REPUBLIC OF KENYA

NORTHERN WATER WORKS DEVELOPMENT AGENCY

CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT -PHASE I

ITT No: NWWDA/T/CW/050/2023-2024

BIDDING DOCUMENT

VOLUME I

MARCH 2024

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1. PART 1 – TENDERING PROCEDURES

i) Section I-Instructions to Tenderers (ITT)

This Section provides relevant information to help tenderers prepare their tenders. Information is also provided on the submission, opening, and evaluation of tenders and on the award of Contracts. Section I contains provisions that are to be used without modification by the Procuring Entity or by a Tenderer.

ii) SectionII-Tender Data Sheet (TDS)

This Section includes provisions that are specific to each procurement and that supplement Section I, Instructions to Tenderers. This section shall be completed appropriately by the Procuring Entity and not by a Tenderer. In any case, the Procuring Entity shall not add any item in the TDS not included in the Standard Tender Document.

iii) Section III-Evaluation and Qualification Criteria

This Section specifies the criteria to determine the Lowest Evaluated Tender that would be considered for contract award; that is the tenderer that meets the qualification criteria and whose tender has been determined to be:

a) Substantially responsive to the bidding document, and
b) The lowest evaluated cost.

No other criterion shall be added by the Procuring Entity. Some parts of this section may be omitted by the Procuring Entity (and not by a Tenderer) to suit the subject procurement. For example, in some cases evaluation may not include Margin of Preference, so any reference to considerations for Margin of Preference will be omitted. The Procuring Entity will complete the parts of the Criterion only as guided and allowed in this section. For example, if the criterion provides "Post qualification and Contract ward" and lists an item that says "Other conditions……." the Entity shall only include the conditions that are allowed in the Standard Tender Document.

iv) Section IV–Tendering Forms

This Section includes the Form of Tender and other forms to be submitted; e.g. priced Schedules of Requirements, Bills of Quantities, Schedules of technical proposal, including technical and financial qualifications, personnel, financial resources, equipment, Tender Security and others to be completed and submitted by the Tenderer as part of its Tender.

PART 2 - PROCUREMENT ENTITY'SREQUIREMENTS

This Section contains the Procuring Entity's Schedules of Requirements, Specifications, Drawings, and supplementary information that describe the items to be procured. The Requirements shall also include (if so required) the environmental, social, health and safety requirements to be satisfied by the Tenderer in executing the contract.

2. PART 3-CONDITIONS OF CONTRACT AND CONTRACT FORMS

i) Section VIII-General Conditions of Contract (GCC)

This Section contains the general clauses to be applied in all contracts. This Section contains provisions that are to be used without modification by the Procuring Entity or by a Tenderer.

ii) Section IX-Special Conditions of Contract (SCC)

The contents of this Section supplement the General Conditions of Contract and shall be prepared by the Procuring Entity.

iii) Section X-Contract Forms

This Section contains forms which, once completed, will form part of the Contract. The forms, when required, shall only be completed by the successful Tender after Contract award.

INVITATION TO TENDER

PROCURING ENTITY: NORTHERN WATER WORKS DEVELOPMENT AGENCY
CONTRACT NAME AND DESCRIPTION: CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT - PHASE I

1. Northern Water Works Development Agency invites sealed tenders for the construction of Maralal Water Supply Project Phase I in Maralal town, Samburu County. The Works comprise of the following:

a) Construction of an approximately 1,416m long 450 mm dia PN10 epoxy coated internally and externally steel pipe raw water main
b) Construction of an approximately 5,203m long DN400 m HDPE pipe treated water to Maralal town.
c) Construction of an approximately 519m long 355mm dia HDPE PN16 line to existing water tank and connection to the existing tank
d) Construction of a 9,000m^3 per day conventional water treatment plant (stilling well, chemical mixing and storage house, dosing channel, flocculation basins, sedimentation tanks, filters, backwash pump house and elevated backwash water tank, chlorine storage house, operator's office, laboratory and recycled water pump house.
e) Construction of a 500M^3 clean water tank at the water treatment works area
f) Construction of one staff house/Resident Engineer's office
g) Construction of a guard house
h) Site ancillary works

2. Tendering will be conducted under open competitive method (Open National Tendering) using a standardized tender document. **Tendering is open to <u>all qualified and interested citizen contractors</u>.**

3. Qualified and interested tenderers may obtain further information and inspect the Tender Documents during office hours i.e. **0800 to 0500** hours local time from Monday to Friday, except during lunch hours **(1230hrs to 1430hrs)**, & during weekends and public holidays at the address given below.

4. All interested bidders to download the **Tender Documents** from the Website(s) **www.nwwda.go.ke** and **www.tenders.go.ke.**Tender documents obtained electronically will be free of charge.

5. Tender documents may be viewed and downloaded for free from the website **www.nwwda.go.ke** and **www.tenders.go.ke.**Tenderers who download the tender document must forward their particulars immediately to **info@nwwda.go.ke** to facilitate any further clarification or addendum.

6. All Tenders must be accompanied by a **tender security of Ksh 5,000,000 in form of a bank guarantee**

7. The Tenderer shall chronologically serialize all pages of the tender documents submitted.

8. Completed tenders must be delivered to the address below on or before **11.00 am on 18th April 2024**. Electronic Tenders **will not** be permitted.

9. Tenders will be opened at **11:30 am on 18th April 2024**. Tenders will be publicly opened in the presence of the Tenderers' designated representatives who choose to attend at the address below.

10. Late tenders will be rejected.

11. The addresses referred to above are:

A. Address for obtaining further information

Chief Executive Officer
Northern Water Works Development Agency
Maji House, Kismayu Road, Garissa
P. O. Box 495-70100, Kenya
+254-46-2103598/0711-559995
Email: **info@nwwda.go.ke**

B. Address for Submission of Tenders.

Chief Executive Officer
Northern Water Works Development Agency
Maji House, Kismayu Road, Garissa
P. O. Box 495-70100, Kenya
+254-46-2103598/0711-559995
Email: info@nwwda.go.ke
For physical delivery: tender box ground floor room A3 (Supply Chain Management Office)

C. Address for Opening of Tenders.

Conference Room
Northern Water Works Development Agency
Maji House, Kismayu Road, Garissa
P. O. Box 495-70100, Kenya
+254-46-2103598/0711-559995
Email: info@nwwda.go.ke

PART 1 - TENDERING PROCEDURES

SECTION I-INSTRUCTIONS TO

TENDERERS A GENERAL PROVISIONS

1. Sope of Tender

1.1 The Procuring Entity as defined in the Appendix to Conditions of Contract invites tenders for Works Contract as described in the tender documents. The name, identification, and number of lots (contracts) of this Tender Document are **specified in the TDS.**

2. Fraud and Corruption

2.1 The Procuring Entity requires compliance with the provisions of the Public Procurement and Asset Disposal Act, 2015, Section 62 "Declaration not to engage in corruption". The tender submitted by a person shall include a declaration that the person shall not engage in any corrupt or fraudulent practice and a declaration that the person or his or her sub-contractors are not debarred from participating in public procurement proceedings.

2.2 The Procuring Entity requires compliance with the provisions of the Competition Act 2010, regarding collusive practices in contracting. Any tenderer found to have engaged in collusive conduct shall be disqualified and criminal and/or civil sanctions may be imposed. To this effect, Tenderers shall be required to complete and sign the "Certificate of Independent Tender Determination" annexed to the Form of Tender.

2.3 Tenderers shall permit and shall cause their agents (where declared or not), subcontractors, sub-consultants, service providers, suppliers, and their personnel, to permit the Procuring Entity to inspect all accounts, records and other documents relating to any initial selection process, pre-qualification process, tender submission, proposal submission, and contract performance (in the case of award), and to have them audited by auditors appointed by the Procuring Entity.

2.4 Unfair Competitive Advantage -Fairness and transparency in the tender process require that the firms or their Affiliates competing for a specific assignment do not derive a competitive advantage from having provided consulting services related to this tender. To that end, the Procuring Entity shall indicate in the **Data Sheet** and make available to all the firms together with this tender document all information that would in that respect give such firm any unfair competitive advantage over competing firms.

