block laying face.

**1068. CUTTING BLOCKS**

Awkward shapes at edges or obstructions, like gulleys manholes are filled by cutting blocks with a block splitter or by using a bolster chisel and hammer.

**1069. VIBRATION**

When the laying of concrete blocks has been completed, then blocks should be vibrated with a plate vibrator. The vibrator should have a centrifugal force of 0.35 to 0.50 sq.m. A frequency of 75 to 100 Hz is recommended. The required number of passes of the plate depends upon a variety of factors and is best determined by site trial. It should be sufficient to provide an even riding surface and prevent vehicles from causing further compaction. Normally two or three passes will suffice. Vibration should not be carried out within about 1m of unrestricted blocks; on the other hand, as little surface course as possible should be left unvibrated overnight. Finally, sand should be brushed over the surface and two or three further passes of the vibrator made, to complete interlock and fill the joints. As soon as vibration has been completed, the road can be used.

**1070. PREPARATION OF FOOTPATH FORMATION**

After the excavation of filling has been completed as specified the footpath formation shall be regulated to an even and uniform surface, and compacted with a roller weighing not less than 2.5 tonnes. If any soft places develop in the formation during compaction they shall be excavated and backfilled with approved granular material, levelled and re-compacted.

**1071. PRECAST CONCRETE PAVING**

Precast concrete paving slabs shall be to B.S. 368 1971 and shall be laid with 1:3 lime mortar using five pats not less than 150mm diameter for each slab. They shall be laid at a level not exceeding 4mm above the top of the kerb or concrete edging. The joints shall be thoroughly cleaned out and grouted with cement mortar well brushed in and flushed off. No cracked or broken slabs shall be used.

**1072. CHASING**

Chasing in load-bearing walling for pipes, etc., is to be kept to a minimum size of cut and the positions and runs of chases are to be approved by the Engineer before any cutting is commenced.

**1073. DAMP-PROOF COURSES (D.P.C.)**

Damp-proof courses shall be 1000-gauge polythene free from tears and holes and be laid with 150mm minimum laps on and including a levelling screed of cement mortar.

**1074. BITUMINOUS FELT ROOFING**

Bituminous felt roofing shall be carried out complete by an approved Specialist Sub- Contractor. Felt roofing shall be executed in accordance with British Standard Code of Practice C.P. 114/101 and strictly in accordance with the manufacturer's instructions, laps shall be 100mm minimum and falls 100mm minimum in 3 metres for flat roofs, and the minimum specification shall be as follows (Felt to B.S. 747):-

- a) One layer of asphalt saturated felt (weighing 6.8 kg. per 10 square metres) laid loose to screed or random and lap nailed to the boarding.
- b) One layer of asphalt saturated felt but weighing 9 kg. per 10 square metres and bedded to underlayer with hot bituminous compound.
- c) One layer of white mineral surfaced roofing felt (weighing not less than 23 kg. per 10 square metres) bedded to underlayer with hot bituminous compound.

**1075. HACKING, ETC.**

The prices for all pavings and plastering, etc., shall include for hacking concrete surfaces and for raking out joints of walls 12mm deep and for cross scoring undercoats to form a proper key. Plastering on walls generally shall be taken to include flush faces of lintels, beams, etc., in the walls.

**1076. SURFACES**

All surfaces to be paved or plastered must be brushed clean and well wetted before each coat is applied. All cement pavings and plaster shall be kept continually damp in the interval between application of coats and for seven days after the application of the final coat.

**1077. PRICES FOR PAVING**

Prices for paving are to include for adequate covering and protection during the progress of the Works to ensure that the floors are handed over in perfect condition on completion.

**1078. POLISHED TERRAZZO**

Polished terrazzo shall be laid by an approved Sub-Contractor and shall consist of a screed or backing coat and a finishing coat of "Snowcrete" and marble chippings (1:2) mixed with "Cemantone No. 1" colouring compound in accordance with the manufacturer's instructions in

the proportions of 10 lbs. compound to 100 lbs. cement. Overall thicknesses are to be as specified. The finishing coat shall be a minimum of 12mm thick for pavings trowelled to a smooth and even finish and well rubbed and polished with carborundum.

**1079. ATTENDANCE UPON ENGINEER'S STAFF**

The Contractor is to provide the necessary support staff, as and when requested by the Engineer, to assist in some of the duties on site. These staff may include but not be limited to chainmen and other short-term staff required for quality control monitoring. An allowance for these is made in the Bill of Quantities.

## **11. ELECTRICAL INSTALLATION**

### **1101. CONTRACTOR'S LICENCE**

The complete electrical installation shall be carried out by a Registered Electrical Contractor with the valid Class 'A' Electrician's License issued by the Ministry of Energy of the Republic of Kenya.

### **1102. REGULATIONS AND STANDARDS**

The complete electrical installation shall be carried out as per the Specifications and complying with the following documents: -

- a) Regulations for the Electrical Equipment of Buildings (14th Edition) issued by the Institution of Electrical Engineers of Great Britain.
- b) Electric Power Act and the Rules made thereunder.
- c) The Kenya Power & Lighting Co. Ltd.'s Bye-Laws.
- d) Relevant current British, Deutsche Industries Norm (DIN), International Standards Organisation and Kenya Standard Specifications and Codes of Practice.
- e) Government Electrical Specification GES 1 and 2, which can be seen at the office of Chief Electrical Engineer of Ministry of Public Works.

Regulations of 14th Edition of I.E.E. Regulations are in force at present in Kenya and to be observed in conjunction with other related local Bye-Laws and Acts.

### **1103. EXTENT OF ELECTRICAL WORK WITHIN CONTRACT**

The electrical works in the proposed development are required to be complete in all respects as specified herein and shall include all items of equipment, materials, accessories, switchgear, lighting fittings, cables, labour, etc., necessary whether such items are specifically referred in the Contract or not. The Contractor shall be deemed to have included in his Tender, price for all items necessary such that the installations are complete in all respects and left in a satisfactory working order. The Contractor will be responsible for liaison with the Kenya Power & Lighting Company Limited and the Kenya Posts & Telecommunications Corporation to suit the incoming power and telephone requirements. The Contractor shall include for all Civil Works, Structures, Foundations, Builder's Works and associated requirements for the mounting, housing and support of all items of plant and equipment supplied and installed under this Contract. The concrete foundation will be to approved manufacturer's details and instructions. All work and materials are to be of the best quality approved by the Engineer and strictly in accordance with

the Specification. In the event of any portion of the work or materials failing to pass the tests specified herein, or set forth in the Maker's list for that particular item, the Engineer may at his discretion, reject that portion of the work or material entirely.

#### **1104. MATERIALS**

All materials used in the Contract shall comply with the appropriate Standard Specification where such applies. Where materials of a particular manufacturer are called for in the Specification and Drawings, they must be offered. However, the Contractor may alternatively suggest and quote other brands of equal quality approved by the Engineer. Conduit fittings shall be the same metal as the conduit to which they are connected except that Zinc-alloy OR Aluminium-alloy fittings may be used with steel conduits. Conduit fittings and accessories shall conform to the appropriate Standard. Conduits shall be mechanically and electrically continuous. All bends and sets shall be made cold without altering the section of the conduit. The inner radius of the bend shall not be less than two and a half times the outside diameter of the conduit. Not more than two right angle bends will be permitted without the inter-position of the draw-in box. Where straight runs are installed draw-in boxes shall be provided at distance not exceeding 12m. Tees, elbows or sleeves of either inspection or solid type will not be permitted. Conduits which terminate in fusegear, distribution boards, adaptable boxes, non-spout switches, trunking, etc., shall be connected thereto by means of screwed sockets and smooth bore brass male bushes.

Where conduits are installed flush in floor slabs or in chases in walls, they shall be held firmly in position by means of substantial pipe hooks driven into wooden plugs. Where conduits are installed on surface they shall be fixed with spacerbar saddles at a distance not exceeding one metre. Conduits shall be installed entirely separate and at least 150mm clear of the hot water and steam pipes and at least 75mm clear of cold water and other services. The Electrical Contractor shall be responsible to ascertain from site details of reinforced concrete and structural steel work and to check from the Main Contractor's drawings the positions of walls, structural concrete and steel work finishes, etc. No reinforced concrete or steelwork shall be drilled without obtaining permission from the Structural Engineer. All circular conduit boxes shall be of a malleable iron conforming to SRN 052 with 50mm fixing centres fitted with H.G. lids where required. They shall be long spouts internally threaded. Deep boxes or extension rings on standard circular boxes shall be used where necessary in order to bring the front face of each box flush with the ceiling or wall. Conduit boxes installed externally shall be galvanised and where subjected to

direct weather conditions they shall be compound filled. Where the words or other approved or equal are used, they shall mean any make of equal quality but the written approval of the Engineer for the use of such alternative shall be obtained prior to their use in the installation. In the absence of any such request, the Engineer is entitled to suppose that materials used are specified.

**1105. WORKMANSHIP**

The whole of the work shall be carried out in the straight forward manner by competent workmen under skilled supervision. The Engineer shall have the authority to have portion of the work taken down, removed or undone, which is executed in an unworkmanlike manner or with improper materials. Where required, the Electrical Contractor shall submit to the Engineer samples of materials he proposes to install for test and approval before installation. In the event of the portions of the work or materials failing to pass the specified tests, or the approval of the Engineer, the Electrical Contractor shall be required at his own expense to put right such defects.

**1106. INSTRUCTIONS ON SITE**

The Contractor shall be required to maintain on site, at all times, during the progress of the Contract and English-speaking Supervisor, to the satisfaction of the Engineer who shall have a full knowledge of the installation and to whom the instructions can be given on site.

**1107. WORKING DRAWINGS**

The Contractor shall prepare working drawings as necessary and shall submit to the Engineer for approval. Working drawings in triplicate shall include, but not be restricted to the following: -

1. Shop floor drawing or Switchboard and Control Panels.
2. Such other drawings as called for in the Specification or as the Engineer may require.

Approval by the Engineer of the working drawings shall not relieve the Contractor of his obligations under this Contract nor relieve him from correcting any error found subsequently in the approved working drawings.

**1108. RECORD DRAWINGS**

The Contractor shall keep on site at all times a complete set of the drawings relative to this Contract, and as the Contract works are proceeded with, indicate in red colour on such drawings, any variations to the Contract works as executed from those shown on the Contract Drawings. The 'As Built' drawings shall be submitted to the Engineer on completion of works or when demanded in writing. A minimum of three sets of 'As Built' drawings shall be provided.

**1109. TESTING**

On completion of the electrical installation work the installation shall be subject to the following test as laid down in the I.E.E. Regulations and Electric Power Act in the presence of the Engineer or his representative.

- a) Insulation Test
- b) Polarity Test
- c) Earth Loop Impedance Test
- d) Earth Electrode Resistance Test

Any other tests, which may be required by the Engineer. The results of all the tests shall be recorded on a Test Certificate to be signed by the Contractor and submitted to the Client for record. The original of the Test Certificate shall be submitted to the Kenya Power & Lighting Co. Ltd. together with a Completion Certificate. The Contract works shall not be considered complete until all testing has been completed to the satisfaction of the Engineer and the Record Drawings have been approved as installed and all specified spares have been provided.

**1110. L.V. SWITCHBOARD**

This shall be self-supporting, floor mounted, totally enclosed, dust-proof, air-insulated cubicle type switchboard complying with SRN 027 designed for use of 415/440 volts, 3 phase, 50 cycles, 4-wire A.C. System and having a short circuit rating of 30KA at low power factor. The switchboard shall be fully front access or near access as instructed by the Engineer. The switchboard shall be completely wired internally using manufacturer's links for connections between busbar and switch fuses. The switchboard shall be complete with labels and ready for installation. The fuse switch shall be with H.R.C. fuses with fully interlocked front door and conforming to SRN 007 on molded case circuit breakers conforming to SRN 040. The busbars shall be of high conductivity copper and shall be manufactured and tested in accordance with SRN 053. They shall be mounted fully enclosed within the main enclosure of the switchboard in separate chamber in accordance with SRN 027. The busbars shall be fully separated from the incoming and outgoing cable areas. Except for instrument, potential or current connections, which shall be clamped in position and of minimum length, no circuit wiring shall be within the busbar chamber. Such wiring shall be protected with fuses where necessary as called for by the Engineer. Interconnections between busbars and switchgear shall be of minimum length, properly insulated and rigidly supported. All contact areas of the busbar and the connections



fastened to the busbars shall be heavily plated. Joints and connections shall be rigidly made with clamps, bolts and nuts with spring washers.

### **1111. CONDUIT SYSTEM**

#### *a) Metallic Conduits and Accessories*

Metallic conduits shall be of heavy gauge solid drawn or welded steel to SRN 052. No conduit shall be less than 20mm diameter. Conduits installed within the buildings shall be black enamel finish. Where installed externally or on surface in basement areas, conduits shall be galvanised.

#### *b) Non-Metallic Conduits and Accessories*

These shall be rigid PVC super high impact heavy gauge Class 'A' conduit to SRN 054. No conduit shall be smaller than 20mm diameter. Joints shall be made by using an approved cement. Tube and fittings shall be perfectly clean and free from greases. The cement shall be applied to both surfaces and the tube shall be rotated within the accessory to ensure complete coverage. In cases of screwed joints, tubes shall be screwed with standard stocks and dies and shall be used with threaded accessories. PVC conduits shall be used only in situation where ambient temperature is between 70 degrees centigrade (153 degrees Fahrenheit)- 60 degrees centigrade (140 degrees Fahrenheit). Expansion couplers shall be used in straight runs exceeding 6 metre with flexible type joint. These couplers shall be extended in length, the one end of which shall be bored standard depth and the other end shall be provided with a sliding entrance over a longer distance allowing the tube to slide up and down as it expands or contracts. For a watertight joint, adhesive shall be used for the sliding end. All PVC conduit boxes shall be circular pattern of Rigid PVC with push fit or screwed spout conformed to SRN 054, and circular looping boxes to SRN 054.

### **1112. GENERAL WIRING**

The wiring throughout shall be in looping cables from point to point and no tee or other joints shall be permitted. Conductors of the same circuit shall be contained in the same conduit of trunking. At distribution boards, the neutral conductors shall be connected to the neutral bar in the same sequence as the line conductors connected to fuses or circuit breakers so that they can be readily identified.

#### *a) PVC Cables in Conduits*

PVC cables in conduits unless otherwise specified shall conform to SRN 055, 600/1000 volts grade, single core PVC insulated. No cable smaller than 1.5mm<sup>2</sup> shall be used in the installation.

b) *Flexible Cords*

Flexible cords shall be of 300 volts grade, V.R.I. OR PVC insulated conforming to SRN 056. No flexible cord shall be smaller than 0.72mm<sup>2</sup> (24/0.20mm).

c) *PVC*

These cables shall be 600/1000-volt grade, conforming to SRN 024 having standard copper conductors with PVC insulation, cores laid up circular, PVC sheath beading, single wire armour and PVC sheath. The cables shall be terminated on distribution boards, switchboards, trunking or adaptable box with compression type brass gland with locknuts and shroud.

d) *PVC Armoured Cables (with Aluminum Conductors)*

These cables shall be 600/1000 volt grade, conforming to SRN 063 having cores of solid Aluminium conductors, insulated with PVC, armoured with aluminium strip or steel wire with PVC sheath overall.

e) *M.I.C.C. Cables*

These cables shall be 440 or 660 volt grade consisting of high conductivity copper conductors embedded in pure and dense, magnesium oxide insulation, contained in a robust yet ductile, seamless, solid drawn copper sheath conforming to SRN 057. Where installed in corrosive situations, they shall be sheathed with PVC sleeving. Terminations of cables shall be provided with sleeves having a temperature rating similar to that of the seals. Terminations shall be made by means of cold screw on pot type seals and in conjunction with ring type universal glands. The greatest care shall be exercised at all times when terminating M.I.C.C. cables and insulation after. All cables shall give infinity test when tested on 1000 volt megger. Where single core M.I.C.C. cables are used, all necessary precautions shall be taken to prevent Hysteresis. Ferrous plates or structure through which the cables pass shall be slotted and brass glands and sockets shall be used.

f) *Wiring System System A - Cables enclosed in concealed steel screwed conduit or trunking*

The wiring shall be carried out in PVC insulated cables installed in steel screwed conduit or trunking concealed in floor slabs, walls of buildings, installed in roof space or concealed in structural beams and columns.

*System B - Cables enclosed in steel screwed conduits or trunking fixed to the surface of walls and ceiling* The wiring shall be carried out in PVC insulated cables installed in steel screwed conduit or trunking installed on the surface of the walls and ceiling or in false ceiling spaces. Conduits shall be screwed in position by means of space bar saddles using brass round head

screws fixed with rawlplugs. Where two or more conduits are installed in parallel, multiple saddles which are screwed between each way shall be used. Conduits shall be installed horizontally on the walls and vertically to switches or outlets. System C - Cables enclosed in concealed non-metallic conduits The wiring shall be carried out in PVC insulated cables installed in rigid, PVC super high impact heavy gauge conduit concealed in floor slabs, walls of buildings in ceiling space or concealed in structural beams and columns. Each continuity conductor shall be installed throughout the length of the conduit. System D - Cables enclosed in non-metallic conduits fixed to the surface of walls and ceilings The wiring shall be carried out in PVC insulated cables installed in rigid PVC super high impact heavy gauge conduit installed on surface of the walls and ceiling or in false ceiling spaces. Where straight run of conduit in excess of 6m are installed on the surface and approved expansion coupling must be installed at every 6m distance. Switch boxes and lighting point boxes shall be fitted with purpose made earthing connectors. Lighting point outlet boxes shall be fitted with steel insert clips to prevent distortion under load. System E - M.I.C.C. cables installed on surface of the walls and ceilings in the roof space or concealed in walls and floors M.I.C.C. cables shall be secured with copper saddles fixed at 375mm centres on vertical runs and 525mm centres on horizontal runs. Termination shall be made by means of cold screw on pot type seals and conjunctions with ring type universal glands. Insulation test shall be taken as described in Clause 1209 above. System F - cables clipped to the roof members and run in steel conduit or rigid PVC conduit drops concealed in walls The wiring shall be in PVC insulated and sheathed cables securely fixed to the roof member by means of buckle clips and then to switches and outlets through conduit drop (steel conduit or rigid conduit). Earth continuity conductor shall be run throughout, if PVC single insulated and sheathed cables are used or PVC twin with earth shall be used. System G - PVC insulated and sheathed cables clipped to the surface of the wall and roof members or to the ceiling The wiring shall be in PVC insulated and sheathed cables fixed to the roof member, surface of the walls and ceiling only when there is no reasonable access from above. They shall be fixed by means of buckle clips. Where cables pass through holes they shall be bushed. System H - PVC insulated single wire armoured, PVC sheathed cables laid in ducts or saddled to walls All the PVC insulated single wire armoured PVC cables laid direct in the ground shall be laid at minimum depth of 600mm, on 75mm bed of sand. Cables shall be suspended on purpose made frames and hangers, drawn through ducts or laid in trenches. Cables suspended on multiple hangers shall be so arranged that one can be removed without disturbing the other. Frames and hangers shall be

galvanised or of non-ferrous material and shall not be fixed in contact with which they are liable to set up electrolytic action. All spacing of cable hangers and supports shall not exceed those laid down for the relevant size and type of cables in the I.E.E. regulations. PVC SWA cables laid direct in ground shall be provided with concrete cable tiles marked "Danger", "Hatari", throughout. Cables shall be terminated using brass compression glands and cable lugs of appropriate size.

### **1113. LIGHTING SWITCHES**

#### Flush Switches

These shall be flush type contained in steel or alloy boxes of the ratings and gangs as specified on the drawings, complete with overlapping ivory or BMA or Matt Chrome coverplates and switch dolies. They shall be as manufactured by "M.K. Electric Limited", gridswitch range or other equal and approved to SRN 058.

#### Ceiling Switches

These shall be of the semi-recessed ivory pattern for fixing to, standard conduit boxes as "M.K. Electric Limited" list to 3121 or other equal and approved. Surface ceiling switches shall be ivory pattern as "M.K. Electric Limited" list 3121 or other equal and approved to SRN 058.

#### Surface Wall Switches

These shall be contained in a steel box with steel cover plate with rating and gangs as specified on the drawings and as manufactured by "M.K. Electric Limited" either dollyoperated or Rocker-operated or any other equal and approved to SRN 058.

### **1114. SOCKETS AND SWITCH SOCKETS**

These shall be 13 amp, flush pattern in steel box complete with overlapping ivory or BMA or Matt Chrome coverplates. They shall be 13 amp. 3 pin, shuttered, switched or unswitched as specified on the drawings and as manufactured by "M.K. Electric Limited" or any other equal and approved and as per SRN 059. All sockets or switch sockets shall be with fused plugtop containing a fuse whose rating shall be suitable for the load connected to it. The plugtop shall be as manufactured by "M.K. Electric Limited" or other equal and approved and as per SRN 059. The surface type sockets or switch sockets shall be in a steel box with metal clad steel cover plates or ivory insulated with ivory mounting block and backplate as manufactured by "M.K. Electric Limited" or other equal and approved and to the SRN 059.

**1115. FUSED CONNECTION UNIT**

These shall be flush, D.P. switched or unswitched in a steel box with ivory or BMA or Matt Chrome overlapping coverplate with or without pilot light as manufactured by “M.K. Electric Limited” or other equal and approved and as per SRN 059. Surface fused spurboxes shall be in a steel box, D.P. switched or unswitched with metalclad steel coverplates as manufactured by “M.K. Electric Limited” or other equal and approved and as per SRN 060.

**1116. TELEPHONE OUTLETS**

These shall consist of 75 x 75 x 50mm deep steel box with single or double outlet telephone cord-outlet plate, ivory or MBA or Matt Chrome as manufactured by “M.K. Electric Limited” or other equal and approved. A 25mm diameter conduit shall be provided between the telephone outlet plate and the outside / to of the building. Where the conduit is taken to the top of the building, the conduit end shall be bent to prevent ingress of rain water. Conduits shall be left with draw-wires.

**1117. TIME SWITCHES**

These shall be 30 Amps. A.C. 200/250 volts 50 C/S with 9 hours spring reserve, “Venner” type TJDISP or other equal and approved.

**1118. M.C.B. DISTRIBUTION BOARDS AND CONSUMER UNITS**

These shall be surface or flush pattern complete with hinged cover incorporating single pole or three pole circuit breakers as indicated on the drawings. The M.C.B. distribution boards and consumer units shall be as manufactured by CRABTREE OR equivalent. The MCB units shall have a short circuit rating as specified on the drawings or as appropriate to its location in the distribution network. The boards shall be complete with 100 Amps. D.P. or T.P. switches as specified.

**1119. WATER-TIGHT SWITCHES**

These shall be of the rating specified 5 ampere OR 15 ampere single pole as manufactured by ‘THORN’ Cat. No. PD 145. The Protection class shall be IP65, or other approved equivalent.

**1120. RADIO / T.V. AERIAL OUTLETS**

These shall be flush type, ivory, with steel box as manufactured by “M.K. Electric Limited” List No. 3523 WHI/890 OR equivalent. A 25mm diameter conduit shall be provided between the outlet and the top of the building with the top conduit end suitably bent to prevent ingress of rain water. Conduit shall be left with draw-wire.

**1121. BELL PUSHES**

These shall be flush type, ivory, with steel box as manufactured by “M.K. Electric Limited” List No. 4850 WHI/890 OR equivalent. The wiring for bell circuits shall be carried out through 2406V step down transformer.

**1122. COOKER CONTROL UNIT**

These shall be white flush type with pilot lamp, installed in an aluminium stove enamelled box with earth terminals as manufactured by “M.K. Electric Limited” List No. 5011/5120. The Electrical Contractor shall supply and install flush connector box for Cooker underneath the cooker control unit 300mm above floor level, complete with wiring in 6mm<sup>2</sup> PVC cables in 25mm conduit and with terminal block and moulded with cover plate as manufactured by “M.K. Electric Limited” List No. 5045 OR equivalent. The wiring between the connector box and the cooker terminals shall be carried out in 6mm<sup>2</sup> PVC twin with earth cable.

**1123. WATER HEATER SWITCH & CONNECTION TO WATER HEATER**

The Contractor shall wire the water heater switch from 15 Amp., S.P. & N., M.C.B. in the distribution board of consumer unit. The wiring from water heater switch to the water heater shall be in 70 / 0076 x 3 core asbestos flexible cable. The water heater switch shall be 20 Amp, D.P. ivory flush type, with pilot lamp and flex-outlet installed in a box as manufactured by “M.K. Electric Limited” List No. 5523 WHI/890 OR other equal and approved by the Engineer.

**1124. COMPLETION AND INSPECTION CERTIFICATES**

On completion of the Electrical Works, the Contractor shall submit to the Engineer Completion and Inspection Certificates as required by Section E of I.E.E. regulations.

**ELECTRICAL INSTALLATION - SPECIFICATION OF WORK**

**1125. SCOPE OF WORK**

Scope of work shall include the following: -

a) Resident Engineer’s Office

Complete installation of lighting, power, telephone points, lighting fittings, distribution board, meter board, etc. in the Resident Engineer’s Office.

b) Security Lighting

Complete installation of security lighting with columns, cables, lanterns, distribution board, etc

**BOREHOLE DRILLING AND CONSTRUCTION**

## **12. DRILLING AND CONSTRUCTION OF BOREHOLES**

### **1201. DRILLING SITE**

A combination of electromagnetic (EM) profiling and Vertical Electrical Sounding (VES) or any other state-of-the-art Geophysical techniques approved by the Engineer shall be used for Ground water exploration and siting of the boreholes. The siting work should be carried out by the contractor or a specialist approved by the Engineer.

The Contractor shall drill the borehole at the exact location as determined by the geophysical survey and approved by the Engineer. The Employer will provide access and wayleave to the site but it is the responsibility of the Contractor to ensure that the plants and equipment's shall access the drilling site.

### **1202. DRILLING METHOD**

The proposed sites are in the Merti Aquifer which primarily comprises Miocene /Pliocene Sandstones, which range from coarse-grained to fine grained, alongside gravels, grit and Miocene Clays. These are deconsolidated geological formations and would readily collapse at high-pressure blasting by air rotary rigs. It is for this reason that the study recommends mud-rotary methods to execute the drilling.

### **1203. ENVIRONMENTAL PROTECTION**

Care must be taken in the handling and storage of all drilling fluids, oils, greases and fuel on site, to avoid any environmental degradation. The Contractor shall dispose of any toxic materials, drilling fluid and other additives, cuttings and discharged water in a manner approved by the Engineer so as not to create damage to public or private property.

### **1204. SITE AGENT**

The Contractor shall ensure that during the full construction period, a capable site agent shall be present on site

### **1205. WORKMANSHIP**

The Contractor shall carry out all the works as instructed by the Engineer in a thorough and workman-like manner, and up to date professional standards, he shall carry out operations with due efficiency and dispatch in accordance with the terms of the contract and to the satisfaction of the Engineer. For this purpose, the Contractor shall use suitable machinery and gear and employ in the contract efficient and experienced workforce.

All machinery, equipment's and materials to carry out drilling, test pumping, headworks etc. as specified in the Bill of Quantities are to be mobilized to the site.

Test pumping equipment should be independent from drilling rig. At the start of the contract the Engineer will verify the specifications and state the repair of all major items of plant. The Engineer shall have the right to order the removal and/or replacement of any plant which in his opinion is insufficient or unsatisfactory to deliver the required services.



**1206. INSPECTION AND VERIFICATION**

The employer or his authorized agents reserves the right to verify the observations and conclusions contained in the reports of the contractor and shall have the right to supervise all activities of the contractor and operations pertinent to this agreement.

**1207. BOREHOLE DEPTH AND DIAMETER**

The Contractor shall drill to the total depth and such diameter as indicated in the Bills of quantities and as instructed by the Engineer or his representative.

**1208. DRILLING METHOD**

The Contractor may drill using Mud rotary or percussion drilling technique that he finds applicable to achieve the depths and diameters required within the time schedule in the contract.

**1209. SAMPLING**

Representative, continuous samples (min 250 gm) of the strata penetrated shall be collected for each 2m interval using the appropriate standard method or as approved by the Engineer for the drilling technique in use.

The Contractor shall take every possible precaution to guard against samples contamination. At all times samples should be put into suitable sample bags, labeled with the depth interval and stored in a position where they will not be contaminated by the site conditions or drilling operations. Geological logging will be the responsibility of the Contractor.

Installation and diameter of any temporary casing required for the construction of the borehole shall be the responsibility of the Contractor. However, the finished work should meet the borehole specifications. Cost of supply, installation and removal of temporary casing shall be borne entirely by the Contractor. The Employer shall not be responsible for any casing left in the borehole or its retrieval.

**1210. GEOPHYSICAL LOGGING**

Gamma ray and resistivity logs will be conducted in order to accurately identify the changes between lithological units and their properties.

**1211. TEMPORARY CASING**

Installation and diameter of any temporary casing required for the construction of the borehole will be left to the Contractor so long as the finished product meets the borehole specifications. Cost for supply, installation and removal of temporary casing shall be borne entirely by the Contractor.

The Contractor shall not claim any casing that is not retrievable and left in the borehole.

**1212. WATER SUPPLY FOR DRILLING**

The Contractor shall make his own arrangements for obtaining, storing, transporting and pumping of water required for drilling/development purposes, and for use by the drilling crew at their campsite. The costs for the same are deemed to be included in the BOQ rates.

**1213. BOREHOLE DESIGN**

The design of the borehole shall be made by the Engineer in consultation with the Contractor after drilling is completed. However, a typical standard borehole design is provided in the Tender Drawings. Drill with 12" bit to the maximum depth, case with 10" steel casing and seal with cement grout. Drill with 10 5/8" bit to final depth. Install 8" (200mm) Steel Casings and screens as appropriate. The screened sections shall be gravel packed.

**1214. CASINGS AND SCREENS**

The borehole shall be lined with steel casings, 200mm and acquirer zones with screens of equivalent strength and dimensions. The screens open area shall not be less than 4% of solid area and shall have a uniform a size of 1mm. Screens shall be provided at lengths of 3m maximum and joined water tight, by either flush threaded connections or as recommended by the manufacturer or equivalent standard, so that the resulting joint is straight and have the same strength as the casings and screens.

The bottom end should be sealed with a bottom cap as expressly required. The casings and screens must be centralized in the borehole so that a 1" (25mm) annular space exists between the borehole wall and the casing. Suitable centralizers should be provided to allow the casings and screens to be correctly in the center of the drilled bore.

Along the screened sections a centralizer should be used every 3m while along the cased sections every 6m will suffice vertically.

The Contractor shall be responsible for the verticality of the borehole during drilling to ensure there is no departure of 3 in 100 between the ground level and the base of the borehole. If required the Contractor shall carry out a verticality test by an approved method. For any departure which is more than allowable, the contractor will make the necessary corrections to the approval of the Engineer at his own cost. The Contractor will not be legible for payment if the borehole is abandoned for failing the verticality test and cannot be corrected.

**1215. GRAVEL PACK**

The Contractor shall provide and install gravel pack material of approved quality of size 3-5mm. Gravel packings shall be installed to cover completely the uppermost screens, plus additional 2 m length to allow for settling. The pack shall be capped with clay seal to prevent contamination.

**1216. SANITARY SEAL**

The upper 3m of the borehole shall be grouted with 1.85 – 2.15 Kg/L cement slurry. The grout shall be injected into the annulus between the casing and the wall of bore.

**1217. YIELD ESTIMATES DURING DRILLING**

The Contractor shall continuously air lift yields in a method approved by the Engineer which shall correspond to method of drilling.