3. Eligible Tenderers

3.1 A Tenderer may be a firm that is a private entity, a state-owned enterprise or institution subject to ITT 3.8, or an individual or any combination of such entities 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 entire 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 tendering process and, in the event the JV is awarded the Contract, during contract execution. Members of a joint venture may not also make an individual tender, be a subcontractor in a separate tender or be part of another joint venture for the purposes of the same Tender. The maximum number of JV members shall be specified in the **TDS.**

3.2 Public Officers of the Procuring Entity, their Spouses, Child, Parent, Brothers or Sister. Child, Parent, Brother or Sister of a Spouse, their business associates or agents and firms/organizations in which they have a substantial or controlling interest shall not be eligible to tender or be awarded a contract. Public Officers are also not allowed to participate in any procurement proceedings.

3.3 A Tenderer shall not have a conflict of interest. Any tenderer found to have a conflict of interest shall be disqualified. A tenderer may be considered to have a conflict of interest for the purpose of this tendering process, if the tenderer:

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

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

c) Has the same legal representative as another tenderer; or

d) Has a relationship with another tenderer, directly or through common third parties, that puts it in a position to influence the tender of another tenderer, or influence the decisions of the Procuring Entity regarding this tendering process; or

e) Any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the goods or works that are the subject of the tender; or

f) any of its affiliates has been hired (or is proposed to be hired) by the Procuring Entity as a consultant for Contract implementation; or

g) Would be providing goods, works, or non-consulting services resulting from or directly related to consulting services for the preparation or implementation of the contract specified in this Tender Document; or

h) Has a close business or personal relationship with senior management or professional staff of the Procuring Entity who has the ability to influence the bidding process and:
   i) are directly or indirectly involved in the preparation of the Tender document or specifications of the Contract, and/or the Tender evaluation process of such contract; or
   ii) may 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 Procuring Entity throughout the tendering process and execution of the Contract.

3.4 A tenderer shall not be involved incorrupt, coercive, obstructive or fraudulent practice. A tenderer that is proven to have been involved in any of these practices shall be automatically disqualified.

3.5 A Tenderer (either individually or as a JV member) shall not participate in more than one Tender, except for permitted alternative tenders. This includes participation as a subcontractor in other Tenders. Such participation shall result in the disqualification of all Tenders in which the firm is involved. Members of a joint venture may not also make an individual tender, be a subcontractor in a separate tender or be part of another joint venture for the purposes of the same Tender. A firm that is not a tenderer or a JV member may participate as a subcontractor in more than one tender.

3.6 A Tenderer may have the nationality of any country, subject to the restrictions pursuant to ITT3.9. A Tenderer shall be deemed to have the nationality of a country if the Tenderer is constituted, incorporated or registered in and operates inconformity 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 subcontractors or sub-consultants for any part of the Contract including related Services.

3.7 A Tenderer that has been debarred from participating in public procurement shall be ineligible to tender or be awarded a contract. The list of debarred firms and individuals is available from the website of PPRA www.ppra.go.ke.

3.8 A Tenderer that is a state-owned enterprise or a public institution in Kenya may be eligible to tender and be awarded a Contract(s) only if it is determined by the Procuring Entity to meet the following conditions, i.e. if it is:

i) A legal public entity of Government and/or public administration,
ii) financially autonomous and not receiving any significant subsidies or budget support from any public entity or Government, and
iii) operating under commercial law and vested with legal rights and liabilities similar to any commercial enterprise to enable it compete with firms in the private sector on an equal basis.

3.9 Firms and individuals shall be ineligible if their countries of origin are:

a) as a matter of law or official regulations, Kenya 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, Kenya 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.

A tenderer shall provide such documentary evidence of eligibility satisfactory to the Procuring Entity, as the Procuring Entity shall reasonably request.

3.10 Foreign tenderers are required to source at least forty (40%) percent of their contract inputs (in supplies, local subcontracts and labor) from citizen suppliers and contractors. To this end, a foreign tenderer shall provide in its tender documentary evidence that this requirement is met. Foreign tenderers not meeting this criterion will be automatically disqualified. Information required to enable the Procuring Entity determine if this condition is met shall be provided for this purpose in *"SECTION III-EVALUATION AND QUALIFICATION CRITERIA, Item 9"*.

3.11 Pursuant to the eligibility requirements of ITT4.10, a tender is considered a foreign tenderer, if the tenderer is not registered in Kenya or if the tenderer is registered in Kenya and has less than 51 percent ownership by Kenyan citizens. JVs are considered as foreign tenderers if the individual member firms are not registered in Kenya or if are registered in Kenya and have less than 51 percent ownership by Kenyan citizens. The JV shall not subcontract to foreign firms more than 10 percent of the contract price, excluding provisional sums.

3.12 The National Construction Authority Act of Kenya requires that all local and foreign contractors be registered with the National Construction Authority and be issued with a Registration Certificate before they can undertake any construction works in Kenya. Registration shall not be a condition for tender, but it shall be a condition of contract award and signature. A selected tenderer shall be given opportunity to register before such award and signature of contract. Application for registration with National Construction Authority may be accessed from the website www.nca.go.ke.

3.13 The Competition Act of Kenya requires that firms wishing to tender as Joint Venture undertakings which may prevent, distort or lessen competition in provision of services are prohibited unless they are exempt in accordance with the provisions of Section 25 of the Competition Act, 2010. JVs will be required to seek for exemption from the Competition Authority. Exemption shall not be a condition for tender, but it shall be a condition of contract award and signature. A JV tenderer shall be given opportunity to seek such exemption as a condition of award and signature of contract. Application for exemption from the Competition Authority of Kenya may be accessed from the website www.cak.go.ke.

3.14 A Kenyan tenderer shall be eligible to tender if it provides evidence of having fulfilled his/her tax obligations by producing a valid tax compliance or valid tax certificate issued by the Kenya Revenue Authority.

4. Eligible Goods, Equipment, and Services

4.1 Goods, equipment and services to be supplied under the Contract may have their origin in any country that is not ineligible under ITT3.9. At the Procuring Entity's request, Tenderers may be required to provide evidence of the origin of Goods, equipment and services.

4.2 Any goods, works and production processes with characteristics that have been declared by the relevant national environmental protection agency or by other competent authority as harmful to human beings and to the environment shall not be eligible for procurement.

5. Tenderer's Responsibilities

5.1 The tenderer shall bear all costs associated with the preparation and submission of his/her tender, and the Procuring Entity will in no case be responsible or liable for those costs.

5.2 The tenderer, at the tenderer's own responsibility and risk, is encouraged to visit and examine and inspect the Site of the Works and its surroundings and obtain all information that may be necessary for preparing the tender and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the tenderer's own expense.

5.3 The Tenderer and any of its personnel or agents will be granted permission by the Procuring Entity to enter up on its premises and lands for the purpose of such visit. The Tenderer shall indemnify the Procuring Entity against all liability arising from death or personal injury, loss of or damage to property, and any other losses and expenses incurred as a result of the examination and inspection.

5.4 The tenderer shall provide in the Form of Tender and Qualification Information, a preliminary description of the proposed work method and schedule, including charts, as necessary or required.

B. CONTENTS OF TENDER DOCUMENTS

6. Sections of Tender Document

6.1 The tender document consists of Parts 1, 2, and 3, which includes all the sections specified below, and which should be read in conjunction with any Addenda issued in accordance with ITT10.

PART 1: **Tendering Procedures** Section
I: Instructions to Tenderers Section II:
Tender Data Sheet (TDS)

Section III: Evaluation and Qualification
Criteria Section IV: Tendering Forms

PART 2: **Works' Requirements**
Section V: Bills of Quantities
Section VI: Specifications
Section VII: Drawings

PART3: **Conditions of Contract and Contract**
Forms Section VIII: General Conditions (GCC)
Section IX: Particular Conditions of Contract Section
X: Contract Forms

6.2 The Invitation to Tender Notice issued by the Procuring Entity is not part of the Contract documents.

6.3 Unless obtained directly from the Procuring Entity, the Procuring Entity is not responsible for the completeness of the Tender document, responses to requests for clarification, the minutes of a pre-arranged site visit and those of the pre-Tender meeting (if any), or Addenda to the Tender document in accordance with ITT 10. In case of any contradiction, documents obtained directly from the Procuring Entity shall prevail.

6.4 The Tenderer is expected to examine all instructions, forms, terms, and specifications in the Tender Document and to furnish with its Tender all information and documentation as is required by the Tender document.