**1218. DEVELOPMENT AND CLEANING OF BOREHOLES**

The method proposed by the Contractor for development of boreholes shall be submitted to the Engineer for his approval. Development of boreholes shall be effective from the depth at which water is encountered to the bottom of each borehole. Development shall continue until water is completely free from fine particles, as to be decided by the Engineer. Upon completion of

development, any accumulation of material shall be removed from the bottom of the borehole by airlifting.

**1219. TEST PUMPING**

The Contractor shall perform test pumping to establish performance and yield of borehole. The period for test pumping shall be 24 hours at constant discharge whose variation is at the discretion of the Engineer. The Contractor shall provide suitable pump for this purpose to the approval of the Engineer which shall determine varying of discharge.

Before Test Pumping s commenced, the borehole will be subjected to short term testing (calibration) to establish the approximate yield/draw down characteristics and to decide upon pumping rates and durations of step-drawdown or continuous yield tests. Sufficient time shall be allowed for the recovery of water levels in boreholes between each type of test.

The test pumping of the boreholes shall be carried out such as to facilitate plotting of yield equilibrium curves and related drawdown and recovery curves.

The pumping shall be started initially with abstraction rate 40% to 50% of the expected maximum yield. Before the pumping is commenced, the water rest level shall be measured either by the air-line or by electric sounder. The drop in the water level shall be checked every 5 minutes for the first 30 minutes after the pumping is commenced and thereafter at every 10 minutes until the equilibrium level is reached. The pumping shall be carried out for at least one hour after the equilibrium drawdown level is established. If the level remains unchanged, then the pumping shall be stopped and water levels measured at every 5 minutes for the first 30 minutes and thereafter every 10 minutes until initial water level is regained.

The above procedure shall be repeated with abstraction rates raised steps of 2m<sup>3</sup> per hour or any other appropriate range, until the maximum is reached.

Once the maximum is reached with an equilibrium drawdown level the test shall be continued for at least 24 hours after the level has been established. If the level remains unchanged then the pumping is stopped and recovery rate measured as described earlier above.

The pumping rate, drop in levels, recovery etc. shall be recorded together with complete details form the pumps used for testing. Any unusual occurrence (e.g. sudden drop in abstraction) shall also be recorded.

During all testing operations, once the flow rate has been determined and preliminary adjustments made, the measured discharge rate shall be maintained within 5% of the required rate for the duration of the test.

No payment shall be made when a testing has aborted either because of pumping failure or more than allowable discharge step-drawdown shall be carried at three separate discharges and after test pumping all the data shall be supplied to the Engineer.

**1220. AFTER LEVEL OBSERVATION**

The Contractor shall supply appropriate electric contact water level gauges for measuring water levels in the boreholes to the nearest 10mm as pre-determined intervals. Well head arrangement shall permit these gauges to be inserted and passed freely. Hereto, the Contractor shall be required to install a dipping tube, minimum ¾” (19mm) inner diameter, lowered to approximately 1m above the pump intake or approximately 2m below anticipated maximum drawdown level. Other methods for measuring water levels are subject to approval by the Engineer.

**1221. ELECTRICAL CONDUCTIVITY MEASUREMENTS**

The Contractor shall have an operational EC-meter on site to take electrical conductivity readings whenever required during drilling, development and test pumping.

**1222. RECORDS**

Daily activity records shall be kept by the Contractor for each borehole. The records shall contain the information as specified below. In addition, separate records should be supplied for each borehole upon completion.

- Daily Records
- Site Name
- Reference Number for borehole
- Dates of reporting and climatic conditions
- Names of Foreman and Drillers
- Method of drilling and total hours of drilling
- Diameter of hole at start and depth of changes in diameter
- Depth of hole at start and end of shift or working day
- Depth and size of casing at start and end of shift
- Description of rocks drilled with depth of transition encountered
- Depth at which water is struck
- Yield of air lifted water, when drilling or developing with air
- Time log showing rate of penetration in minutes per meter, type of bit, and standby time due to breakdown.
- Depth intervals at which each formation samples are taken.
- Records of components and quantities used or added to the drilling fluid or air.
- Water level at start of each working day
- Electrical conductivity measurement
- Problems encountered during drilling.
- Details on installation in the borehole (if any).
- Depth and description of well casing
- Depth and description of well screens.
- Details of work to be involved at hourly rates (eg test pumping)

A copy of the daily drilling shall be made available for signature daily, including any other pertinent data as may be requested by the Engineer.

**1223. Borehole Completion Record**

Within a period not exceeding **one month** after completion of the drilling, the Contractor shall submit a report.

- As per standard borehole completion form provided
- Detailed driller's log
- Copy of standard chemical water quality test
- Borehole design and installation details (as-is-built drawings)

A copy of the Borehole Completion Record shall be made available to, and approved by the Engineer on completion of each borehole, before being forwarded to the Employer.

**1224. WATER SAMPLING**

Water samples for testing the chemical and (if requested by the Engineer) bacteriological water quality will be taken at the end of the test pumping. These samples shall be collected in suitable clean bottles, once they have been rinsed with the same groundwater. They shall then be filled, sealed and marked properly i.e. indicating borehole number, date and hour of sampling.

**1225. CAPPING THE BOREHOLE**

During borehole construction, installation, development and test pumping, the contractor shall use all reasonable measures to prevent entrance of foreign matter into the borehole. The Contractor shall be responsible for any objectionable materials that may fall into the borehole and any effect it may have on water quality or quantity until completion of the works and acceptance by the Engineer or the Employer.

**1226. ACCEPTANCE OF BOREHOLES**

The boreholes shall only be accepted by the Engineer upon satisfactory completion of all drilling operations, installation of casing and screens, development works, pump testing and wellhead construction.

**1227. LOSS OF EQUIPMENT**

Any equipment lost down a borehole must be removed or the borehole will be considered a lost bore. A replacement borehole will have to be constructed and test pumped at the Contractors expense.

**1228. LOST BORE**

Should any incident to the plant, behavior of the ground, jamming of the tools, or casing, or any other cause prevent the satisfactory completion of the works, a borehole shall be deemed to be lost and no payment shall be made for the bore or for any materials not recovered there from, not for any time spent during drilling while attempting to overcome problems. Also the borehole should be permanently sealed.

In the event of a lost bore, the contractor shall construct a borehole immediately adjacent to the lost bore or at a site indicated by the Engineer. The option of declaring any bore lost shall rest with the Contractor, subject to the approval of the Engineer.

The abandoned hole shall be treated as follows:

- (a) The Contractor may salvage as much casing and screen from the initial borehole as possible and use it in a new borehole if not damaged, with the approval of the Engineer.
- (b) Salvaged material shall remain the property of the Contractor.
- (c) The borehole shall be sealed by concrete, cement grout, or neat cement and shall be placed from the bottom upward by methods that will avoid segregation or dilution of materials.
- (d) The upper 2 meters of borehole shall be backfilled with native top soil. Sealing of the abandoned boreholes shall be done in such a manner as to avoid accidents and to prevent it from acting as a vertical conduit for transmitting contaminated surface or subsurface waters into the water bearing formations.

**1229. TIME SCHEDULE**

The contractor shall mobilize the required personnel and equipment to carry out satisfactory the programme, and in so doing, shall take into account the urgent need to complete all the boreholes at an early date. The contractor shall maintain, as may be required, an adequate number of qualified personnel to discharge satisfactorily his obligations under this agreement.

**1230. STANDBY TIME**

In the event of delays occurring as a result of action or inaction by the Employer, for which the Contractor would be entitled to claim Standby Time, the Contractor should notify the Engineer immediately in writing that such claims are becoming application.

**1231. CONSTRUCTION OF WELL HEAD COVER AND APRON**

The contractor shall on completion of each borehole cap the top of the borehole with a mild steel blank flange, which shall incorporate a threaded nipple of 19mm (3/4") diameter with cap, welded to the flange, to enable dipping access to the borehole. The blank flange shall be 400mm above ground level and be bolted to a mild steel flange welded to a minimum of 2m length of mild steel casing coated internally and externally with non-toxic or bitumen or epoxy coating to the approval of the Engineer. The casing shall fit neatly over the uPVC casing and be permanently grouted in at the time of completion of the borehole. Prior to, during and after the construction of headworks, the Contractor must ensure that no debris whatsoever falls into the borehole.

**1232. WELL DISINFECTION**

Disinfection of the borehole shall be carried out by the Contractor before demobilization from site. This shall be done by placing a chlorine solution into the well so that a concentration of at least 50 mg/l of available chlorine existing in all parts of the borehole at static conditions. All the borehole surfaces above the static water level shall be completely flushed with the solution. The solution shall remain in the borehole a minimum of 2 hours before pumping the borehole waste.

**1233. CLEARING THE SITE**

On completion of each borehole the site must be left clean and free from all debris, hydrocarbons and waste, and all pits filled to the satisfaction of the Engineer. A site not delivered clean may render the borehole unacceptable.

**1234. CHOICE OF BOREHOLE PUMP**

Notwithstanding the pump discharge capacity indicated in the Bill of Quantities, the final decision on the pump discharge capacity shall be on the basis of the safe yield of the borehole and the pumping head as determined by the test pumping results.

**1235. SCHEDULE OF PAYMENTS**

The payment of work executed by the Contractor and accepted by the Client according to this agreement shall be made by applying either one or the other of the rate of charges hereunder according to the drilling category and nature of works actually executed.

For applying the quoted rates, the following points shall be taken into account:

- (a) Drilling of borehole will be paid for on the basis of meters drilled from surface to total depth.
- (b) Payment for respective size of casing installed will be on the basis of meters furnished and installed. The prices per meter include all operations and all supplies necessary for installing and cementing. The casing will be measured overall (including collars and threads).
- (c) Payment for screens will be on basis of meters (units) furnished and installed, including collars and threads. The price per meter include all operations and supplies necessary for setting the gravel packing.
- (d) Compensation for testing operations (pumping tests) will be paid on an hourly basis. The hourly price will be applied from the time that the pump starts operating for the pumping test proper as such until the time normal operations can be resumed. The pro-rata price will be applied to elapsed time approximated to the nearest quarter of an hour.

## **13. STANDARD REFERENCE NUMBERS**

### **12.1 Introduction**

The Engineer has agreed to use a method of modifying the text of engineering specifications by referring to a Standard Specification Reference Number (SRN) instead of a National Standard and then providing a tabulated comparison between British and German Standards, cross-referenced further where appropriate to an International Standard (ISO), an International Electro-technical Standard (IEC), to an American Waterworks Standard (AWWA) or other appropriate National Standards.

### **12.2 General Clause on Standard Specification**

A general introductory clause to be inserted into general specification documents has been prepared. It is quoted below to assist in the preparation of Future Specification Volumes.

### **12.3 Standards**

The Contractor shall observe these Specifications and shall carry out all work in a skilled and workmanlike manner in keeping with modern methods of mechanical and construction engineering. In addition, the Contractor shall conform with all conditions currently in force with regard to the execution of construction work and shall follow all instructions issued by the competent Authorities, the Employer and the Engineer. Where Standard Specifications are referred to in the Text of the Specifications this is done by reference to a Standard Specification Reference Number (SRN). A table of comparison is annexed to this Specification where the SRN is cross-referenced to Standard Specifications issued by the International Standards Organization (ISO) and to National Standard Specification that will be accepted in their English version by the Engineer as providing for the quality of workmanship etc. required. The Tenderer shall at his discretion base his Tender on one or other of the National Standard Specifications indicated in that table save that where a relevant Standard Specification issued by the ISO exists at the date of Tender, such an International Standard should as a minimum be complied with. As the National Standards referred to in the table of comparison may expand on or strengthen further the requirements of ISO, Tenderers choosing not to comply with one of the National Standards indicated may either indicate an alternative National Standard with which they shall comply or provide with their Tender a full and detailed description of the Standards they propose to attain.



Where a Tenderer offers a particular item to a National Standard not specified in the table of comparison he shall comply with the requirements of the Instructions to Tenderers in this respect and shall enclose a copy in English of the alternative National Standard offered with his Tender. Alternative National Standards or Tender's own detailed description of the Standards they propose shall be subject to the approval of the Engineer.

**12.3. List of National Specification Cross Referenced**

The list has been sub-divided into sections as follows: -

SRN No.	Specification
001-099	Electrical and Mechanical
100-199	Concrete
200-299	Metallic Pipes and Fittings
300-399	Fittings
400-499	Other Pipes and Fittings
500-599	Valve, Meters, Hydrants and Other Specials
600-649	Testing Methods and Equipment
650-699	Site Work Codes of Practice
700-749	Drawing Practice, Standard Symbols, etc.
750-799	Glossary
800-899	Building Materials (exclu. In-situ Concrete)
900-999	Miscellaneous

**3.1 CONCRETE**

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
100	METHOD FOR SPECIFYING CONCRETE	1045	TBL.1	5328	TBL.3	KS 02-594	
101	STANDARD OF MATERIAL AND WORK-GENERAL	see	VOB	8110		VOB 2	
102	STANDARD OF MATERIAL, WATER RETAINING STRUCTURES		SUB NO.	8007			
103	ORDINARY PORTLAND CEMENT	1164	1	12		KS 02-1262& KS 02-1263	
104	SULPHATE RESISTANT CEMENT	1164	1:CL.4	4027			
105	MORTAR CUBES-COMPRESSIVE STRENGTH	1164	1:CL.4-4	12	METHOD 2 CL 7.3	ISO 3893	
106	CEMENT-TEST FOR SOUNDNESS		6, EN.112	12	CL.9		
107	SAMPLING AND TESTING OF AGGREGATES	4226	1-4	812	1,2,3	BS EN 1097-3 BS EN 932	BS 812 part 1 by BS 882 Part 2 Replaced by BS EN 1097-3 Part 102 Replaced by BS EN 932-1 but remains current
107	SAMPLING AND TESTING OF AGGREGATES (CONT)	1045		812	101-119		
108	FINE AGGREGATE FOR CONCRETE-GENERAL	4226	1-4	882	TBL.2		
108	FINE AGGREGATE FOR CONCRETE-GENERAL ( CONT)	1045					
109	FINE AGGREGATE FOR CONCRETE-GRADING	4226	1-4	882	TBL.2		
110	COARSE AGGREGATES FOR CONCRETE- GENERAL	4226		882	CL.4.1		
110	COARSE AGGREGATES FOR	1045					

CHAPTER 12: STANDARD REFERENCE NUMBERS

	CONCRETE- GENERAL ( CONT)						
111	COARSE AGGREGATES FOR CONCRETE - GRADING	4226		882	TBL.2		
111	COARSE AGGREGATES FOR CONCRETE - GRADING ( CONT)	1045					
112	COARSE AGGREGATES FOR CONCRETE - SHRINKAGE AND ABSORPTION	4226		812	2	ISO 6783 BS EN 1367	BS 812 Part 120 Replaced by BS EN 1367 but remains current
112	COARSE AGGREGATES FOR CONCRETE - SHRINKAGE AND ABSORPTION ( CONT)	1045					
113	COARSE AGGREGATES FOR CONCRETE- FLAKINESS	4226		812	105.1		
113	COARSE AGGREGATES FOR CONCRETE- FLAKINESS (CONT)	1045					
114	WATER FOR MAKING CONCRETE	4226		3148			
114	WATER FOR MAKING CONCRETE (CONT.1)	4030					
114	WATER FOR MAKING CONCRETE (CONT.2)						
115	CONCRETE MIX DESIGN - GENERAL			5328			
115	CONCRETE MIX DESIGN - GENERAL (CONT)	1084	1				
116	TRIAL MIXES - CUBES	1048		1881	108		
117	SAMPLING & TESTING OF CONCRETE	1048		1881	5, 114,121, 122	ISO 1920, 4012,4108,	
118	CONCRETE BATCH MIXER			1305			BS 1305 Obsolescent
119	CONCRETE BATCH TYPE MIXERS	459		3963			BS 3963 Obsolescent

CHAPTER 12: STANDARD REFERENCE NUMBERS

120	STRUCTURAL USE OF R/C IN BUILDING	1045		8110	1		
121	CONCRETE TRUCK-MOUNTED MIXERS	1084	3	4251		Withdrawn	BS 4251 Withdrawn
122	BITUMEN RUBBER JOINT SEALING COMPOUND			2499	TYPE A1		
123	POLYSULPHIDE JOINT SEALING COMPOUND			4254			BS 4254 Obsolescent
124	WATERPROOF BUILDING PAPERS			1521	(CLASS B)		
125	IMPACT TESTING OF MILD STEEL	488	3	7613 7668			BS 4360 Withdrawn Replaced by BS 7613,BS 7668 BS EN 10029 Parts 1 to 3 of BS EN 101113 BS EN 10155,BS EN 10210-1
126	STEEL R/F HOT-ROLLED STEEL BARS	488	1-3	4449			
127	STEEL R/F COLD TWISTED	488	1-3	4449			
128	STEEL R/F STEEL FABRIC	488	4-5	4483			
129	BAR REINFORCEMENT AND BENDING			4466			
130	SAND FOR INTERNAL PLASTERING	4226		1199			
131	PLYWOOD SHUTTERING	68791		6566	1-8		BS 6566 Withdrawn Replaced by various BS EN standards on the same subject
131	PLYWOOD SHUTTERING (CONT)	68792					
132	CONCRETE COMPACTION	4235	1,2				
133	CONCRETE SITE QUALITY CONTROL	1084	1				
134	DESIGN OF CONCRETE MIXES	52171		See HMSO		HMSO RD NOTE 4	
135	SAND FOR MOTOR	4226		1200			
136	SAND FOR	4226		1199			

CHAPTER 12: STANDARD REFERENCE NUMBERS

	RENDERING						
137	HOT APPLIED JOINT SEALER			2499			
138	WATER STOPS AND WATER BARS	7865	1,2	8007			
139	TESTING CONCRETE STATIC MODULES (COMPARISON ELASTICITY)			1881	121		
140	TESTING CONCRETE - WATER ABSORPTION			1881	122		
141	TESTING CON SAMPLING, TESTING FRESH CONCRETE E.T.C	1048		1881	101-110 & 113	KS 02-595:1-8	
142	PRECAST CONCRETE COMPONENTS (COPING UNITS)			5642/2	2		
143	STRUCTURAL USE OF CONCRETE DESIGN & CONSTRUCTION			8110	1		
144	STRUCTURAL USE OF CONCRETE -SPECIAL CIRC						
145	IN-SITU CONCRETE DIAPHRAM WALLS	4126					
146	TEST SILVER FOR AGGREGATES			410			
147	LIGHT WEIGHT AGGREGATES FOR CONCRETE	4226	2,3	3797	2		BS 3797 Partially Replaced by BS EN 1744-1:1998
148	SUPERSULPHATED CEMENT			4248 (4550)			BS 4248 Partially Replaced by Parts and Section of BS 4550
149	CONCRETE ADMIXTURES			5075			
150	GRADUATE MEASURING CYLINDER			604		ISO 4788	
151	COLD REDUCED STEEL WIRE FOR THE REINFORCEMENT OF CONCRETE			4482			

**CHAPTER 12: STANDARD REFERENCE NUMBERS**

152	FUSION BONDED EPOXY COATED CARBON STEEL BARS FOR THE REINFORCEMENT OF CONCRETE			7295	1&2		Part 1: Coated bars Part 2: Coatings
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**3.2 METALLIC PIPES AND FITTINGS**

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
200	GREYCAST IRON PRESSURE PIPES AND FITTINGS			1211		ISO 13:ISO 49	BS 1211 Obsolescent Partially Replaced by BS 4772
200	GREY IRON PIPES AND FITTINGS (CONT)			4622		ISO 13	BS 4622 Obsolescent
201	CAST IRON FLANGED PIPES&FITTINGS			2035			BS 2035 Obsolescent Partially Replaced by BS 4772
202	DUCTILE IRON PIPES&FITTINGS (WATER)					ISO 2531,EN 545	
202	DUCTILE IRON PIPES&FITTINGS (SEWERAGE)					EN 598	
202	DUCTILE IRON PIPES&FITTINGS (GAS)					EN 969	
203	STEEL TUBES WITH PLAIN OR THREADED ENDS			1387		ISO 65	
203	STEEL TUBES WITH THREADED ENDS (CONT)	2440					
203	STEEL TUBES WITH THREADED ENDS (CONT)	2441					
203	STEEL TUBES WITH THREADED ENDS (CONT)	2442					
203	STEEL TUBES WITH THREADED ENDS THREADS	76	2	21		ISO 7/1:1982 ISO 7/2:1982	
204	WROUGHT STEEL PIPE			1740	1	ISO 4145	

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<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
	FITTINGS TO SSRN 203						
204	TH. STEEL PIPE FITTINGS TO SSRN 203	2980					
204	TH. STEEL PIPE FITTINGS TO SSRN 203- LONG THREAD	2981					
204	TH. STEEL PIPE FITTINGS TO SSRN 203- NIPPLES	2982					
204	TH. STEEL PIPE FITTINGS TO SSRN 203- BENDS	2983					
204	TH. STEEL PIPE FITTINGS TO SSRN 203- TEES E.T.C	2987	1,2				
204	W. STEEL PIPE FITTINGS TO SSRN 203- BUSHINGS	2990					
204	W. STEEL PIPE FITTINGS TO SSRN 203- PLUGS&CAPS	2991					
204	TH. STEEL PIPE FITTINGS TO SSRN 203- SOCKETS	2986				ISO 7-2:1982	
204	W. STEEL PIPE FITTINGS TO SSRN 203- RED'NG SOCKETS	2988					
205	COPPER TUBES FOR WATER					EN 1057.ISO 8493 (TESTS)	
205	COPPER TUBES FOR WATER (CONT)	1754	3				
205	COPPER TUBES FOR WATER	1755	3				
206	COPPER TUBES- GENERAL PURPOSE			2871	2	ISO 196:1978	
206	COPPER TUBES- GENERAL PURPOSE (CONT)	1754	1,2				
206	COPPER TUBES- GENERAL PURPOSE (CONT)	1755	1,2				
207	FLANGES FOR FERROUS PIPES - STEEL BY PN	2500		4504	3-3.1	ISO 7005- 1:1992	BS 4504 Part 3 : Sections 3.2 (1989) Withdrawn

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<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
							Replaced by BS EN 1092-2 (1997)
207	FLANGES FOR FERROUS PIPES - STEEL BY CLASS	2501	1	1560	3-3.1	ISO 7005:1988: ANSI B16.5	
207	FLANGES FOR FERROUS PIPES - CI BY CLASS	2519	1	1560	3-3.2	ISO 7005-2	
207	FLANGES FOR FERROUS PIPES - CI BY PN				2	EN 1092,ISO 2531:1991: ISO 7005-2:1988	
207	FLANGES FOR FERROUS PIPES - SLIP ON FOR WELDING	2576					
207	FLANGES FOR FERROUS PIPES - WELDING NECK	2627-38					
207	FLANGES FOR FERROUS PIPES - SCREWED	2566					
207	FLANGES FOR FERROUS PIPES - LAPPED-PLAIN COLLAR	2655-56					
207	FLANGES FOR FERROUS PIPES - LOOSE WELDING NECK	2673					
207	FLANGES FOR FERROUS PIPES - CONTACT SURFACE						
207	FLANGES FOR FERROUS PIPES - BLANK	2527					
208	GASKET DIMENSIONS TOSSRN 207 (a) & (d)				1	EN 1514	
208	GASKET DIMENSIONS TOSSRN 207 (a) & (d) (CONT)				2	EN 1514	
208	GASKET DIMENSIONS TOSSRN 207 (a) & (d) (CONT)				3	EN 1514	
208	GASKET DIMENSIONS TOSSRN 207 (a) & (d) (CONT)				4	EN 1514	



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<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
208	GASKET FOR GROOVED FLANGES	2693					
208	GASKET FOR GROOVED O- RINGS	2697					
209	C.I PIPE FITTINGS, MALLEABLE,SCREWED					ISO 49:1994	
210	STEEL PIPES & FITTINGS- GENERAL			534			
210	STEEL PIPES & FITTINGS- WATER GENERAL	2460		534		EN 10224, AWWA C200-97 NFA 47-150	
210	STEEL PIPES & FITTINGS- DESIGN	2413	1,2	8010 2.1		AWWA M11	
210	STEEL PIPES & FITTINGS- WELDING JOINTS	2559	1,2,3	8010 2.1		AWWA M11	
211	CEMENT MOTOR LINING- D.I PIPES			EN 545		EN 545,AWWA C.104A,C602-95	
211	CEMENT MOTOR LINING- D.I PIPES	2614					
211	CEMENT MOTOR LINING- D.I PIPES (CONT)					DVGW W343 ISO 4179:1985 ISO 6600:1980	
212	CEMENT MOTOR LINING- STEEL PIPES	2614		534		AWWA C205 NFA 49-701DVGW- W343/W346	
212	CEMENT MOTOR LINING- STEEL PIPES (CONT)	2614				AWWA C602-95 ISO/DIS 8324	
213	S PIPES& TUBES- MATERIAL PROP TESTS	1629		3600		AWWA C 200-97	
213	CARBON STEEL PIPES AND TUBES			3601		ISO 2604/2/3/6	
213	STEEL PIPES AND TUBES- SPECIAL REQUIREMENTS	1626					
213	STEEL PIPES AND TUBES – SEAMLESS	2448					
213	STEEL PIPES AND	2458					

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<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
	TUBES – WELDED						
214	BITUMEN PROTECTION TO IRON AND STEEL-HOT			4147		BS 4147 type 1, grade “d”	
214	BITUMEN PROTECTION TO IRON AND STEEL-COLD			3416		BS 3416 type II	
214	BITUMEN PROTECTION TO STEEL PIPES E.T.C	30673	Type E4				
214	BITUMEN PROTECTION TO DUCTILE IRON PIPES	30674	4				
215	EXT. PROTECTION-IRON& STEEL EPOXY C			None		AWWA C210-97	
216	STEEL FITTINGS – REINFORCING			None		AWWA C208-59 AWWA M11	
216	STEEL FITTINGS – DIMENSIONS			534		AWWA C208-59 AWWA M11	
217	D.I PIPES& FITT. SCREWED GLAND JOINTS					See SSRN 219	
218	D.I PIPES& FITT. BOLTED GLAND JOINTS					See SSRN 219	
219	D.I PIPES &FITT. S&S JOINTS			8010	2-2.1		
219	D.I PIPES &FITT. S&S JOINTS (CONT)					EN 545	
219	D.I PIPES &FITT. S&S JOINTS (CONT)	28603					
219	PIPELINES ON LAND: DESIGN, CONSTRUCTION AND INSTALLATION: STEEL FOR OIL AND GAS			8010	2.8		
220	D.I PIPES – ZINC COATING & PROT. SHEATS	30674	3	None			
221	IRON&STEEL PIPES ENAMEL-HOT APPLIED			7873		AWWA C203-97	
221	STEEL FLANGED PIPES& FITTINGS-ENAMELLED	2873					

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<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
222	ELASTOMERIC JOINTS , RINGS- REQUIREMENTS			2494			Partly Replaced by BS 7874 and BS EN 681-1
222	ELASTOMERIC JOINTS , RINGS- VULCANIZED RUBBER				1	EN 681	
222	ELASTOMERIC JOINTS , RINGS- DRAINS AND SEWERS	4060					
223	PIPE THREADS – TUBES & FITT. (WATERTIGHT)	See ISO DIN		21		ISO 7/1: 1982 ISO 7/2 : 1982	
224	CAST IRON S& S PIPES & FITTINGS			78	2		BS 78 Withdrawn, Replaced BY BS 4622 Part 2 Obsolescent, Partially replaced by BS 4772
225	STEEL PIPES- HOT DEEP GALVANISING					EN 10240	
226	CARBON STEEL FITTINGS- BUTT- WELDING –GENERAL	2609		1965	1		BS 1965 Part2 Withdrawn
226	STEEL FITTINGS – BUTT- WELDING TEES	2615	1,2				
226	STEEL FITTINGS – BUTT- WELDING REDUCERS	2616	1,2				
226	STEEL FITTINGS – BUTT- WELDING CAPS	2617					
227	POLYTHENE SLEEVING FOR STEEL PIPES& FITTINGS	None		None		ISO 8180:1985	
227	POLYTHENE SLEEVING FOR D.I PIPES	30764	5				
228	ST PIPES- DIMENSION & MASSES- PRESS. PURPOSE	2413	1,2	3600			
228	S PIPES- DIMENSION & MASSES- PRESS. PURPOSE (CONT)	2460					
229	STAINLESS STEEL TUBES& WIRES			1554			

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<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
229	STAINLESS STEEL TUBES& WIRES (CONT)			4825	1	ISO 2037:1980	
229	STAINLESS STEEL TUBES& WIRES (CONT)			6362		ISO 7598	
229	STAINLESS STEEL TUBES& WIRES (CONT)	17457					
229	STAINLESS STEEL TUBES& WIRES (CONT)	17440					
230	STEEL PIPES FOR WATER FLEXIBLE SOCKETS & SPIGOT JOINTS	2460		CP2010-2		EN 10224, ISO 559	
230	STEEL PIPES FOR WATER FLEXIBLE SOCKETS & SPIGOT JOINTS	2460		CP2010-2		EN 10224, AWWA C200-97	
231	FERROUS P DEFINITION OF NOMINAL PRESSURE			None		ISO 7268:1983	
232	STEEL PIPELINES- TAPE COATING SYSTEMS	30672	1	None		AWWA C214-95	
233	BURSTING DISCS& DEVICES			2915		ISO 6718:1991	
234	STEEL PIPES FOR PETROLEUM AND GAS INDUSTRY	17172				EN 10208-2, API 5L	
235	FITTINGS TO STAINLESS STEEL TUBES			4825	2	ISO 2851:1973	
235	FITTINGS TO STAINLESS STEEL TUBES (CONT)			4825	3	ISO 2852:1974	
235	FITTINGS TO STAINLESS STEEL TUBES (CONT)			4825	4	ISO 2853:1976	
235	FITTINGS TO STAINLESS STEEL TUBES(CONT)			4825	5		
236	FITTINGS TO BRASS TUBES			2051	1		
237	RUBBER GASKET MATERIAL JOINTS FOR PIPELINES			2494		ISO 4633:ISO 6447:ISO 6448	
238	STORAGE OF			None		ISO	

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<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
	VULCANISED RUBBER					2230:1973	
239	BITUMINOUS VARNISH DUCTILE IRON PIPES			None		ISO 8179- 2:1995	
240	FOUNDING- SPHEROIDAL GRAPHITE CAST IRON					EN 1563	
240	FOUNDING AUSTEMPERED DUCTILE IRON CASTINGS					EN 1564	
241	FUSION BONDED EPOXY COATINGS FOR STEEL PIPES	30671		None		EN 10309, AWWA C213 NFA 49-706	
241	FUSION BONDED EPOXY COATINGS FOR STEEL PIPES					AWWA C213	
242	FLEXIBLE BOLTED SLEEVE COUPLINGS			534		AWWA C219	
243	FLEXIBLE GROOVED AND SHOULDERED COUPLINGS					AWWA C606	
244	SPHERICAL JOINTS FOR WELDING, STEEL PIPES			534		UNI 6363	
245	BIT.SEAL COAT'GS ON D.I PIPE CEM. MOR.LINING			7892			
246	POLYMERIC FILM PRO. SLEEV'G FOR IRON PIPES	30674	5	6076		EN 534	
247	HOT ENAMEL COATING TO IRON & STEEL PIPES			7873			
248	EXTERNAL ZINC COATINGS ON D.I PIPES	2444		None		ISO 8179- 1:1995	
249	BOLTS & NUTS FOR PIPELINES	2507		None			
250	STEEL PIPELINES – THERMOSET PLASTIC COATINGS	30671		BGC/CW6		AWWA C213 NFA 49-706	
251	STEEL PIPES- POLYPROPYLENE COATING	30678		None		EN 10286, NFA 49-711	
252	STEEL TUBES ELECTROMAGNETIC				1	EN 10246	