7. Clarification of Tender Document, Site Visit, Pre-Tender Meeting

7.1 Tenderer requiring any clarification of the Tender Document shall contact the Procuring Entity in writing at the Procuring Entity's address **specified in the TDS** or raise its enquiries during the pre-Tender meeting if provided for in accordance with ITT 7.2. The Procuring Entity will respond in writing to any request for clarification, provided that such request is received no later than the period specified in the **TDS p**rior to the deadline for submission of tenders. The Procuring Entity shall forward copies of its response to all tenderers who have acquired the Tender D documents in accordance with ITT 7.4, including a description of the inquiry but without identifying its source. If so specified **in the TDS**, the Procuring Entity shall also promptly publish its response at the web page identified in the **TDS**. Should the clarification result in changes to the essential elements of the Tender Documents, the Procuring Entity shall amend the Tender Documents following the procedure under ITT 8 and ITT 22.2.

7.2 The Tenderer, at the Tenderer's own responsibility and risk, is encouraged to visit and examine and inspect the site(s) of the required contracts and obtain all information that may be necessary for preparing a tender. The costs of visiting the Site shall be at the Tenderer's own expense. The Procuring Entity shall specify in the **TDS** if a pre- arranged Site visit and or a pre-tender meeting will be held, when and where. The Tenderer's designated representative is invited to attend a pre-arranged site visit and a pre-tender meeting, as the case may be. The purpose of the site visit and the pre-tender meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

7.3 The Tenderer is requested to submit any questions in writing, to reach the Procuring Entity not later than the period specified in the **TDS** before the meeting.

7.4 Minutes of a pre-arranged site visit and those of the pre-tender meeting, if applicable, including the text of the questions asked by Tenderers and the responses given, together with any responses prepared after the meeting, will be transmitted promptly to all Tenderers who have acquired the Tender Documents. Minutes shall not identify the source of the questions asked.

7.5 The Procuring Entity shall also promptly publish anonymized (*no names*) Minutes of the pre-arranged site visit and those of the pre-tender meeting at the web page identified **in the TDS**. Any modification to the Tender Documents that may become necessary as a result of the pre-arranged site visit and those of the pre-tender meeting shall be made by the Procuring Entity exclusively through the issue of an Addendum pursuant to ITT 8 and not through the minutes of the pre-Tender meeting. Non-attendance at the pre-arranged site visit and the pre-tender meeting will not be a cause for disqualification of a Tenderer.

8. Amendment of Tender Documents

8.1 At any time prior to the deadline for submission of Tenders, the Procuring Entity may amend the Tender Documents by issuing addenda.

8.2 Any addendum issued shall be part of the Tender Documents and shall be communicated in writing to all who have obtained the Tender Documents from the Procuring Entity. The Procuring Entity shall also promptly publish the addendum on the Procuring Entity's website in accordance with ITT 7.5.

8.3 To give Tenderers reasonable time in which to take an addendum into account in preparing their Tenders, the Procuring Entity should extend the deadline for the submission of Tenders, pursuant to ITT 22.2.

C. PREPARATION OF TENDERS

9. Cost of Tendering

The Tenderer shall meet all costs associated with the preparation and submission of its Tender, and the Procuring Entity shall not be responsible or liable for those costs, regardless of the conduct or outcome of the tendering process.

10. Language of Tender

The Tender, as well as all correspondence and documents relating to the tender exchanged by the tenderer and the Procuring Entity, shall be written in the English Language. Supporting documents and printed literature that are part of the Tender may be in another language provided they are accompanied by an accurate and notarized translation of the relevant passages into the English Language**,** in which case, for purposes of interpretation of the Tender, such translation shall govern.

11. Documents Comprising the Tender

11.1 The Tender shall comprise the following:

a) Form of Tender prepared in accordance with ITT 12;
b) Schedules including priced Bill of Quantities, completed in accordance with ITT 12 and ITT 14;
c) Tender Security or Tender-Securing Declaration, in accordance with ITT 19.1;
d) Alternative Tender, if permissible, in accordance with ITT 13;
e) Authorization: written confirmation authorizing the signatory of the Tender to commit the Tenderer, in accordance with ITT 20.3;
f) Qualifications: documentary evidence in accordance with ITT 17 establishing the Tenderer's qualifications to perform the Contract if its Tender is accepted;
g) Conformity: a technical proposal in accordance with ITT 16;
h) Any other document required in the **TDS**.

11.2 In addition to the requirements under ITT 11.1, Tenders 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 Tender shall be signed by all members and submitted with the Tender, together with a copy of the proposed JV Agreement. Change of membership and conditions of the JV prior to contract signature will render the tender liable for disqualification.

12. Form of Tender and Schedules

12.1 The Form of Tender and Schedules, including the Bill of Quantities, shall be prepared using the relevant forms furnished in Section IV, Tendering Forms. The forms must be completed without any alterations to the text, and no substitutes shall be accepted except as provided under ITT 20.3. All blank spaces shall be filled in with the information requested. The Tenderer shall chronologically serialize all pages of the tender documents submitted.

12.2 The Tenderer shall furnish in the Form of Tender information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this Tender.

13. Alternative Tenders

13.1 Unless otherwise specified in the TDS, alternative Tenders shall not be considered.

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

13.3 Except as provided under ITT13.4 below, Tenderers wishing to offer technical alternatives to the requirements of the Tender Documents must first price the Procuring Entity's design as described in the Tender Documents and shall further provide all information necessary for a complete evaluation of the alternative by the Procuring Entity, 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 Tenderer with the Winning Tender conforming to the basic technical requirements shall be considered by the Procuring Entity.

13.4 When specified in the **TDS**, Tenderers are permitted to submit alternative technical solutions for specified parts of the Works, and such parts will be identified in the **TDS**, as will the method for their evaluating, and described in Section VII, Works' Requirements.

14. Tender Prices and Discounts

14.1 The prices and discounts (including any price reduction) quoted by the Tenderer in the Form of Tender and in the Bill of Quantities shall conform to the requirements specified below.

14.2 The Tenderer 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 Tenderer shall be deemed covered by the rates for other items in the Bill of Quantities and will not be paid for separately by the Procuring Entity. An item not listed in the priced Bill of Quantities shall be assumed to be not included in the Tender, and provided that the Tender is determined substantially responsive notwithstanding this omission, the average price of the item quoted by substantially responsive Tenderers will be added to the Tender price and the equivalent total cost of the Tender so determined will be used for price comparison.

14.3 The price to be quoted in the Form of Tender, in accordance with ITT 12, shall be the total price of the Tender, including any discounts offered.

14.4 The Tenderer shall quote any discounts and the methodology for their application in the Form of Tender, in accordance with ITT 12

14.5 It will be specified in the **TDS** if the rates and prices quoted by the Tenderer are or are not subject to adjustment during the performance of the Contract in accordance with the provisions of the Conditions of Contract, excepting cases where the contract is subject to fluctuations and adjustments, not fixed price. In such a case, the Tenderer shall furnish the indices and weightings for the price adjustment formulae in the Schedule of Adjustment Data and the Procuring Entity may require the Tenderer to justify its proposed indices and weightings.

14.6 Where tenders are being invited for individual lots (contracts) or for any combination of lots (packages), tenderers wishing to offer discounts for the award of more than one Contract shall specify in their Tender the price reductions applicable to each package, or alternatively, to individual Contracts within the package. Discounts shall be submitted in accordance with ITT 14.4, provided the Tenders 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 30 days prior to the deadline for submission of Tenders, shall be included in the rates and prices and the total Tender Price submitted by the Tenderer.

15. Currencies of Tender and Payment

15.1 The currency (ies) of the Tender and the currency (ies) of payments shall be the same.

15.2 Tenderers shall quote entirely in Kenya Shillings. The unit rates and the prices shall be quoted by the Tenderer in the Bill of Quantities, entirely in Kenya shillings

a) A Tenderer expecting to incur expenditures in other currencies for inputs to the Works supplied from outside Kenya (referred to as “the foreign currency requirements”) shall (if so, allowed in the **TDS**)

indicate in the Appendix to Tender the percentage(s) of the Tender Price (excluding Provisional Sums), needed by the Tenderer for the payment of such foreign currency requirements, limited to no more than two foreign currencies.

b) The rates of exchange to be used by the Tenderer in arriving at the local currency equivalent and the percentage(s) mentioned in (a) above shall be specified by the Tenderer in the Appendix to Tender and shall be based on the exchange rate provided by the Central Bank of Kenya on the date 30 days prior to the actual date of tender opening. Such exchange rate shall apply for all foreign payments under the Contract.

15.3 Tenderers may be required by the Procuring Entity to justify, to the Procuring Entity'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 in the Appendix to Tender are reasonable, in which case a detailed breakdown of the foreign currency requirements shall be provided by Tenderers.