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<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
	TESTING –LEAKS						
253	TWO& THREE LAYER POLYTHENE COATINGS FOR STEEL PIPES	30670		534		AWWA C215 NFA 49-704 NFA 49-710	
254	LIQUID EPOXY COATINGS FOR STEEL PIPES					AWWA C210	
255	LIQUID EPOXY LININGS FOR STEEL PIPES					AWWA C210 NFA 49-709	
256	LIQUID POLYERUTHANE COATINGS FOR STEEL PIPES	30671				AWWA C222	
257	LIQUID POLYERUTHANE LININGS FOR STEEL PIPES					AWWA C222 NFA 49-709	
258	EXTRUDED POLYETHENE COATINGS FOR DI PIPES	30674	1	EN 545		EN 545	
259	CEMENT MORTAR COATINGS FOR D.I PIPES	30674	2				
260	LIQUID EPOXY COATINGS FOR D.I PIPES			EN 545		EN 545	
261	FUSION BONDED EPOXY COATINGS & LININGS FOR D.I FITTINGS					AWWA C116	
262	LIQUID POLYURETHANE COATINGS FOR D.I PIPES			EN 545		EN 545	
263	LIQUID POLYURETHANE LININGS FOR D.I PIPES			EN 545		EN 545	
264	TWO LAYER EPOXY NYLON COATINGS& LININGS FOR STEEL PIPES					EN 10310 AWWA C224	

**3.3 PLASTIC PIPES AND FITTINGS**

**CHAPTER 12: STANDARD REFERENCE NUMBERS**

<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
300	uPVC PIPES FOR COLD WATER	19532		3505		ISO 2505.3114.3606	
300	uPVC PIPES FOR COLD WATER (CONT 1)	8062				ISO 3472,3472,3473,3474	
300	uPVC PIPES FOR COLD WATER(CONT 2)					ISO 161/1	
300	uPVC PIPES FOR COLD WATER(CONT 3)					KS 06-149:2	
301	JOINTS & FITTINGS FOR uPVC PRESSURE PIPES	8063	1,12	4346		ISO 2035,2044	
301	JOINTS & FITTINGS FOR uPVC PRESSURE PIPES (CONT 1)	16450				ISO 2045,2048 2536	
301	JOINTS & FITTINGS FOR uPVC PRESSURE PIPES (CONT 2)	16451					
302	uPVC PIPELINES-LAYING AND JOINTING	16928		See CP		CP 312	
303	uPVC PIPELINES-PRESSURE TESTING	4279	1,7				
304	uPVC PIPELINES-ADHESIVES FOR JOINTING	16970					
305	uPVC PIPES – GENERAL	8061		3505			
305	uPVC PIPES – GENERAL (CONT 1)	8062		3506			
305	uPVC PIPES – GENERAL (CONT 2)	19532					
306	uPVC PIPES- PRESSURE TESTS TO DESTRUCTION			4728		ISO 1167	Obsolescent ( but still remains current) Replaced by BS EN 921 and partially replaced by BS EN 2782 Part 11 method 1127P-1997 but remains current
307	HDPE PIPES, JOINTS ,FITTINGS	16963	1-3	3284 (6572) (6730)			Obsolescent- Partially replaced by BS 6572:55**
308	RUBBER RINGS FOR MECHANICAL JOINTS			2494			

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<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
309	uPVC UNDERGROUND DRAIN PIPES & FITTINGS			4660			Partially replaced by BS EN 1401-1
310	uPVC PIPES IMPACT TEST 20 DEGREES CENTIGRADE			3505		ISO 3127	
311	uPVC PIPES SHORT TERM HYDROSTATIC TEST			3505			
312	uPVC PIPES LONG TERM HYDROSTATIC TEST			3505			
313	uPVC PIPES INTERNAL PRESSURE ENDURANCE TEST	8061					
314	uPVC WATER ABSORPTION TEST	8061				ISO 2508	
315	uPVC PIPES – VARIOUS OTHER TESTS					ISO 2505,3114, 3472,3473, 3474	
316	PIPES- RATE OF LEAKAGE			8010:2			
317	G.R,P PIPES			6464			
318	PLASTIC PIPES AND FITTINGS FOR USE AS SUB SOIL FIELD DRAINS			4962			
318	POLYPROPYLENE WASTE PIPE AND FITTINGS <sup>9</sup> EXTERNAL DIAMETER 34,6MM,41.0MM AND 54.1MM)			5254			
319	THERMOPLASTIC WASTE PIPE AND FITTINGS			5255			
320	GLASS REINFORCED PLASTICS (GRP) PIPES,JOINTS AND FITINGS FOR USE FOR WATER SUPPLY OR SEWERAGE			5480			
321	UNPLASTICIZED PVC PIPE AND FITTINGS FOR GARVITY SEWERS			5481			



**CHAPTER 12: STANDARD REFERENCE NUMBERS**

<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
322	PLASTICS PIPEWORK (THERMOPLASTIC MATERIALS)			5955	6		Part 6: Installation of unplasticized PVC pipework for gravity drains and sewers
323	BLUE POLYETHYLENE PIPES UP TO NOMINAL SIZE 63 FOR BELOW GROUND USE FOR POTABLE WATER			6572			
324	BLACK POLYETHYLENE PIPES UP TO NOMINAL SIZE 63 FOR ABOVE GROUND USE FOR POTABLE WATER			6730			

**3.4 OTHER PIPES AND FITTINGS**

<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
401	ASBESTOS CEMENT A/C PRESSURE PIPES	19800	1-3	486		ISO 160 BS EN 512	BS 486 Withdrawn Replaced by BS EN 512
401	ASBESTOS CEMENT A/C PRESSURE PIPES (CONT)			4624			
402	A/C SEWER PIPES, JOINTS, FITTINGS			3656		ISO 881 BS EN 588-1	BS 3656 Withdrawn Replaced by BS EN 588-1
402	A/C SEWER PIPES, JOINTS, FITTINGS (CONT 1)						
402	A/C SEWER PIPES, JOINTS, FITTINGS (CONT 2)	19850	1,2				
403	A/C PIPES FOR THRUST BORING					ISO 4488	
404	A/C PIPES- GUIDE FOR LAYING			5927		ISO 4482	
405	A/C PIPES- FIELD PRESSURE TESTING	4279	1,6,9,10	5886		ISO 4483	
406	PIPE SUPPORTS	See DVGW		3974	1	DVGW 310 PT.2	
407	UNREINFORCED CONCRETE PIPES (OGEE)	4032		5911	3		
408	PRESTRESSED	4035		4625			

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<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
	CONCRETE PRESSURE PIPES						
409	PRECAST CONCRETE PIPES- DRAINS&SEWERS	4032		5911	1,3		
410	CONCRETE POROUS PIPES- UNDER DRAINS			5911	114		
411	NON PRESSURE DUCTILE IRON PIPES ETC					ISO 7186	
412	RUBBER AND PLASTIC HOSES AND ASSEMBLIES					ISO 7751	
413	CONCRETE CYLINDRICAL PIPES& FITTINGS METRIC			5911	1-3	AWWA C602-83	BS 5911Part 1:1981 Withdrawn Replaced by BS 5911 Part 100: 1988 BS 5911 Part 200: 1989 BS 5911 Part 200: 1994
414	CLAY PIPES (SEWERAGE)			65			
415	TESTING OF JOINTED PIPES AND MANHOLES			2005			BS 2005- Obsolescent
416	CONCRETE PRESSURE PIPES INCLUDING JOINTS AND FITTINGS					BS EN 639	

**3.5 VALVES, METERS, HYDRANTS**

<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PART</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
501	DOUBLE FALNGED C.I GATE VALVES (WATER)			5163		AWWA C203-78	
501	DOUBLE FALNGED C.I GATE VALVES (WATER) (CONT 1)	3230	1-3				
501	DOUBLE FALNGED C.I GATE VALVES (WATER) (CONT 2)						
501	DOUBLE FALNGED C.I GATE VALVES (WATER) (CONT 3)	3352	1,4				
502	C.I GATE VALVES-			5150			

**CHAPTER 12: STANDARD REFERENCE NUMBERS**

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
	GENERAL						
502	C.I GATE VALVES- GENERAL(CONT)	3352	1,4				
503	C.I (PARALLEL SLIDE)GATE VALVES - GENERAL			5151			
504	C.I GLOBE VALVES GENERAL	3356	1-5	5152			
505	C.I CHECK VALVES GENERAL	3202		5153		AWWA C508-82	
505	C.I CHECK VALVES GENERAL (CONT)	See DVGW		6282	1,4	DVGW- W376	
506	C.I AND STEEL BUTTERFLY VALVES- GENERAL	3354	1-4	5155		BS EN 593:1998	BS 5155 Withdrawn Replaced by BS EN 593:1998
507	BOURDON TYPE PRESSURE GAUGES			1780		BE EN 837:1998	BS 1780 Withdrawn Replaced by BS EN 837-1:1998
508	FLOAT OPERATED VALVES N.D 500MM			1212	1,2,3		
509	FIRE HYDRANTS	3221	1,2	750			
510	WATER METERS	19648	1-3	5728	1,2	ISO 4064-1	BS 5728 Withdrawn Replaced by BS EN 5728:Part 4
510	WATER METERS (CONT)					KS 06-248 1,2	
511	COPPER ALLOY GATE, CHECK ETC VALVES	3352	11				
511	COPPER ALLOY GATE, CHECK ETC VALVES (CONT)			5154			
512	FIRE HOSE COUPLINGS& EQUIPMENT	14244		336			
513	SURFACE BOXES			5834	2,3		
513	SURFACE BOXES (CONT 1)						
513	SURFACE BOXES (CONT 2)						
513	SURFACE BOXES (CONT 3)						
513	SURFACE BOXES (CONT 4)						
514	METALLIC BALL VALVES	3357	1-7				DIN 3357 Part 6,7 Withdrawn
515	uPVC VALVES	3441	2				

**CHAPTER 12: STANDARD REFERENCE NUMBERS**

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
517	FIRE HYDRANT SYSTEMS FOR BUILDINGS			5041	1-5		
518	BUTTERFLY VALVES			5155			
519	DIAPHRAGM VALVES			5156			
520	CAST IRON PLUG VALVES			5158			
521	UNDERGROUND STOPVALVES FOR WATER SERVICES			5433			

**3.6 TESTING METHODS AND EQUIPMENT**

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
600	NON-DESTRUCTIVE TESTING OF WELDS (TUBES)	8564	1	3889 (6072)	1,2A	AP15LS	BS 3889 Partially replaced by 6072
600	NON-DESTRUCTIVE TESTING OF WELDS (TUBES) (CONT)	50120	1,2	6072			
601	SOILS FOR CIVIL ENGINEERING PURPOSE-TEST METHODS	18196		1377			
602	TESTING OF PIPELINE FOR WATER (INTERNAL PRESSURE)	4279	1-7,9,10				
603	TESTING OF CEMENT	See EDIN		4550	1,2,3	BS EN 196-7 EDIN EN75,112 114,15	BS 4550 Part 1& Part 2 Withdrawn Replaced by BS EN 196-7:1992
604	MATERIAL TESTING-DOCUMENTATION					ISO 404, EURONORM 21	
605	MEASUREMENT OF WATER FLOW (WATER METERS)					ISO 4064/3	
606	DRINKING WATER QUALITY- TESTING					KS 05-459:5	
607	RECOMMENDATIONS AND CLASSIFICATION FOR TOP SOIL			3882			
608	METHODS OF TESTING MOTORS, SCREEDS AND PLASTERS			4551			
609	STRUCTURAL FIXINGS IN CONCRETE AND MASONRY			5080	1&2		Part 1: Method of test for tensile loading

**CHAPTER 12: STANDARD REFERENCE NUMBERS**

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
							Part 2: Method for determination of resistance to loading in shear
610	SIZE OF HARDWOODS AND METHODS OF MEASUREMENT			5450			
611	RECOMMENDATIONS FOR TESTING OF AGGREGATES			5835	1		Part 1: Compatibility test for graded aggregates

**3.7 SITE WORK CODES OF PRACTICE**

SRN	SUBJECT	DIN	PART	BSS	PART	OTHE R	REMARKS
650	SITE INVESTIGATIONS	18196	1	5930			
650	SITE INVESTIGATIONS (CONT)	18307					
651	WATER SUPPLY	2000	See BS	BS 6007		CP 310	CP 310 Withdrawn Replaced by BS 8301
651	WATER SUPPLY (CONT 1)	2425	3,5	BS 8301		CP 301	CP 301 Withdrawn Replaced by BS 8301
651	WATER SUPPLY (CONT 2)	4046					
651	WATER SUPPLY (CONT 3)	19630					
652	BUILDING DRAINAGE	1986	2-4	BS 8301		CP 301	CP 301 Withdrawn Replaced by BS 8301
653	WATER PIPELINE CONSTRUCTION	19630					
654	TRENCHING FOR PIPELINES	4124					
655	SEWAGE PIPELINE CONSTRUCTION						
656	WALLING (BRICK & BLOCK MASONRY)	18330	See BS	5390 5628		CP 121	CP 121 Withdrawn Replaced by BS 5390 and BS 5628 Part 3
657	USE OF STRUCTURAL STEEL IN BUILDING	18203	1,2	449 BS 5950	2		BS 449 Parts 1 and 2 Part 2: Addendum No. 1 (1975) Withdrawn Replaced by BS 8301
658	SEWERAGE			8005		BS EN 1610	
659	SMALL SEWERAGE TREATMENT WORKS			6297			

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	AND CESS POOLS						
660	TEST PUMPING OF WATER WELLS			6316			
661	METHODS OF MEASUREMENT OF LIQUID FLOW IN OPEN CHANNEL			3680	1-10	BS ISO 748 BS ISO 1100-2 ISO TR 8363	BS 3680 Part 3A Withdrawn Replaced by BS ISO 748:1997 Part 3C Withdrawn Replaced by BS ISO 1100-2 BS 3680 Part 3G Withdrawn Replaced by ISO TR 8363 BS 3680 Parts 3J ,8F,8G Withdrawn
662	MEASUREMENT OF FLOW IN CLOSED CONDUITS BY CURRENT METERS OR PITOT STATIC TUBES					ISO 7194	
663	CONSTRUCTION AND DEMOLITION OF CONCRETE AND MASONRY					ANSI A10,9-1983	
664	DRAINAGE OF ROOFS AND PAVED AREAS			6367			
665	FOUNDATIONS			8004		CP 2004	CP 2004 Withdrawn Replaced by BS 8004
666	STRUCTURAL USE OF TIMBER			5268		CP 112,2	CP 112,2 Withdrawn Replaced by BS 5268 Part 2 BS 5268 Part 3
667	RETAINING WALLS	4085					
668	WATERPROOFING OF BUILDINGS & STRUCTURES	18195	1-4				
669	WATER QUALITY-SAMPLING					ISO 5667/2/3	
670	WELDING PROCEDURES-APPROVAL TESTING			4870	1	BS EN 288-3 BS EN 288-4	BS 4870 Part 1 Withdrawn Replaced by BS EN 288-3. BS 4870 Part 2 Withdrawn Replaced by BS EN 288-4
671	WELDING APPROVAL TESTING			4871	1	BS EN 287-1 BS EN 287-2	BS 4871 Part 1 Withdrawn Replaced by BS EN 287-1. BS 4871 Part 2

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							Withdrawn Replaced by BS EN 287-2
671	LOGGING OF ROCK CORES					LOGGING OF ROCK CORES FOR ENGINEERING PURPOSES, GEOLOGICAL ASSOCIATION OF LONDON	
673	TEST FOR STABILIZED SOILS			1924			
674	DRAIN AND SEWER SYSTEMS OUTSIDE BUILDINGS				1,2,3	BS EN 752	Part 1: Generalities and definitions Part 2: Performance requirements Part 3: Planning
675	CONSTRUCTION AND TESTING OF DRAINS AND SEWERS					BS EN 610	
676	IDENTIFICATION OF PIPELINES AND SERVICES			1710			
677	WELDING OF STEEL PIPELINES ON LAND AND OFFSHORE			4515			
678	PERFORMANCE REQUIREMENTS FOR JOINTS AND FITTINGS FOR USE WITH POLYETHYLENE PIPES			5114			
679	STRUCTURAL USE OF TIMBER			5268	2,3&5		Part 2: Permissible stress design materials and workmanship Part 3: Trussed rafted roof Part 5: Preservative treatment of structural timber
680	STAIRS, LADDER AND			5395	1,2&3		Part 1: Design of straight

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	WALKWAYS						stairs Part 2: Design of helical and spiral stairs Part 3: Design of industrial type stairs, permanent ladder and walkways
681	INTERNAL PLASTERING			5492			
682	GUIDE TO ACCURACY IN BUILDING			5606			
683	SAFE USE OF EXPLOSIVES IN THE CONSTRUCTION INDUSTRY			5607			
683	USE OF MASONRY			5628	3		Part 3: Materials and components, design and workmanship
684	EARTHWORKS			6031			
685	PAINTING OF BUILDINGS			6150			
686	LOADING FOR BUILDINGS			6399	1		Part 1; Dead and imposed loads
687	GUIDE TO INSTALLATION AND USE OF VALVES			6683			
688	DESIGN, INSTALLATION, TESTING AND MAINTENANCE OF SERVICES SUPPLYING WATER FOR DOMESTIC USE WITHIN BUILDINGS AND THEIR CURTILAGES			6700			
689	GUIDE FOR STRUCTURAL DESIGN OF PAVEMENTS CONSTRUCTED WITH CLAY OR CONCRETE BLOCK PAVER			7533			
690	SEWERAGE			8005	1		Part 1: Guide to new sewerage construction
691	PROTECTION OF STRUCTURES AGAIST			8102			



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	WATER FROM THE GROUND						
692	DESIGN AND INSTALLATION OF DAMP PROOF COURSES IN THE MASONRY CONSTRUCTION			8215			
693	CODE OF PRACTISE FOR BUILT UP FELT ROOFING			8217			

**3.8 DRAWING PRACTICE, STANDARD SYMBOLS ETC**

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
700	IDENTIFICATION OF PIPELINE ACCORDING TO FLUID CONVEYED	2403					
701	GRAPHICAL SYMBOLS FOR GENERAL ENGINEERING-PIPING SYSTEMS	2406		1553	1		
701	GRAPHICAL SYMBOLS FOR GENERAL ENGINEERING-PIPING SYSTEMS ( CONT)	2429	1	BS 6007		CP 310	CP 310 Withdrawn Replaced by BS 8301
702	PROJECT NETWORK TECHNIQUES			4335			
703	DRAWING OFFICE PRACTICE – ARCHITECTS AND BUILDERS			1192	1-4		BS 1192 Part 2 Obsolescent
704	CONSTRUCTION DRAWING PRACTICE			1192	1-4		BS 1192 Part 2 Obsolescent
705	ENGINEERING DRAWING PRACTICE			308	1	ISO 128,2162,2203	
706	DRAWING PRACTICE FOR ENGINEERING DRAWINGS			5070	1-3	BS EN 61082	BS 5070 Part 1 Partially replaced by BS EN 61082 BS 5070 Part 2 Withdrawn Replaced by BS EN 61082-2
707	BUILDING AND CIVIL ENGINEERING TERMS			6100	1-6		
708	WATER SUPPLY-MAPS AND PLANS	2425	3,5				
709	CARTOGRAPHIC REPRESENTATION OF CLIMATE	5001 9	1				
750	CONCRETE (INC.R/F)-			6100	6.2,6.3		

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SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
	GLOSSARY						
751	VALVES- GLOSSARY						
752	IRON AND STEEL- GLOSSARY FOR PIPES			6562	1-2		

**3.9 BUILDING MATERIALS**

SRN	SUBJECT	DIN	PAR T	BSS	PART	OTHER	REMARKS
801	LIME FOR MORTAR	1060	1,2,3	890	CL.B		DIN 4960 Part 2& 3 Withdrawn
802	QUARRY TILES FOR SILLS			6431		BS EN ISO 10545- 2,3,4&6	BS 6431 Parts 10,11,12&14 Replaced by BS EN ISO 10545-2 BS EN ISO 10545-3 BS EN ISO 10545-4 BS EN ISO 10545-6 Respectively but remain current
803	DAMP- PROOF ( BITUMINOUS FELT)			743(6398 : BS6398, BS 6515 and BS 8215)			BS 743 Partially Replaced by
804	CONCRETE BLOCKS			6398		KENYAN M.O.W ST.SPEC.	
804	CONCRETE BLOCKS(CONT)			6073	1,2		BS 6073 Partially Replaced by BS EN 772-2
805	HOLLOW CLAY PARTITION BLOCKS	278		3921			BS 3921 Partially Replaced by BS EN 772-3&7
806	BRICK WALLING	105	1-5	3921			BS Partially Replaced by BS EN 772-3 & 7
807	ASBESTOS ROOF SLATES AND SHEETING			690	3,4		BS 690 Part 3 Withdrawn Replaced by BS EN 494 and 492 respectively
808	FIXING BOLTS & SCREENS FOR ROOFING						
809	INSULATION BOARD AND HARD BOARD			1142	1,2,3	ISO 766/7/, 818/19,2695,	BS 1142 Partially Replaced by BS EN

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						3340,3546,3 729	120,310, 316- 323:1&2 325,382-1 and BS EN 622:1-6
809	INSULATION BOARD AND HARD BOARD (CONT)						
810	BLOCK BOARD	68705	1,3	3444		ISO 1096,97,98,2 074, 2426-30	DIN 68705 Part 1 Withdrawn
811	PLYWOOD (TROPICAL HARDWOOD)	4078		6566	1-8	ISO 1096, 1097	BS 6566 Replaced by various BS EN Standards on the same subject.
811	PLYWOOD (TROPICAL HARDWOOD (CONT.))	68705	1,5			ISO 1098	DIN 68705 Part 1 Withdrawn.
812	SEALING OF EXT. WALL JOINTS	18540	SH. 1,2,3				
813	CHIPBOARD	68761	4	5669			BS 5669 Part 1 Partially Replaced by BS EN 120, 309, 310,311,312, Parts 1-6 and 317 BS 5669 Part 4 Partially Replaced by BS 7916
813	CHIPBOARD (CONT1)	68763					
813	CHIPBOARD (CONT2)	68764					
814	LAMINATED PLASTIC SHEETING	16922		3794		BS EN 438	BS 3794 W Withdrawn Replaced by BS EN 438 Parts 1& 2
814	LAMINATED PLASTIC SHEETING(CONT)						
814	LAMINATED PLASTIC SHEETING(CONT.2)						
815	WOOD WOOL SLABS	1101		1105			BS 1101 Obsolescent
815	WOOD WOOL SLABS (CONT. 1)	1102					
816	QUALITY OF TIMBER- WORKMANSHIP	68141		1186	2		
817	MATERIAL FOR FLUSH DOORS	68706		459			BS 459 Part 3 Withdrawn
817	MATERIAL FOR FLUSH DOORS (CONT	18101					

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SRN	SUBJECT	DIN	PAR T	BSS	PART	OTHER	REMARKS
	1)						
817	MATERIAL FOR FLUSH DOORS (CONT. 2)						
818	WATERPROOF ADHESIVE	53255		1203	TYPE MR		
819	STRUCTURAL STEEL & METALWORK			4360 7316 7668		ISO 630,6891 BS EN 10029;1-3 BS EN 10113 BS EN 10155 BS EN 10210-1	BS 4360 Withdrawn Replaced by BS EN 10029 Parts 1 to 3 BS EN 10113, BS EN 10155 and BS EN 10210-1
819	STRUCTURAL STEEL & METAL WORKS			4360 7316 7668			
820	SPLIT RING TIMBER CONNECTORS			1579			
821	METAL WINDOWS			6510			
822	GLASS FOR GLAZING	1249	1	952	1		
822	GLASS FOR GLAZING (CONT.)	18301					
823	GALVANISED M.S TUBING (MILD STEEL) (CONT.)	2440		1387		ISO 65,7/1,7/2	
823	GALVANIZATION M.S. TUBING (MILD STEEL) (CONT.1)	2441		21			
823	GALVANIZATION M.S. TUBING (MILD STEEL) (CONT.2)	2442					
823	GALVANIZATION M.S. TUBING (MILD STEEL) (CONT.3)	2999	1				
824	FITTINGS TO M.S TUBING MILD STEEL	2460		1256,143			
824	FITTINGS TO M.S TUBING MILD STEEL(CONT:1)			143		BS EN ISO 10242	
824	FITTINGS TO M.S TUBING MILD STEEL			1740	1		

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	(CONT:2)						
825	POLYTHENE TUBING FOR COLD WATER SERVICES	19533		2782		ISO 161 -1 BS ISO 4065 BS ISO 11922-1	
825	POLYTHENE TUBING FOR COLD WATER SERVICES (CONT: 1)	8072		6572 6730			
825	POLYTHENE TUBING FOR COLD WATER SERVICES (CONT: 1)	8073					
825	POLYTHENE TUBING FOR COLD WATER SERVICES (CONT: 1)	8075					
825	POLYTHENE TUBING FOR COLD WATER SERVICES (CONT: 1)	8074					
826	BRASSWORK & FITTING FOR TAPS & STOP VALVES.			1010	2		
827	BALL VALVES FOR CISTERNES			1212	3		
828	PLASTIC FLOATS FOR BALL VALVES			2456			
829	CAST IRON SOIL, WAST & VENT PIPES (CONT)			416			
829	CAST IRON SOIL, WAST & VENT PIPES(CONT: 1)	19522	1,2				
829	CAST IRON SOIL, WAST & VENT PIPES (CONT: 2)						
829	CAST IRON SOIL, WAST & VENT PIPES (CONT: 3)	195					
830	GALVANISED MILD STEEL COLD WATER TANK			417	2 CL.A		
831	ENAMELLED CAST IRON BATH			1189			
831	ENAMELLED CAST IRON BATH (CONT: 1)						
831	ENAMELLED CAST IRON BATH (CONT: 2)	4774					

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832	PILLAR TAPS	7572		1010	2		
833	GLAZED VITREOUS CHINA W.C PAN	1387		5503			
833	GLAZED VITREOUS CHINA W.C PAN (CONT)	1381					
834	HINGED PLASTIC SEAT TO W.C. PAN			1254			
835	GLAZED VITREOUS CHINA LAVATORY BASIN	4462		1188			
835	GLAZED VITREOUS CHINA LAVATORY BASIN (CONT: 1)			5506	2		
836	STAINLESS STEEL SINK	4465		1244	2		
837	BRASS "S" AND "P" TRAPS			1184			BS 1184 Obsolescent
839	A/C DRAIN PIPES AND FITTINGS	19831		3656		BS EN 588-1	BS 3656 Withdrawn Replaced by BS EN 588-1
839	A/C DRAIN PIPES AND FITTINGS(CONT:1)	19841					
839	A/C DRAIN PIPES AND FITTINGS(CONT: 2)	19850	1,2				
840	CONCRETE DRAIN PIPE	See 409		2870			
841	PITCH FIBRE DRAIN PIPES			2760			BS 2760 Withdrawn
842	CAST IRON DRAIN PIPES	19500		437		ISO 6594	
842	CAST IRON DRAIN PIPES(CONT:1)	19501					
842	CAST IRON DRAIN PIPES(CONT:2)	19502					
842	CAST IRON DRAIN PIPES(CONT:3)	19503					
842	CAST IRON DRAIN PIPES(CONT:4)	19504					
842	CAST IRON DRAIN PIPES(CONT:5)	19505					
842	CAST IRON DRAIN PIPES(CONT:6)	19506					
842	CAST IRON DRAIN PIPES(CONT:7)	19507					

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842	CAST IRON DRAIN PIPES(CONT:8)	19508					
842	CAST IRON DRAIN PIPES(CONT:9)	19509					
842	CAST IRON DRAIN PIPES(CONT:10)	19501 0					
842	CAST IRON DRAIN PIPES(CONT:11)	19501 1					
842	CAST IRON DRAIN PIPES(CONT:12)	19501 4					
842	CAST IRON DRAIN PIPES(CONT:13)	19501 9					
842	CAST IRON DRAIN PIPES(CONT:14)	19521					
843	JOINTING COMPOUND FOR C.I DRAIN PIPES			BS 6956	1,5,6,7		
844	C.I S & FITTING FOR DRAINS	19519		437			
845	STEP IRONS TO MANHOLES & SEPTIC TANKS	1211	1	1247			
845	STEP IRONS TO MANHOLES & SEPTIC TANK (CONT:1)	1212	1				
845	STEP IRONS TO MANHOLES & SEPTIC TANK(CONT:2)	1213					
845	STEP IRONS TO MANHOLES & SEPTIC TANK (CONT:3)	4281					
846	C.I. MANHOLE COVERS AND FRAMES	1229		497	1	BS EN 124	BS 497 Withdrawn Replaced by BS EN 124
846	C.I. MANHOLE COVERS AND FRAMES(CONT:1)	4271	1,3				
846	C.I. MANHOLE COVERS AND FRAMES (CONT: 2)	19593	1,2,3				
846	C.I. MANHOLE COVERS AND FRAMES (CONT:3)	19594	1,2				
846	C.I. MANHOLE COVERS AND FRAMES (CONT:4)	19596					

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846	C.I. MANHOLE COVERS AND FRAMES (CONT:5)	19597					
847	STEEL LADDERS FOR PERMANENT ACCESS	3620		4211			
848	HAND RAILING	24533		6180			
849	GALVANISED CHAIN LINK FENCING	11991		1722	1		
850	OPEN MESH STEEL FLOORING			4592	1		
851	MASTIC ASPHALT FOR ROOFING			6925			
852	ALUMINIUM FOR LOUVRE WINDOWS			1470		BS EN 485 BS EN 515 BS EN 573	BS 1470 Withdrawn Replaced by BS EN 485 Parts 1-4, BS EN 515, BS EN 573 Parts 1-4
853	FIXING ACCESSORIES FOR BUILDING PURPOSES			1494	1		BS 1494 Part 2 Withdrawn
854	PRECAST CONCRETE MANHOLES	4034		5911	2,3		BS 5911 Part 1 Withdrawn Replaced by BS 5911 Part 100 (1988) BS 5911 Part 200 (1989) and BS BS 5911 Part 200 (1994)
855	PRECAST CONCRETE KERBS & CHANNELS	483		7263	1		
856	WATERPROOF BUILDING PAPERS	4122		1521			
856	WATERPROOF BUILDING PAPERS (CONT.1)	52126					
856	WATERPROOF BUILDING PAPERS (CONT.2)	52127					
856	WATERPROOF BUILDING PAPERS (CONT.3)	52128					
856	WATERPROOF BUILDING PAPERS (CONT.4)	52129					
856	WATERPROOF BUILDING PAPERS	52130					



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	(CONT.5)						
857	METAL TIES FOR CAVITY WALL			1243			
858	A/C BUILDING PRODUCTS (TESTS FOR SHEETS)	274	1-4	4624			
859	PRECAST CONCRETE FLAGSTONES	485		7263	1		
860	ASBESTOS CEMENT RAIN WATER GOODS	19831	1-9	569			
860	ASBESTOS CEMENT RAIN WATER GOODS (CONT 1.)	19841	1-6				
860	ASBESTOS CEMENT RAIN WATER GOODS (CONT.2)	19850	1				
861	LINTELS – PREFABRICATED			5977	2		
862	uPVC SOIL AND VENT PIPES, FITTINGS E.T.C	1187		4514			
863	STRUCTURAL STEEL IN BUILDINGS			449 (5950)	2		BS 449 Part 2 Withdrawn Replaced by BS 5950 Part 5
864	PROTECTIVE BARRIERS IN AND ABOUT BUILDINGS			6180			
866	BITUMENS FOR BUILDING AND CIVIL ENGINNERING			3960	1,3		
867	SOLAR WATER HEATERS					AS 2813-85	
868	FLOORING-INITIAL TREATMENT MAINTAINANCE			6263	2		
869	RIGID FLAT SHEET BUILDING MATERIALS						
870	BUILDING STONE			1438			
871	CAST STONE			1217			
872	WOOD PRESERVATIVES- CREOSOTE			144			
873	WASTE TRAPS- PLASTIC			3943			
874	COPPER FLOATS FOR			1968			