16. Documents Comprising the Technical Proposal

The Tenderer shall furnish a technical proposal including a statement of work methods, equipment, personnel, schedule and any other information as stipulated in Section IV, Tender Forms, in sufficient detail to demonstrate the adequacy of the Tenderer's proposal to meet the work's requirements and the completion time.

17. Documents Establishing the Eligibility and Qualifications of the Tenderer

17.1 Tenderers shall complete the Form of Tender, included in Section IV, Tender Forms, to establish Tenderer's eligibility in accordance with ITT 4.

17.2 In accordance with Section III, Evaluation and Qualification Criteria, to establish its qualifications to perform the Contract the Tenderer shall provide the information requested in the corresponding information sheets included in Section IV, Tender Forms.

17.3 If a margin of preference applies as specified in accordance with ITT33. 1, national tenderers, individually or in joint ventures, applying for eligibility for national preference shall supply all information required to satisfy the criteria for eligibility specified in accordance with ITT 33.1.

17.4 Tenderers shall be asked to provide, as part of the data for qualification, such information, including details of ownership, as shall be required to determine whether, according to the classification established by the Procuring Entity, a particular contract or group of contractors qualifies for a margin of preference. Further the information will enable the Procuring Entity identify any actual or potential conflict of interest in relation to the procurement and/or contract management processes, or possibility of collusion between tenderers, and there by help to prevent any corrupt influence in relation to the procurement process or contract management.

17.5 The purpose of the information described **in ITT 17.2** above overrides any claims to confidentiality which a tenderer may have. There can be no circumstances in which it would be justified for a tenderer to keep information relating to its ownership and control confidential where it is tendering to undertake public sector work and receive public sector funds. Thus, confidentiality will not be accepted by the Procuring Entity as a justification for a Tenderer's failure to disclose, or failure to provide required information on its ownership and control.

17.6 The Tenderer shall provide further documentary proof, information or authorizations that the Procuring Entity may request in relation to ownership and control which information on any changes to the information which was provided by the tenderer under ITT 6.4. The obligations to require this information shall continue for the duration of the procurement process and contract performance and after completion of the contract, if any change to the information previously provided may reveal a conflict of interest in relation to the award or management of the contract.

17.7 All information provided by the tenderer pursuant to these requirements must be complete, current and accurate as at the date of provision to the Procuring Entity. In submitting the information required pursuant to these requirements, the Tenderer shall warrant that the information submitted is complete, current and accurate as at the date of submission to the Procuring Entity.

17.8 If a tenderer fails to submit the information required by these requirements, its tenderer will be rejected. Similarly, if the Procuring Entity is unable, after taking reasonable steps, to verify to a reasonable degree the information submitted by a tenderer pursuant to these requirements, then the tender will be rejected.

17.9 If information submitted by a tenderer pursuant to these requirements, or obtained by the Procuring Entity (whether through its own enquiries, through notification by the public or otherwise), shows any conflict of interest which could materially and improperly benefit the tenderer in relation to the procurement or contract management process, then:

i) If the procurement process is still on going, the tenderer will be disqualified from the procurement process,
ii) If the contract has been awarded to that tenderer, the contract award will be set aside,
iii) The tenderer will be referred to the relevant law enforcement authorities for investigation of whether the tenderer or any other persons have committed any criminal offence.

17.10 If a tenderer submits information pursuant to these requirements that is incomplete, inaccurate or out-of-date, or attempts to obstruct the verification process, then the consequences ITT 17.8 will ensue unless the tenderer can show to the reasonable satisfaction of the Procuring Entity that any such act was not material, or was due to genuine error which was not attributable to the intentional act, negligence or recklessness of the tender.

18. Period of Validity of Tenders

18.1 Tenders shall remain valid for the Tender Validity period specified in the TDS. The Tender Validity period starts from the date fixed for the Tender submission deadline (as prescribed by the Procuring Entity in accordance with ITT 22). A Tender valid for a shorter period shall be rejected by the Procuring Entity as non-responsive.

18.2 18.2 In exceptional circumstances, prior to the expiration of the Tender validity period, the Procuring Entity may request Tenderers to extend the period of validity of their Tenders. The request and the responses shall be made in writing. If a Tender Security is requested in accordance with ITT 19, it shall also be extended for thirty (30) days beyond the deadline of the extended validity period. A Tenderer may refuse the request without forfeiting its Tender security. A Tenderer granting their quest shall not be required or permitted to modify its Tender.

19. Tender Security

19.1 The Tenderer shall furnish as part of its Tender, either a Tender-Securing Declaration or a Tender Security as specified in the **TDS**, in original form and, in the case of a Tender Security, in the amount and currency **specified in the TDS**. A Tender-Securing Declaration shall use the form included in Section IV, Tender Forms.

19.2 If a Tender Security is specified pursuant to ITT19.1, the Tender Security shall be a demand guarantee in any of the following forms at the Tenderer's option:

i) cash;
ii) a bank guarantee;
iii) a guarantee by an insurance company registered and licensed by the Insurance Regulatory Authority listed by the Authority; or
iv) a guarantee issued by a financial institution approved and licensed by the Central Bank of Kenya, from a reputable source, and an eligible country.

19.3 If an unconditional bank guarantee is issued by a bank located outside Kenya, the issuing bank shall have a correspondent bank located in Kenya to make it enforceable. The Tender Security shall be valid for thirty (30) days beyond the original validity period of the Tender, or beyond any period of extension if requested under ITT 18.2.

19.4 If a Tender Security or Tender-Securing Declaration is specified pursuant to ITT 19.1, any Tender not accompanied by a substantially responsive Tender Security or Tender-Securing Declaration shall be rejected by the Procuring Entity as non-responsive.

19.5 If a Tender Security is specified pursuant to ITT 19.1, the Tender Security of unsuccessful Tenderers shall be returned as promptly as possible upon the successful Tenderer's signing the Contract and furnishing the Performance Security and any other documents required in the **TDS**. The Procuring Entity shall also promptly return the tender security to the tenderers where the procurement proceedings are terminated, all tenders were determined non-responsive or a bidder declines to extend tender validity period.

19.6 The Tender Security of the successful Tenderer shall be returned as promptly as possible once the successful Tenderer has signed the Contract and furnished the required Performance Security, and any other documents required in the **TDS**.

19.7 The Tender Security may be forfeited or the Tender-Securing Declaration executed:

a) if a Tenderer withdraws its Tender during the period of Tender validity specified by the Tenderer on the Form of Tender, or any extension there to provide by the Tenderer; or

b) if the successful Tenderer fails to:

i) sign the Contract in accordance with ITT 47; or

ii) furnish a Performance Security and if required in the **TDS**, and any other documents required in the **TDS.**

19.8 Where tender securing declaration is executed, the Procuring Entity shall recommend to the PPRA that PPRA debars the Tenderer from participating in public procurement as provided in the law.

19.9 The Tender Security or the Tender-Securing Declaration of a JV shall be in the name of the JV that submits the Tender. If the JV has not been legally constituted into a legally enforceable JV at the time of tendering, the Tender Security or the Tender-Securing Declaration shall be in the names of all future members as named in the letter of intent referred to in ITT 4.1 and ITT 11.2.

19.10 A tenderer shall not issue a tender security to guarantee itself.

20. Format and Signing of Tender

20.1 The Tenderer shall prepare one original of the documents comprising the Tender as described in ITT 11 and clearly mark it "ORIGINAL." Alternative Tenders, if permitted in accordance with ITT 13, shall be clearly marked "ALTERNATIVE." In addition, the Tenderer shall submit copies of the Tender, in the number **specified in the TDS** and clearly mark them "COPY." In the event of any discrepancy between the original and the copies, the original shall prevail.

20.2 Tenderers shall mark as "CONFIDENTIAL" all information in their Tenders which is confidential to their business. This may include proprietary information, trade secrets, or commercial or financially sensitive information.

20.3 The original and all copies of the Tender shall be typed or written in indelible ink and shall be signed by a person duly authorized to sign on behalf of the Tenderer. This authorization shall consist of a written confirmation as specified in the **TDS** and shall be attached to the Tender. The name and position held by each person signing the authorization must be typed or printed below the signature. All pages of the Tender where entries or amendments have been made shall be signed or initialed by the person signing the Tender.

20.4 In case the Tenderer is a JV, the Tender 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.

20.5 Any inter-lineation, erasures, or overwriting shall be valid only if they are signed or initialed by the person signing the Tender.

D. SUBMISSION AND OPENING OF TENDERS

21. Sealing and Marking of Tenders

21.1 The Tenderer shall deliver the Tender in a single sealed envelope, or in a single sealed package, or in a single sealed container bearing the name and Reference number of the Tender, addressed to the Procuring Entity and a warning not to open before the time and date for Tender opening date. Within the single envelope, package or container, the Tenderer shall place the following separate, sealed envelopes:

a) in an envelope or package or container marked "ORIGINAL", all documents comprising the Tender, as describedinITT11; and

b) in an envelope or package or container marked "COPIES" all required copies of the Tender; and

c) if alternative Tenders are permitted in accordance with ITT 13, and if relevant:

i) in an envelope or package or container marked "ORIGINAL - ALTERNATIVE TENDER", the alternative Tender; and

ii) in the envelope or package or container marked "COPIES-ALTERNATIVETENDER", all required copies of the alternative Tender.

The inner envelopes or packages or containers shall:

a) Bear the name and address of the Procuring Entity.
b) Bear the name and address of the Tenderer; and
c) Bear the name and Reference number of the Tender.

21.2 If an envelope or package or container is not sealed and marked as required, the *Procuring Entity* will assume no responsibility for the misplacement or premature opening of the Tender. Tenders that were misplaced or opened prematurely will not be accepted.

22. Deadline for Submission of Tenders

22.1 Tenders must be received by the Procuring Entity at the address specified in the **TDS** and no later than the date and time also specified in the **TDS.** When so specified in the **TDS**, Tenderers shall have the option of submitting their Tenders electronically. Tenderers submitting Tenders electronically shall follow the electronic Tender submission procedures specified in the **TDS**.

22.2 The Procuring Entity may, at its discretion, extend the deadline for the submission of Tenders by amending the Tender Documents in accordance with ITT 8, in which case all rights and obligations of the Procuring Entity and Tenderers previously subject to the deadline shall thereafter be subject to the deadline as extended.

23. Late Tenders

The Procuring Entity shall not consider any Tender that arrives after the deadline for submission of tenders, in accordance with ITT 22. Any Tender received by the Procuring Entity after the deadline for submission of Tenders shall be declared late, rejected, and returned unopened to the Tenderer.

24. Withdrawal, Substitution, and Modification of Tenders

24.1 A Tenderer may withdraw, substitute, or modify its Tender 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 ITT 20.3, (except that withdrawal notices do not require copies). The corresponding substitution or modification of the Tender must accompany the respective written notice. All notices must be:

a) prepared and submitted in accordance with ITT 20 and ITT 21 (except that withdrawals notices do not require copies), and in addition, the respective envelopes shall be clearly marked "WITHDRAWAL," "SUBSTITUTION," "MODIFICATION; "and
b) received by the Procuring Entity prior to the deadline prescribed for submission of Tenders, in accordance with ITT 22.

24.2 Tenders requested to be withdrawn in accordance with ITT 24.1 shall be returned unopened to the Tenderers.

24.3 No Tender may be withdrawn, substituted, or modified in the interval between the deadline for submission of Tenders and the expiration of the period of Tender validity specified by the Tenderer on the Form of Tender or any extension thereof.

25. Tender Opening

25.1 Except in the cases specified in ITT 23 and ITT 24.2, the Procuring Entity shall publicly open and read out all Tenders received by the deadline, at the date, time and place specified **in the TDS**, in the presence of Tenderers' designated representatives and anyone who chooses to attend. Any specific electronic Tender opening procedures required if electronic Tendering is permitted in accordance with ITT 22.1, shall be as specified in the **TDS.**

25.2 First, envelopes marked "WITHDRAWAL" shall be opened and read out and the envelopes with the corresponding Tender shall not be opened but returned to the Tenderer. No Tender withdrawal shall be permitted unless the corresponding withdrawal notice contains a valid authorization to request the withdrawal and is read out attender opening.

25.3 Next, envelopes marked "SUBSTITUTION" shall be opened and read out and exchanged with the corresponding Tender being substituted, and the substituted Tender shall not be opened, but returned to the Tenderer. No Tender substitution shall be permitted unless the corresponding substitution notice contains a valid authorization to request the substitution and is read out at Tender opening.

25.4 Next, envelopes marked "MODIFICATION" shall be opened and read out with the corresponding Tender. No Tender modification shall be permitted unless the corresponding modification notice contains a valid authorization to request the modification and is read out at Tender opening.

25.5 Next, all remaining envelopes shall be opened one at a time, reading out: the name of the Tenderer and whether there is a modification; the total Tender Price, per lot (contract) if applicable, including any discounts and alternative Tenders; the presence or absence of a Tender Security or Tender-Securing Declaration, if required; and any other details as the Procuring Entity may consider appropriate.

25.6 Only Tenders, alternative Tenders and discounts that are opened and read out at Tender opening shall be considered further for evaluation. The Form of Tender and pages of the Bill of Quantities (to be decided on by the tender opening committee) are to be initialed by the members of the tender opening committee attending the opening.

25.7 At the Tender Opening, the Procuring Entity shall neither discuss the merits of any Tender nor reject any Tender (except for late Tenders, in accordance with ITT 23.1).

25.8 The Procuring Entity shall prepare minutes of the Tender Opening that shall include, as a minimum:

a) The name of the Tenderer and whether there is a withdrawal, substitution, or modification;
b) The Tender Price, per lot (contract) if applicable, including any discounts;
c) Any alternative Tenders;
d) The presence or absence of a Tender Security, if one was required.
e) Number of pages of each tender document submitted.

25.9 The Tenderers' representatives who are present shall be requested to sign the minutes. The omission of a Tenderer's signature on the minutes shall not invalidate the contents and effect of the minutes. A copy of tender opening register shall be issued to a tenderer upon request.

E. EVALUATION AND COMPARISON OF TENDERS

26. Confidentiality

26.1 Information relating to the evaluation of Tenders and recommendation of contract award shall not be disclosed to Tenderers or any other persons not officially concerned with the Tender process until information on Intention to Award the Contract is transmitted to all Tenderers in accordance with ITT 43.

26.2 Any effort by a Tenderer to influence the Procuring Entity in the evaluation of the Tenders or Contract award decisions may result in the rejection of its tender.

26.3 Notwithstanding ITT 26.2, from the time of tender opening to the time of contract award, if a tenderer wishes to contact the Procuring Entity on any matter related to the tendering process, it shall do so in writing.

27. Clarification of Tenders

27.1 To assist in the examination, evaluation, and comparison of the tenders, and qualification of the tenderers, the Procuring Entity may, at its discretion, ask any tenderer for a clarification of its tender, given a reasonable time for a response. Any clarification submitted by a tenderer that is not in response to a request by the Procuring Entity shall not be considered. The Procuring Entity'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 tender shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Procuring Entity in the evaluation of the tenders, in accordance with ITT 31.

27.2 If a tenderer does not provide clarifications of its tender by the date and time set in the Procuring Entity's request for clarification, its Tender may be rejected.

28. Deviations, Reservations, and Omissions

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

a) "Deviation" is a departure from the requirements specified in the tender document;

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

c) "Omission" is the failure to submit part or all of the information or documentation required in the Tender document.

29. Determination of Responsiveness

29.1 The Procuring Entity's determination of a Tender's responsiveness is to be based on the contents of the tender itself, as defined in ITT 11.

29.2 A substantially responsive Tender is one that meets the requirements of the Tender document without material deviation, reservation, or omission. A material deviation, reservation, or omission is one that, if accepted, would:

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

b) limit in any substantial way, inconsistent with the tender document, the Procuring Entity's rights or the tenderer's obligations under the proposed contract; or

c) if rectified, would unfairly affect the competitive position of other tenderers presenting substantially responsive tenders.

29.3 The Procuring Entity shall examine the technical aspects of the tender submitted in accordance with ITT 16, to confirm that all requirements of Section VII, Works' Requirements have been met without any material deviation, reservation or omission.

29.4 If a tender is not substantially responsive to the requirements of the tender document, it shall be rejected by the Procuring Entity and may not subsequently be made responsive by correction of the material deviation, reservation, or omission.

30. Non-material non-conformities

30.1 Provided that a tender is substantially responsive, the Procuring Entity may waive any non-conformities in the tender.

30.2 Provided that a Tender is substantially responsive, the Procuring Entity may request that the tenderer submit the necessary information or documentation, within a reasonable period of time, to rectify nonmaterial non-conformities in the tender related to documentation requirements. Requesting information or documentation on such non-conformities shall not be related to any aspect of the price of the tender. Failure of the tenderer to comply with the request may result in the rejection of its tender.