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	FLOAT OPERATED VALVES						
875	VITREOUS CHINA SANITARY FITTINGS			3402			
876	PAINTS-LEAD BASED			2523 (5082,53 58)			BS 2523 Obsolescent Partially Replaced by BS 5082 and BS 5358
877	READY MIXED OIL BASED PRIMING PAINTS			2521/4 (See 2523)			
878	READY MIXED OIL-BASED UNDERCOATING AND FINISHING PAINTS						
879	COLD POURED SEALING MATERIALS FOR CONCRETE PAVEMENTS			5212			
880	GULLY TOPS AND MANHOLE TOPS FOR VEHICULAR PEDESTRIAN AREAS, DESIGN REQUIREMENTS, TYPE TESTING, MARKING QUALITY CONTROL					BS EN 124	
881	STRUCTURAL TIMBER STRENGTH CLASSES			338			
882	CLAY ROOFING TILES AND FITTINGS			402	1		Part 1: Specification for plain tiles and fittings
883	BITUMEN ROAD EMULSIONS (ANIONIC AND CATIONIC)			434	1		Part 1: Bitumen road emulsions
884	DRESSED NATURAL STONE KERBS, CHANNELS, QUADRANTS AND SETTS			435			
885	CONCRETE ROOFING TILES AND FITTINGS PRODUCT SPECIFICATION					BS EN 490	
886	AIRBRICKS AND			493			

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	GRATINGS FOR WALL VENTILATION						
887	EAVES, GUTTERS AND FITTINGS MADE OF PVC-C					BS EN 607	
888	EAVES, GUTTERS AND RAINWATER DOWN PIPES OF METAL SHEETS					BS EN 612	
889	PLYWOOD					BS EN 635	
890	TIMBER AND JOINERY					BS EN 942	
891	PRESSED STEEL GUTTERS, RAIN WATER PIPES, FITTINGS AND ACCESSORIES			1091			
892	WC FLUSHING CISTERNS (INCLUDING DUAL FLUSH CISTERNS AND FLUSH PIPES)			1125			
893	NAILS			1202	1,2&3		Part 1: steel nails Part 2: Copper nails Part 3: Aluminium nails
893	FIXING ACCESSORIES FOR BUILDING PURPOSES			1494			Part 1: Fixings for sheet, roof and wall coverings
894	AUTOMATIC FLUSHING CISTERNS FOR URINALS			1876			
895	WASTES ( EXCLUDING SKELETON SINK WASTES) AND BATH OVERFLOWS			3380			
896	LIGHTWEIGHT AGGREGATES FOR MASONRY UNITS AND STRUCTURAL CONCRETE			3797			
897	TERRAZO TILES			4131			
898	WELDABLE STRUCTURAL STEELS			4360			
899. 1	UNPLASTICIZED POLYVINIL			4576			

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	CHLRIDE(PVC-U) RAINWATER GOODS AND ACCESSORIES						
899. 2	INDUSTRIAL TYPE METAL FLOORING, WALKWAYS AND STAIRS TREADS			4592	1,2&3		Part 1: Open bar gratings Part 2: Expanded metal grating panels Part 3: Cold formed planks Part 4: Glass reinforced plastics open bar gratings
899. 3	READY MIX BUILDING MORTARS			4271			
899. 4	INTERNAL AND EXTERNAL WOOD DOOR SETS, DOOR LEAVES AND FRAMES			4487			Part 1: dimensional requirements
899. 5	HOT ROLLED STRUCTURAL STEEL SECTIONS			4848	2&4		Part 2: Hot finished hollow sections Part 4: Equal and unequal angles
899. 6	URINALS			4880	1		Part 1: Stainless steel slab urinals
899. 7	MORTAR ADMIXTURES			4887	1&2		Part 1: Air entraining (plasticizing) admixture Part 2 : Set retarding admixture
899. 8	SOFTWOOD GRADES FOR STRUCTURAL USE			4978			
899. 9	COATED MACADAM FOR ROADS AND OTHER PAVED AREAS			4987	1&2		Part 1: Constituent material and mixtures Part 2: Transport, laying and compaction
899. 10	WATER BORNE PRIMING PAINTS FOR WOODWORK			5082			
899. 11	MASONRY CEMENT			5254			
899. 12	EXTERNAL RENDERINGS			5262			
899.	SOLVENT-BORNE			5358			

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13	PRIMING PAINTS FOR WOOD WORK						
899. 14	WALL AND FLOOR TILING			5385	1,2,3,4 &5		Part 1: Design and installation of internal ceramic wall tiling and mosaics in normal conditions Part 2: Design and installation of external ceramic wall tiling and mosaics (including terra cotta and talence tiles) Part 3: design and installation of ceramic floor tiles and mosaics Part 4: Tiling and mosaics in specific conditions Part 5: design and installation of terrazzo tile and slab, natural stone and composition block floorings
899. 15	STONE MASONRY			5390			
899. 16	SPECIFICATION FOR LOW RESISTANCE SINGLE TAPS AND COMBINATION TAP ASSEMBLIES (NOMINAL SIZE ½ AND ¾ ) SUITABLE FOR OPERATION AT PN 10 MAX. AND MINIMUM FLOW PRESSURE OF 0.01MPa (0.1 BAR)			5412			
899. 17	VITREOUS CHINA WASHDOWN WC PANS WITH HORIZONTAL OUTLET			5503	1&2		Part 1: connecting dimensions Part 2: Materials, quality, performance and dimensions other than connecting

**CHAPTER 12: STANDARD REFERENCE NUMBERS**

<b>SRN</b>	<b>SUBJECT</b>	<b>DIN</b>	<b>PAR T</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
							dimensions
899. 18	VITREOUS CHINA BOWL URINALS ( RIMLESS TYPE)			5520			
899. 19	PRESERVATION OF TIMBER			5589			
899. 20	PLASTIC CONNECTORS FOR USE WITH HORINZONTAL OUTLET VITREOUS CHINA WC PANS			5627			
899. 21	STILES, BRIDLE GATES AND KISSING GATES			5709			
899. 22	GLAZING FOR BUILDINGS			6262			
899. 23	MANUFACTURE OF GLUED STRUCTURAL COMPONENTS FOR TIMBER AND WOOD BASED PANEL PRODUCTS			6446			
899. 24	POLYETHYLENE DAMP-PROOF COURSES FOR MASONRY			6515			
899. 25	INSTALLATION OF CHEMICAL DAMP PROOF COURSES			6576			
899. 26	PORTLAND PULVERIZED- - FUEL ASH CEMENTS			6588			
899. 27	PRECAST CONCRETE PAVING BLOCKS			6717	1		Part 1: Paving blocks
899. 28	EXTERIOR WOOD COATING SYSTEMS			6952	1		Part 1: Guide to classification and selection
899. 29	PRECAST CONCRETE FLAGS, KERBS, CHANNELS, EDGINGS AND QUADRANTS			7263	1&2		Part 1: Specification Part 2: Code of practice for laying
899. 30	IN-SITU FLOORINGS			8204	2		Part 2: Concrete wearing surface

**3.10 ELECTRICAL/MECHANICAL**

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
001	FRACTIONAL HORSE-POWER MOTORS (DIMENSIONS)	42021		2048	1		
002	CURRENT TRANSFORMERS			7626		IEC 60185	
003	VOLTAGE TRANSFORMERS			7625		IEC 60186/186A	
004	CIRCUIT BREAKERS 1 kV A.C.			5311		IEC 60056/267	
005	CIRCUIT BREAKERS A.C. VOLT. OPERATED			842		BS EN 61008-1	
006	CIRCUIT A.C CURRENT OPERATED			4293		BS IEC 1008-2-2	BS 4293 Partially Replaced by BS EN 61008-1 and BS IEC 1008-2-2
007	FUSE SWITCHES (AIR BREAK)			5419		IEC 408	BS 5419 Withdrawn Replaced by BS EN 60947-3
008	MOTOR STARTERS AND CONTROLLERS	46062		587			BS 587 Withdrawn Replaced by BS EN 60947-4-1 and BS 5856-1
009	MOTOR STARTERS ABOVE 1000 V.A.C			5856	1	IEC 60632-1	
010	ELECTRIC MOTOR DIMENSIONS	42673	Bl. 1-4	4999	10	IEC 60072,72A	
011	INDUCTION MOTORS FOR GENERAL PURPOSE	42673	Bl. 1-4	5000	10	IEC 60072	
012	ENCLOSURE PROTECTION SWITCH/CONTROL GEAR	40050	Bl. 2,6,9,10	5420		IEC 60144 (IP32)	BS 5420 Withdrawn Replaced by BS EN 60947-1
013	MOTOR STARTERS NOT EXC. 1000 V.A.C.	46062		4941	1,3,4	IEC 292,1,2,3,4	BS 4941 Withdrawn Replaced b BS EN 60947-4-1

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014	ELECTRICITY METER			37	1,5,8		BS 37 Withdrawn Replaced by Parts 1-4 of BS 5685
015	WATT-HOUR METER			5685		IEC 521	BS 5685 Part 1 (1979) and Parts 2,3 &4 (1986) all Obsolescent
016	ACCEPTANCE TESTS FOR PUMPS	4325		5316	1	ISO 2548 IEC 198	
017	ACCEPTANCE TESTS FOR PUMPS (CLASS B)	4325		5316	2	ISO 3555 IEC 198	
018	CODE OF PRACTICE, ELECTRICAL WIRING					IEE W. REGS (15 <sup>TH</sup> ED)	
019	ELECTRICAL PROTECTIVE RELAYS			142			BS 142 Part 1 Section 1.5 Sub-section 1.5.1 – 1.5.3 all renumbered as BS 60255-21- 1,2,3 respectfully
020	FACTORY BUILT SWITCHGEAR ASSEMBLIES	57670	TL. 6	5486	1,2,3,13	IEC 439-2	BS 5486 Part 1 Withdrawn Replaced by BS EN 60439- 1
021	RECIPROCATING INT/COMB. ENGINES			5514	1,2	ISO 3046, PT.1,2	BS 5541 Part 2 (1988) ‘test methods’ Withdrawn – Replaced by 5514 Part 1 (1996)
022	MACHINES FOR MISCELLANEOUS APPLICATIONS			5000	99		
023	INSULATING MATERIALS FOR ELECTRICAL MACHINES			2757		IEC 85	
024	PCV INSULATED CABLES NOT EXCEEDING 1900	57207	4,5	6346			



CHAPTER 12: STANDARD REFERENCE NUMBERS

	V.A.C						
025	ROATAING ELECTRICAL MACHINES GENERAL –			4999	1,2,3	IEC 34-1, 34-8,72, 72A	Renumbered as EN 60034-4
026	CONCRETE CABLE COVERS			2484			BS 2484 Obsolescent
027	ELECTRIC POWER SWITCHGEAR (LOW VOL. N.E IKV)	57660		5486 5727 7354			
028	SAFETY ISOLATING TRANSFORMERS			3535			
029	ROTATING ELECTRICAL MACHINES – RATING PLATES	42961		4999	4	IEC 60034-1	
030	ROTATIN ELECTRICAL MACHINES- ENCLOSURES	40050		4999	20	IEC 60035-5	
031	ROTATING ELECTRICAL MACHINES- CONDITIONS			4999	31	IEC 60034-1	
032	ROTATING ELECTRICAL MACHINES- TEMPERATURE LIMITS	See E DIN		4999	32	IEC 60034-1 E DIN	
033	ROTATING ELECTRICAL MACHINES- VIBRATION	See DIN ISO		4999	50	ISO 2373	
034	ROTATING ELECTRICAL MACHINES – TESTS			4999	60	IEC 60034-1	
035	GENERATORS DRIVEN BY I/C ENGINES	See VDMA		5000	3	VDMA 6280	
036	MACHINES WITH FLAMEPROOF ENCLOSURES	22418		5000	17		
037	MAINTENANCE OF ELECTRICAL SWITCHGEAR (V.N.E. 14 KV)			6626			
038	PROTECTION PROVIDED BY			5490		IEC 600529 BS EN	BS 5490 Withdrawn

CHAPTER 12: STANDARD REFERENCE NUMBERS

	ENCLOSURES (CLASS N OF DEG.)					60529	Replaced by BS EN 60529
039	ELECTRICAL EQUIPMENT OF INDUSTRIAL MACHINES			2771		EN 60204, Part 1	BS 2771 Part 1 Replaced by EN 60204-1 (1993) but remains current for use as a reference standard for BS EN 60204-3-1: 1992
040	SWITGEAR AND CONTROL GEAR UPTO 1000V			4752		IEC 600157-1 600157-1A	BS 4752 withdrawn Replaced by BS EN 60947-2
041	PVC INSULATED CABLES FOR SWITCHES AND CONTROL GEAR			6231			
042	BASIC ENVIRONMENTAL TESTING PROCEDURES			2011	1.1	IEC 60068-1	BS 2011 Parts Withdrawn and Replaced by parts of BS EN 60068
043	DEFINITIONS AND GENERAL REQUIREMENTS					IEC 60051-1	
044	PANEL MOUNTED INSTRUMENTS – DIMENSIONS					IEC 600473	
045	CELLULOSIC PAPERS FOR ELECTRICAL PURPOSES			5626	1,2,3	IEC 600554	
046	COMMISSIONING, OPERATION AND MAINTENANCE OF STORAGE PUMPS					IEC 600805	
047	RUBBER ISULATD CABLES					IEC 600245	
048	VOLTAGE FLUCTUATION LIMITS- GUIDE					IEC 600827	
049	ELECTRIC CABLES – ARMOURING – WIRE FOR					KS 04-290	

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050	ROTATING ELECTRICAL MACHINES FOR HARZARDOUS AREAS ("N")			5000	16		
051	POWER TRANSFORMERS – GENERAL					BS EN 60076-1	
052	ELECTRIC CONDUCT – STEEL			4568	2		
053	BUS BARS			159			
054	NON-METALLIC CONDUITS			4607 (6099)	2		Partially replaced by BS 6099 Part 1 and BS 6099 Section 2.2
055	PVC CABLES IN CONDUITS			6004			
056	INSULATED FLEXIBLE CORD			6500			
057	M.I.C.C CABLES			4782	1		
058	FLUSH SWITCHES			3676			
059	ELECTRIC SOCKETS			1363			Part 3: 1989 Replaced by BS 1363 Part 3 (1995) but remains current
060	FUSED SPUR BOXES			1362			
061	CONTACTORS			775			Part 1 (1969) Withdrawn Replaced by BS 5424: Part 1 1977
062	SECURITY LIGHTING INSTALLATION					CP 1004	Renumbered as BS 5498
063	ALUMINIUM SOLID CONDUCTORS			3988			

**3.11 MISCELLANEOUS**

SRN	SUBJECT	BSS	PART	OTHER	REMARKS
900	ZINC SPRAY PROCTECTION	2569	1	ISO 2063 BS En 22063	BS 2569 Withdrawn Replaced by BS EN 22063
900	ZINC SPRAY PROTECTION (CONT)	5493		BS EN ISO 12944	BS 5493 Proposed for Obsolescence Partially Replaced by Parts 1-8 of BS