30.3 Provided that a tender is substantially responsive, the Procuring Entity shall rectify quantifiable nonmaterial non-conformities related to the Tender Price. To this effect, the Tender Price shall be adjusted, for comparison purposes only, to reflect the price of a missing or non-conforming item or component in the manner specified **in the TDS.**

31. Arithmetical Errors

31.1 The tender sum as submitted and read out during the tender opening shall be absolute and final and shall not be the subject of correction, adjustment or amendment in anyway by any person or entity.

31.2 Provided that the Tender is substantially responsive, the Procuring Entity shall handle errors on the following basis:

a) Any error detected if considered a major deviation that affects the substance of the tender, shall lead to disqualification of the tender as non-responsive.

b) Any errors in the submitted tender arising from a miscalculation of unit price, quantity, subtotal and total bid price shall be considered as a major deviation that affects the substance of the tender and shall lead to disqualification of the tender as non-responsive. and

c) If there is a discrepancy between words and figures, the amount in words shall prevail

31.3 Tenderers shall be notified of any error detected in their bid during the notification of award.

32. Conversion to Single Currency

For evaluation and comparison purposes, the currency (ies) of the Tender shall be converted into a single currency **as specified in the TDS**.

33. Margin of Preference and Reservations

33.1 A margin of preference may be allowed only when the contract is open to international competitive tendering where foreign contractors are expected to participate in the tendering process and where the contract exceeds the value/threshold specified in the Regulations.

33.2 A margin of preference shall not be allowed unless it is specified so in the **TDS**.

33.3 Contracts procured on basis of international competitive tendering shall not be subject to reservations exclusive to specific groups as provided in ITT 33.4.

33.4 Where it is intended to reserve a contract to a specific group of businesses (these groups are Small and Medium Enterprises, Women Enterprises, Youth Enterprises and Enterprises of persons living with disability, as the case may be), and who are appropriately registered as such by the authority to be specified in the **TDS**, a procuring entity shall ensure that the invitation to tender specifically indicates that only businesses or firms belonging to the specified group are eligible to tender. No tender shall be reserved to more than one group. If not so stated in the Invitation to Tender and in the Tender documents, the invitation to tender will be open to all interested tenderers.

34. Nominated Subcontractors

34.1 **Unless** otherwise stated **in the TDS,** the Procuring Entity does not intend to execute any specific elements of the Works by subcontractors selected/nominated by the Procuring Entity. In case the Procuring Entity nominates a subcontractor; the subcontract agreement shall be signed by the Subcontractor and the Procuring Entity. The main contract shall specify the working arrangements between the main contractor and the nominated subcontractor.

34.2 Tenderers may propose subcontracting up to the percentage of total value of contracts or the volume of works as specified **in the TDS**. Subcontractors proposed by the Tenderer shall be fully qualified for their parts of the Works.

34.3 Domestic subcontractor's qualifications shall not be used by the Tenderer to qualify for the Works unless their specialized parts of the Works were previously designated so by the Procuring Entity **in the TDS** as can be met by subcontractors referred to hereafter as 'Specialized Subcontractors', in which case, the qualifications of the Specialized Subcontractors proposed by the Tenderer may be added to the qualifications of the Tenderer.

35. Evaluation of Tenders

35.1 The Procuring Entity shall use the criteria and methodologies listed in this ITT and Section III, Evaluation and Qualification Criteria. No other evaluation criteria or methodologies shall be permitted. By applying the criteria and methodologies the Procuring Entity shall determine the Lowest Evaluated Tender in accordance with ITT 40.

35.2 To evaluate a Tender, the Procuring Entity shall consider the following:

a) Price adjustment in accordance with ITT 31.1(iii); excluding provisional sums and contingencies, if any, but including Day work items, where priced competitively;

b) Price adjustment due to discounts offered in accordance with ITT 14.4;

c) converting the amount resulting from applying (a) and (b) above, if relevant, to a single currency in accordance with ITT 32;

d) price adjustment due to quantifiable non material non-conformities in accordance with ITT 30.3; and

e) any additional evaluation factors specified **in the TDS** and 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 considered intender evaluation.

35.4 Where the tender involves multiple lots or contracts, the tenderer will be allowed to tender for one or more lots (contracts). Each lot or contract will be evaluated in accordance with ITT 35.2. The methodology to determine the lowest evaluated tenderer or tenderers based one lot (contract) or based on a combination of lots (contracts), will be specified in Section III, Evaluation and Qualification Criteria. In the case of multiple lots or contracts, tenderer will be will be required to prepare the Eligibility and Qualification Criteria Form for each Lot.

36. Comparison of Tenders

The Procuring Entity shall compare the evaluated costs of all substantially responsive Tenders established in accordance with ITT 35.2 to determine the Tender that has the lowest evaluated cost.

37. Abnormally Low Tenders and Abnormally High Tenders

Abnormally Low Tenders

37.1 An Abnormally Low Tender is one where the Tender price, in combination with other elements of the Tender, appears so low that it raises material concerns as to the capability of the Tenderer in regards to the Tenderer's ability to perform the Contract for the offered Tender Price or that genuine competition between Tenderers is compromised.

37.2 In the event of identification of a potentially Abnormally Low Tender, the Procuring Entity shall seek written clarifications from the Tenderer, including detailed price analyses of its Tender price in relation to the subject matter of the contract, scope, proposed methodology, schedule, allocation of risks and responsibilities and any other requirements of the Tender document.

37.3 After evaluation of the price analyses, in the event that the Procuring Entity determines that the Tenderer has failed to demonstrate its capability to perform the Contract for the offered Tender Price, the Procuring Entity shall reject the Tender.

Abnormally High Tenders

37.4 An abnormally high tender price is one where the tender price, in combination with other constituent elements of the Tender, appears unreasonably too high to the extent that the Procuring Entity is concerned that it (the Procuring Entity) may not be getting value for money or it may be paying too high a price for the contract compared with market prices or that genuine competition between Tenderers is compromised.

37.5 In case of an abnormally high price, the Procuring Entity shall make a survey of the market prices, check if the estimated cost of the contract is correct and review the Tender Documents to check if the specifications, scope of work and conditions of contract are contributory to the abnormally high tenders. The Procuring Entity may also seek written clarification from the tenderer on the reason for the high tender price. The Procuring Entity shall proceed as follows:

i) If the tender price is abnormally high based on wrong estimated cost of the contract, the Procuring Entity may accept or not accept the tender depending on the Procuring Entity's budget considerations.

ii) If specifications, scope of work and/or conditions of contract are contributory to the abnormally high tender prices, the Procuring Entity shall reject all tenders and may retender for the contract based on revised estimates, specifications, scope of work and conditions of contract, as the case may be.

37.6 If the Procuring Entity determines that the Tender Price is abnormally too high because genuine competition between tenderers is compromised (*often due to collusion, corruption or other manipulations*), the Procuring Entity shall reject all Tenders and shall institute or cause competent Government Agencies to institute an investigation on the cause of the compromise, before retendering.

38. Unbalanced and/or Front-Loaded Tenders

38.1 If in the Procuring Entity's opinion, the Tender that is evaluated as the lowest evaluated price is seriously unbalanced and/or front loaded, the Procuring Entity may require the Tenderer to provide written clarifications. Clarifications may include detailed price analyses to demonstrate the consistency of the tender prices with the scope of works, proposed methodology, schedule and any other requirements of the Tender document.

38.2 After the evaluation of the information and detailed price analyses presented by the Tenderer, the Procuring Entity may as appropriate:

a) accept the Tender; or

b) require that the total amount of the Performance Security be increased at the expense of the Tenderer to a level not exceeding a 10% of the Contract Price; or

c) agree on a payment mode that eliminates the inherent risk of the Procuring Entity paying too much for undelivered works; or

d) reject the Tender,

39. Qualifications of the Tenderer

39.1 The Procuring Entity shall determine to its satisfaction whether the eligible Tenderer that is selected as having submitted the lowest evaluated cost and substantially responsive Tender, meets the qualifying criteria specified in Section III, Evaluation and Qualification Criteria.

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

39.3 An affirmative determination shall be a prerequisite for award of the Contract to the Tenderer. A negative determination shall result in disqualification of the Tender, in which event the Procuring Entity shall proceed to the Tenderer who offers a substantially responsive Tender with the next lowest evaluated price to make a similar determination of that Tenderer's qualifications to perform satisfactorily.

40. Lowest Evaluated Tender

Having compared the evaluated prices of Tenders, the Procuring Entity shall determine the Lowest Evaluated Tender. The Lowest Evaluated Tender is the Tender of the Tenderer that meets the Qualification Criteria and whose Tender has been determined to be:

a) Most responsive to the Tender document; and

b) The lowest evaluated price.

41. Procuring Entity's Right to Accept Any Tender, and to Reject Any or All Tenders.

The Procuring Entity reserves the right to accept or reject any Tender and to annul the Tender process and reject all Tenders at any time prior to Contract Award, without there by incurring any liability to Tenderers. In case of annulment, all Tenders submitted and specifically, Tender securities, shall be promptly returned to the Tenderers.

F. AWARD OF CONTRACT

42. Award Criteria

The Procuring Entity shall award the Contract to the successful tenderer whose tender has been determined to be the Lowest Evaluated Tender.

43. Notice of Intention to enter into a Contract

Upon award of the contract and prior to the expiry of the Tender Validity Period the Procuring Entity shall issue a Notification of Intention to Enter into a Contract/Notification of award to all tenderers which shall contain, at a minimum, the following information:

a) the name and address of the Tenderer submitting the successful tender;

b) the Contract price of the successful tender;

c) a statement of the reason(s) the tender of the unsuccessful tenderer to whom the letter is addressed was unsuccessful, unless the price information in (c) above already reveals the reason;

d) the expiry date of the Standstill Period; and

e) instructions on how to request a debriefing and/or submit a complaint during the stand still period;

44. Stand still Period

44.1 The Contract shall not be signed earlier than the expiry of a Standstill Period of 14 days to allow any dissatisfied tender to launch a complaint. Where only one Tender is submitted, the Standstill Period shall not apply.

44.2 Where a Standstill Period applies, it shall commence when the Procuring Entity has transmitted to each Tenderer the Notification of Intention to Enter into a Contract with the successful Tenderer.

45. Debriefing by the Procuring Entity

45.1 On receipt of the Procuring Entity's Notification of Intention to Enter into a Contract referred to in ITT 43, an unsuccessful tenderer may make a concern regarding their tender. The Procuring Entity shall provide the debriefing within five days of receipt of the request.

45.2 Debriefings of unsuccessful Tenderers may be done in writing or verbally. The Tenderer shall bear its own costs of attending such a debriefing meeting.

46. Letter of Award

Prior to the expiry of the Tender Validity Period and upon expiry of the Standstill Period specified in ITT 42.1, upon addressing a complaint that has been filed within the Standstill Period, the Procuring Entity shall transmit the Letter of Award to the successful Tenderer. The letter of award shall request the successful tenderer to furnish the Performance Security within 21 days of the date of the letter.

47. Signing of Contract

47.1 Upon the expiry of the fourteen days of the Notification of Intention to enter into contract and upon the parties meeting their respective statutory requirements, the Procuring Entity shall send the successful Tenderer the Contract Agreement.

47.2 Within fourteen (14) days of receipt of the Contract Agreement, the successful Tenderer shall sign, date, and return it to the Procuring Entity.

47.3 The written contract shall be entered into within the period specified in the notification of award and before expiry of the tender validity period.

48. Performance Security

48.1 Within twenty-one (21) days of the receipt of the Letter of Award from the Procuring Entity, the successful Tenderer shall furnish the Performance Security and, any other documents required in the **TDS**, in accordance with the General Conditions of Contract, subject to ITT 38.2 (b), using the Performance Security and other Forms included in Section X, Contract Forms, or another form acceptable to the Procuring Entity. A foreign institution providing a bank guarantee shall have a correspondent financial institution located in Kenya, unless the Procuring Entity has agreed in writing that a correspondent bank is not required.

48.2 Failure of the successful Tenderer to submit the above-mentioned Performance Security and other documents required in the **TDS** or sign the Contract shall constitute sufficient grounds for the annulment of the award and forfeiture of the Tender Security. In that event the Procuring Entity may award the Contract to the Tenderer offering the next Best Evaluated Tender.

48.3 Performance security shall not be required for contract estimated to cost less than the amount specified in the Regulations.

49. Publication of Procurement Contract

Within fourteen days after signing the contract, the Procuring Entity shall publish the awarded contract at its notice boards and websites; and on the Website of the Authority. At the minimum, the notice shall contain the following information:

a) name and address of the Procuring Entity;

b) name and reference number of the contract being awarded, a summary of its scope and the selection method used;
c) the name of the successful Tenderer, the final total contract price, the contract duration.
d) dates of signature, commencement and completion of contract;
e) names of all Tenderers that submitted Tenders, and their Tender prices as read out at Tender opening.

50. Procurement Related Complaint and Administrative Review

50.1 The procedures for making Procurement-related Complaints shall be specified in the **TDS.**

50.2 A request for administrative review shall be made in the form provided under contract forms.

SECTION II - TENDER DATA SHEET (TDS)

The following specific data shall complement, supplement, or amend the provisions in the Instructions to Tenderers (ITT). Whenever there is a conflict, the provisions herein shall prevail over those in ITT.

Reference to ITC Clause	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
A. General	
ITT 1.1	The name of the contract is: **CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT-PHASE I** The reference number of the Contract is **NWWDA/T/CW/050/2023-2024** The number and identification of lots (contracts) comprising this Tender are ***N/A***
ITT 2.4	The Information made available on competing firms is as follows:
ITT 2.4	The firms that provided consulting services for the contract being tendered for are: **Interconsult Engineers Ltd**
ITT 3.1	Maximum number of members in the Joint Venture (JV) shall be: ***2***
B. Contents of Tender Document	
ITT 7.1	(i) The Tenderer will submit any request for clarifications in writing to the Address **Chief Executive Officer** **Northern Water Works Development Agency** **Maji House, Kismayu Road, Garissa** **P. O. Box 495-70100, Kenya** **+254-46-2103598 / 0711559995** **Email: info@nwwda.go.ke** to reach the Procuring Entity not later than 11th April 2024 (ii) The Procuring Entity will publish its response on the website _ www.nwwda.go.ke
ITT 7.2	(A) A pre-arranged pretender site visit ***shall*** take place at the following date, time and place: Date…4th April, 2024…… Time: 10:00 AM Place: Samburu Water and Sewerage Company Offices in Maralal town (B) Pre-Tender meeting ***shall*** take place at the following date, time and place: Date: 4th April, 2024…….. Time: immediately after the pre-tender site visit Place: Maralal town
ITT 7.3	The Tenderer will submit any questions in writing, to reach the Procuring Entity not later than **7 Days** after the meeting.
ITT 7.5	The Procuring Entity's website where Minutes of the pre-Tender meeting and the pre-arranged pretender will be published is www.nwwda.go.ke

Reference to ITC Clause	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
C. Preparation of Tenders	
ITT 11.1 (h)	The Tenderer shall submit the following additional documents in its Tender: a) Certified Copy of registration certificate as a water works contractor by the National Construction Authority (NCA) under NCA 1 category b) Certified Copy of Certificate of Incorporation and a current CR12 showing the shareholding/ ownership structure of the bidder at the time of submission of the tender c) A valid Tax Compliance Certificate c) Certified copies of audited financial statements and respective auditor's reports for the Last 3 years (2019-2020, 2020-2021, 2021-2022). d) Bid Security in form of unconditional Bank Guarantee or of Ksh. 5,000,000 (Five Million Kenya Shillings) e) Evidence of a legally registered permanent office for the bidding entity in the form of either office space lease/rent agreement (witnessed by an Advocate of the High Court) with evidence of payment of rent/lease dues in the last 12 months OR proof of ownership of the premise where the office is located which shall be in the form of a land ownership document in the name of bidding entity. e) Schedule of Sub-Contractors, if any, including details of work for which the Sub-Contractor shall be employed including the value which should not exceed 30% of Tender Price of Works and details of Sub-Contractor's experience in that field of work. f) Schedule of Projected Cash-Flow – should be based on the outline Programme for execution of the whole of the Works. g) The Bidder shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow requirements stated in this document. The bidder must also demonstrate that it has been having a current ratio of at least 1:1 for each of the last 3 audited financial years h) Schedule of Manufacturers for the following key materials/equipment: (i) Epoxy Coated Steel Pipes and Fittings- internally and externally (ii) Epoxy Coated externally Steel Pipes and Fittings and cement lined internally (iii) HDPE Pipes and fittings (iv) Reinforcement Steel (v) Cement For each item in (g) above the Tenderer 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 (ISO/EN/BS/AWWA. etc.).