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<b>SRN</b>	<b>SUBJECT</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
					EN ISO 12944
901	METALLIC ZINC RICH PRIMER	4652			
902	COLOUR OF FINISH (BUILDING MATERIALS)	4800		VOB pt. C	
903	HOT DIP GALVANIZING ON IRON & STEEL	729		ISO 1459	
903	HOT DIP GALVANIZING ON IRON & STEEL (CONT.)	5493		ISO 1461 BS EN ISO 12944	BS 5493 proposed for Obsolescence Partially Replaced by Parts 1-8 of BS EN ISO 12944
904	BLACK BITUMEN SOLUTION (COLD APP.) FOR WATER TANKS.	3416	TYPE 11	DVGW-GWS	
905	WELDABLE STRUCTURAL STEELS	4360		ISO 630	BS 4360 Withdrawn- Replaced by BS 7613, BS 7668, BS EN 10113, BS EN 10155 & BS EN 10210
906	CLASSIFICATION OF GREY CAST IRON	1452		ISO 185	Bs 1452 Withdrawn Replaced by BS EN 1561
907	BEARING DESIGN LIFE				
908	BITUMEN – HOT APPLIED – COATINGS FOR IRON AND STEEL	4147			
908	BITUMEN – HOT APPLIED – COATINGS FOR IRON AND STEEL (CONT.)	5493			
909	PRESSED STEEL RECTANGULAR TANKS.	1564			
910	GREY IRON CASTINGS FOR MANHOLE COVERS	1452	GRADE 10		
911	MALLEABLE CAST IRON	6681		ISO 5922	BS 6681 Withdrawn Replaced by BS EN 1562
911	MALLEABLE CAST			ASTM A 47-	

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<b>SRN</b>	<b>SUBJECT</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
	IRON (CONT.)			77	
912	ROLLED STEEL	4360		ISO 630	BS 4360 Withdrawn Replaced by BS 7668, BS EN 10113, BS EN 10155 & BS EN 10210
912	ROLLED STEEL (CONT)				
913	STRUCTURAL STEEL SECTIONS	4			BS 4 Part 2 (1969) Withdrawn Replaced by BS 4848 Part 2
914	ISO METRIC BLACK HEXAGONAL BOLTS, SCREWS AND NUTS	4190		ISO 272, 4759-1, 3	Bs 4160 Obsolescent
914	ISO METRIC BLACK HEXAGONAL BOLTS, SCREWS AND NUTS (CONT1)			ISO 885, 888	
914	ISO METRIC BLACK HEXAGONAL BOLTS, SCREWS AND NUTS (CONT 2)			ISO 898/2, 898/1	
915	SIZES FOR FERROUS & NON- FERROUS BARS	6722			
916	MECHANITE IRON, GRADE E			ASTM A48, No. 308	
917	CORROSION OF PROTECTION OF STEEL STRUCTURES – GENERAL	5493		BS EN ISO 12944	BS 5493 Proposed for Obsolescence Partially Replaced by Parts 1-8 of BS EN ISO 12944
918	INGOT ZINC	3436		ISO 752 BS EN 1179 (1996)	BS 3436 Withdrawn Replaced by BS EN 1179 (1996)
919	WELDING OF STEELS (METAL ARC)	5135	1		BS 5135 Partially Replaced by BS EN 1011-1 (1998)
919	WELDING OF STEELS (METAL ARC) (CONT 1)	499	1		BS 499 Part Obsolescent/ Withdrawn
919	WELDING OF				

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SRN	SUBJECT	BSS	PART	OTHER	REMARKS
	STEELS (CONT 2)				
919	WELDING OF STEEL (METAL ARC) (CONT 3)				
920	STEEL PLATE, SHEET AND STRIP	1449	1 (Withdrawn)	ISO 3573	BS 1499 Parts Withdrawn Replaced by BS EN 10111,10209, BS EN 10149-2&3, 10051,10131,10139,10149-2&3, 10048,10140, 10029, 10258&10259
920	STEEL PLATE, SHEET AND STRIP (CONT 1)			ISO 3574	
920	STEEL PLATE, SHEET AND STRIP (CONT 2)				
920	STEEL PLATE, SHEET AND STRIP (CONT 3)				
920	STEEL PLATE, SHEET AND STRIP (CONT 4)				
920	STEEL PLATE, SHEET AND STRIP (CONT 5)				
920	STEEL PLATE, SHEET AND STRIP (CONT 6)				
920	STEEL PLATE, SHEET AND STRIP (CONT 7)				
920	STEEL PLATE, SHEET AND STRIP (CONT 8)				
921	ELECTROPLATED COATINGS ON THREADS-STANDARD	3382	1-6		
922	ELECTROPLATED COATINGS ON THREADS-THICKENED	3382	7	ISO-DIS 4042	
923	ISO METRIC SCREW THREADS	3463	1-2	ISO 68,261,724,9 655/1,965/3,	

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<b>SRN</b>	<b>SUBJECT</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
				262	
923	ISO METRIC SCREW THREADS (CONT)			ISO 1106-3, 7438	
924	ISO METRIC PRECISION HEXAGON BOLTS, SCREWS AND NUTS	3692		ISO 887	BS 3692 Obsolescent
925	METAL WASHERS FOR GENERAL ENGINEERING	4320		ASS 2602:83 2603:83- ISO/12 887	
926	STEEL STRUCTURES – PAINTS FOR POLYURETHANE				
927	SHEAR TEST FOR METALS				
928	WELDED STEEL TANKS FOR OIL STORAGE			APS 650	
929	LIFTING APPLIANCES- OVERHEAD TRAVELLING CRANES			ISO 7752/5	
930	HIGH STRENGTH FRICTION GRIP BOLTS	4325			
931	ELECTRODES FOR MANUAL ARC WELDING	639		BS EN499	BS 639 Withdrawn Replaced by BS EN 499
932	BLACK CUP COUNTERSUNK BLOTS, SCREWS WITH NUTS	4933			BS 4933 Obsolescent
933	METAL LATHING	1369			
934	ROLLED ASPHALT HOT PROCESS FOR ROADS	594			
935	BINDER DIST. FOR ROAD SURFACE DRESSING	1707			
936	BITUMINOUS ROOFING FELT	747		CP 114:3	CP 114:3 Withdrawn
937	GAS WELDING	2640			
938	METALLIC			BS EN 1460	

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<b>SRN</b>	<b>SUBJECT</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
	COATING, HOT DIP GALVANIZED COATING ON FERROUS MATERIALS				
939	METHOD FOR SPECIFYING ELECTROPLATED COATINGS OF ZINC AND CADMIUM ON IRON AND STEEL	1706			
940	DIMENSIONS OF GASKETS FOR PIPE FLANGES TO BS 4504	4865	1		Part 1: Non-metallic flag gaskets (including gaskets for flanges to BS 4722)
941	BONDING AGENTS FOR USE WITH GYPSUM PLASTERS AND CEMENT	5270	1		Part 1: Polyvinyl acetate (PVAC) emulsion bonding agents for indoor use with gypsum building plasters
942	FALSEWORK	5975			
943	TUBULAR POLYETHYLENE FILM FOR USE AS A PROTECTIVE SLEEVING FOR BURIED IRON PIPES AND FITTINGS	6076			
944	FLEXIBLE JOINTS FOR GREY OR DUCTILE CAST IRON DRAINPIPES AND FITTINGS (BS 437) AND FOR DISCHARGE AND VENTILATING PIPES AND FITTINGS (BS 416)	6087			
945	HOT ROLLED PRODUCTS OF NON-ALLOY STRUCTURAL STEELS	1002 5			
946	STAINLESS STEELS	1008 8	2		Part 2: Technical delivery conditions for sheet/plate



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<b>SRN</b>	<b>SUBJECT</b>	<b>BSS</b>	<b>PART</b>	<b>OTHER</b>	<b>REMARKS</b>
					and strip for general purposes

**4.1 DIN**

<b>DIN</b>	<b>SRN</b>	<b>DIN</b>	<b>SRN</b>	<b>DIN</b>	<b>SRN</b>	<b>DIN</b>	<b>SRN</b>	<b>DIN</b>	<b>SRN</b>
105	806	2000	651	2988	204	4279	405	19630	651
106	806	2403	700	2990	204	4279	602	19648	510
267	914	2406	701	2991	204	4281	845	19800	401
278	805	2410	213	2993	204	4325	017	19850	402
459	119	2413	210	2999	203	4325	016	19850	839
483	855	2413	228	2999	823	7572	832	19850	860
488	128	2425	708	3202	502	7865	138	22418	036
488	127	2425	651	3202	505	8061	305	28500	201
488	126	2429	701	3202	501	8061	314	28500	200
488	125	2440	203	3202	509	8061	313	28601	217
1025	905	2440	823	3221	501	8062	300	28602	218
1025	913	2441	203	3230	501	8062	305	28603	219
1045	108	2441	823	3352	502	8063	301	30670	227
1045	107	2442	203	3352	511	8072	825	30671	215
1045	110	2442	823	3352	506	8073	825	30672	221
1045	120	2444	225	3354	504	8074	825	30673	214
1045	111	2448	213	3356	514	8075	825	30673	908
1045	113	2458	213	3357	515	8528	919	30674	220
1045	112	2460	210	3441	847	B553	919	40050	012
1048	116	2460	213	3620	114	855	919	40050	030
1048	117	2460	824	4030	407	8564	600	42021	001
1060	801	2500	207	4032	409	8565	220	42673	010
1084	115	2501	207	4032	655	1045	100	42673	011
1084	121	2505	216	4033	854	16450	301	42961	029
1084	133	2519	207	4034	409	16451	301	46062	008
1101	815	2526	207	4035	408	16922	814	46062	013
1002	815	2559	210	4035	651	16928	302	50019	709
1064	103	2566	107	4046	222	16963	307	50120	600
1064	106	2605	226	4060	811	16970	304	50120	919
1064	105	2615	226	4078	667	18101	817	50141	927
1064	104	2615	216	4085	654	18195	668	50976	903
1187	862	2616	226	4124	145	18196	601	52128	856
1199	849	2616	216	4126	109	18196	650	52129	856
1211	845	2617	216	4226	110	18203	657	52130	856
1212	845	2617	226	4226	108	18301	822	53255	818
1229	846	2632	207	4226	107	18307	650	55928	900
1230	414	2633	207	4226	130	18330	656	55928	917
1249	822	2673	207	4226	111	18540	812	57207	024
1381	833	2693	208	4226	136	19522	829	57660	027
1387	833	2695	208	4226	114	19532	300	57670	020

**CHAPTER 12: STANDARD REFERENCE NUMBERS**

<b>DIN</b>	<b>SRN</b>	<b>DIN</b>	<b>SRN</b>	<b>DIN</b>	<b>SRN</b>	<b>DIN</b>	<b>SRN</b>	<b>DIN</b>	<b>SRN</b>
1614	920	2696	208	4226	113	19532	305	68705	811
1623	920	2697	208	4226	112	19533	825	68706	817
1624	920	2873	221	4226	135	19593	846	68761	813
1626	213	2950	209	4235	132	19594	846	68763	813
1629	213	2980	204	4271	846	19596	846	68764	813
1754	205	2986	203	4279	202	19597	846	68791	131
1986	652	2987	204	4279	303	19630	653	68792	131

## 4.2 BSS

BSS	SRN	BSS	SRN	BSS	SRN	BSS	SRN	BSS	SRN
4	913	1188	835	2494	308	4466	129	5486	020
12	103	1189	831	2499	137	4483	128	5493	900
12	106	1192	703	2439	122	4504	207	5493	908
12	105	1192	704	2569	900	4514	862	5493	917
21	203	5911	410	2640	937	6811	012	5506	835
21	223	1199	130	2757	023	4550	603	5514	021
21	823	1199	136	2871	206	4568	052	5626	045
5685	014	1200	135	2871	205	4592	850	5642	142
65	414	1203	818	3148	114	4607	054	5669	813
78(4772)	224	1211(4772)	200	3284(6811)	307	4622	200	5685	015
143	824	1212	508	3382	921	4624	401	5728	510
144	872	1212	827	3382	922	4624	858	5834	513
159	053	1217	871	3402	875	4625	408	5856	009
308	705	1243	857	3416	904	4652	901	5886	405
336	512	1244	836	3444	810	4660	309	5911	407
368	859	1247	845	3505	311	4670	938	5911	409
410	146	1254	834	3505	310	4800	902	5911	413
416	829	1256	824	3505	300	4870	670	5911	854
417	830	1363	059	3505	305	4871	671	5927	404
437	844	1369	933	3505	312	4999	030	5930	650
437	842	1377	601	3506	305	4999	033	5977	861
459	817	1387	203	3535	028	4999	034	6004	055
499	919	1362	060	3600	213	4999	031	6072	600
534	210	1387	823	3600	228	4999	010	6073	804
534	212	1438	870	3601	213	4999	029	6100	707
569	860	1449	920	3643	923	4999	025	6100	750
594	934	1521	124	3656	839	5000	011	6180	864
604	150	1521	856	3676	058	5000	022	6231	041
690	807	1553	701	3680	661	5000	036	6263	868
729	903	1554	229	3690	866	5000	035	6282	505
743	803	1564	909	3692	924	5000	050	6297	659
747	936	1579	820	3889	600	5041	517	6316	660
750	509	1707	935	3921	805	5070	706	6346	024
775	061	1722	849	3921	806	5075	149	6367	664
812	107	1740	204	3941	003	5135	919	6398	804
812	112	1740	824	3943	873	5150	502	6431	802
812	113	1881	139	3988	063	5151	503	6464	317
842	005	1881	140	3974	406	5152	504	6500	056
882	108	1881	141	4027	104	5153	505	6510	821
882	109	1881	116	4147	214	5154	511	6626	037
882	110	1881	117	4147	908	5163	501	6722	915
882	111	1924	673	4211	847	5212	879	6746	024
890	801	1968	874	4248	148	5311	004	6925	851

**CHAPTER 12: STANDARD REFERENCE NUMBERS**

952	822	2011	042	4293	006	5316	016	8007	012
1010	826	2048	001	4320	925	5316	017	8010	316
1010	832	2494	318	4335	702	5328	100	8110	101
1105	815	2521	877	4346	301	5328	115	8110	143
1142	809	2456	820	4395	930	8007	138		
1186	816	2494	222	4449	126	5419	007		

4.3: OTHER STANDARDS

OTHER STANDARDS	SRN	OTHER STANDARDS	SRN
ASS 2602:83,2603:03	926	ISO 2035,2044	301
AGMA 5T 510	907	ISO 2045,2048,2536	301
ANSI A10 9-1983	663	ISO 2063	900
AP15LS	234	ISO 2505,3114,3472,3473,3474	315
APS 650	928	ISO 2531	202
AS 2813-85	867	ISO 2531	207
ASTM A 47-77	911	ISO 2548 ICE 198	016
ASTM A 48, No. 308	916	ISO 272,4759-1,3	914
AWWA C. 508-82	505	ISO 3046,PARTS 1,2	021
AWWA C.104A,C602-76	211	ISO 3114,3606	300
AWWA C.200-75	210	ISO 3127	310
AWWA C.200-75	230	ISO 4042	922
AWWA C.203-78	221	ISO 4179,6600,DVGW W342	211
AWWA C.205 DVGW-W-342-71	212	ISO 4200	228
AWWA C.214-83	232	ISO 4633	222
AWWA C.602-83	212	ISO 49	209
AWWA C.602-89	413	ISO 7/2	203
CP 1004	062	ISO 7005/2,3	207
CP 112,2	666	ISO 7-1/2	223
CP 2004	665	ISO 7186	411
CP 2005	658	ISO 7194	662
CP 301	652	ISO 7268	231
CP 310	651	ISO 752	918
CP 312	302	ISO 7751	412
CP 499	848	ISO 7752/5	929
IEC 60072	011	ISO 8493	205
IC 60072,72A	010	ISO 881	402
IEC 600805	046	ISO 8885,888	914
IEC 600827	048	ISO 887	925
IEV 60085	023	ISO 898/2,898/1	914
IEE W. REGS (15 <sup>th</sup> EDITION)	018	ISO 965/3,262	923
ISO 1106-3,7438	924	ISO DIS 4042	921
ISO 1167	306	KENYA MWS\$I STANDARD SPEC.	804
ISO 128,2162,2203,5455,5457	705	KS 04-290	049
ISO 13	200	KS 05-459:5	606
ISO 160	401	KS 06-149:2	300
ISO 161/1	300	KS 06-248 1,2	510
ISO 161-1	825	VDB 2	101
ISO 185	906	VDB PART C	902
ISO 1920,4012,4108,4013	117	VDMA 6280	035
ISO 196 (TESTS)	206		