ITT 13.1	Alternative Tenders ***shall not be*** considered.
ITT 13.2	Alternative times for completion ***shall not be*** permitted.
ITT 13.4	Alternative technical solutions shall be permitted for the following parts of the Works: **N/A**
ITT 14.5	The prices quoted by the Tenderer shall be **fixed.**
ITT 15.2(a)	Foreign currency requirements ***not allowed.***
ITT 18.2	The Tender validity period shall be ***120 days.***
ITT 18.3	a) The Number of days beyond the expiry of the initial tender validity period will be ***30 days.*** (b) The Tender price shall be adjusted by the following percentages of the tender price: **N/A**
ITT 19.1	Tender Security shall be required, the amount and currency of the Tender Security shall be **Ksh.5,000,000 (Five Million Kenya Shillings) in form of a Bank Guarantee**

Reference to ITC Clause	PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS
ITT 19.5	Other documents required are **N/A**
ITT 20.1	In addition to the original of the Tender, the number of copies is: **two (2) copies**
ITT 20.3	The written confirmation of authorization to sign on behalf of the Tenderer shall consist of: ***Written Power of Attorney duly notarized by a commissioner of oaths.*** ***If not signed by the legally authorized representative of the Bidder, the signatory must have an appointment letter in form of a written power of attorney. Such authority to appoint the signatory must have been bestowed by the Bidder's Articles of Association of which a certified copy the relevant page must be submitted together with the tender. The letter shall clearly have a specimen signature of the appointee and shall be witnessed by a qualified Commissioner for Oaths/Notary Public. A certified copy of the Identification Card/Passport of the appointee shall be attached to that appointment letter.***
D. Submission and Opening of Tenders	
ITT 21.2	A tender package or container that cannot fit in the tender box shall be received at the Supply Chain Management office (Ground floor A-3)
ITT 22.1	(A) For Tender submission purposes the Procuring Entity's address is: ***Chief Executive Officer*** ***Northern Water Works Development Agency*** ***Maji House, Kismayu Road, Garissa*** ***P. O. Box 495-70100, Kenya*** ***+254-46-2103598 / 0711559995*** **Email:** info@nwwda.go.ke Date and time for submission of Tenders: ***On or before 18th April 2024 at 11.00am*** Tenders ***shall not submit*** tenders electronically.
ITT 25.1	The Tender opening shall take place at the time and the address for Opening of Tenders provided below: ***Chief Executive Officer*** ***Northern Water Works Development Agency*** ***Maji House, Kismayu Road, Garissa*** ***P. O. Box 495-70100, Kenya*** ***+254-46-2103598*** Email: info@nwwda.go.ke Date and time for Opening of Tenders: ***On 18th April, 2024 at 11.30am*** Tenders ***shall not be opened*** electronically.
ITT 25.1	If Tenderers are allowed to submit Tenders electronically, they shall follow the electronic tender submission procedures **specified below: N/A**
E. Evaluation, and Comparison of Tenders	
ITT 30.3	The adjustment shall be based on the ***"average"*** price of the item or component as quoted in other substantially responsive Tenders. If the price of the item or component cannot be derived from the price of other substantially responsive Tenders, the Procuring Entity shall use its Lowest estimate.

ITT 31.2	The error shall be considered a major deviation that leads to disqualification of the tender if the percentage of the error (error over the tender price quoted) is: **0%**

Reference to ITC Clause	**PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS**
ITT 32.1	The currency that shall be used for Tender evaluation and comparison purposes to convert at the selling exchange rate all Tender prices expressed in various currencies into a single currency is: **Kenya Shillings.** The source of exchange rate shall be: **N/A** The date for the exchange rate shall be*:* **N/A**
ITT 33.2	A margin of preference ***"shall not"*** apply.
ITT 33.4	The invitation to tender is extended to the following groups that qualify for Reservations. **N/*A***
ITT 34.1	At this time, the Procuring Entity ***"does not intend"*** to execute certain specific parts of the Works by subcontractors selected in advance.
ITT 34.2	Contractor's may propose subcontracting: Maximum percentage of subcontracting permitted is: ***30% of the total contract amount.*** Tenderers planning to subcontract more than 10% of total volume of work shall specify, in the Form of Tender, the activity (ies) or parts of the Works to be subcontracted along with complete details of the subcontractors and their qualification and experience.
ITT 34.3	**N/A**
ITT 35.2 (e)	Additional requirements apply. These are detailed in the evaluation criteria in Section III, Evaluation and Qualification Criteria.
ITT 48.2	Other documents required in addition to the Performance Security are, • **Programme of Works** • **Certified copy of NCA 1 Registration Certificate and Annual Practicing License– Water Works**

ITT 50.1	The procedures for making a Procurement-related Complaint are available from the PPRA website www.@ppra.go.ke or complaints@ppra.go.ke. If a Tenderer wishes to make a Procurement-related Complaint, the Tenderer should submit its complaint following these procedures, in writing (by the quickest means available, that is either by hand delivery or email to: For the attention: **Andrew Rage Eysimkele** Title/position: **Chief Executive Officer** Procuring Entity: **Northern Water Works Development Agency** Email address*: info@nwwda.go.ke* In summary, a Procurement-related Complaint may challenge any of the following: (i) the terms of the Tender Documents; and (ii) the Procuring Entity's decision to award the contract.

SECTION III- EVALUATION AND QUALIFICATION CRITERIA
General Provisions

1. General Provisions

1.1 This section contains the criteria that the Employer shall use to evaluate tender and qualify tenderers. No other factors, methods or criteria shall be used other than specified in this tender document. The Tenderer shall provide all the information requested in the forms included in Section IV, Tendering Forms. The Procuring Entity shall use the **Standard Tender Evaluation Document for Goods and Works** for evaluating Tenders.

1.2 Wherever a Tenderer is required to state a monetary amount, Tenderers should indicate the Kenya Shilling equivalent using the rate of exchange determined as follows:

a) 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 are to be converted) was originally established.
b) Value of single contract - Exchange rate prevailing on the date of the contract signature.
c) Exchange rates shall be taken from the publicly available source identified in the ITT 14.3. Any error in determining the exchange rates in the Tender may be corrected by the Procuring Entity.

1.3 Evaluation and contract award Criteria

The Procuring Entity shall use the criteria and methodologies listed in this Section to evaluate tenders and arrive at the Lowest Evaluated Tender. The tender that (i) meets the qualification criteria, (ii) has been determined to be substantially responsive to the Tender Documents, and (iii) is determined to have the Lowest Evaluated Tender price shall be selected for award of contract.

2. Preliminary examination for Determination of Responsiveness

The Procuring Entity will start by examining all tenders to ensure they meet in all respects the eligibility criteria and other requirements in the ITT, and that the tender is complete in all aspects in meeting the requirements of *"Part 2 – Procuring Entity's Works Requirements",* including checking for tenders with unacceptable errors, abnormally low tenders, abnormally high tenders and tenders that are front loaded. The Standard Tender Evaluation Report for Goods and Works for evaluating Tenders provides clear guidelines on how to deal with review of these requirements. Tenders that do not pass the Preliminary Examination will be considered irresponsive and will not be considered further.

PRELIMINARY EVALUATION (All are Mandatory)

	Preliminary Evaluation and Mandatory Requirements	**Single**	**JV**		
No	**Mandatory Eligibility criteria**	**entity**		**R**	**NR**
1	The Tender is signed and by the person with power of attorney, without material deviation, reservation, or omission.	Must meet	Must meet		
2	There is a letter granting power of attorney to sign the contract, if so required.	Must meet	Must meet		
3	Tenderer is a legally registered entity- Attach copy of Certificate of incorporation and current CR12	Must meet	Must meet		
4	If Tenderer is a JV, it is properly constituted.	N/A	Must meet		
5	Copy of Valid Tax Compliance Certificate	Must meet	Each must meet		
6	All Tenders must be accompanied by Tender security of Ksh 5,000,000 in the form of Bank Guarantee.	Must meet	Must meet		
7	A Tenderer has not participated in more than one Tender, except for permitted alternative tenders	Must meet	Each must meet		
8	Tenderer has not been debarred by the PPRA or any other recognized institution.	Must meet	Each must meet		
9	Tenderer is a commercially autonomous Kenyan State-owned Enterprise.	Must meet	Must meet		
10	Tenderer has no conflicts of interest.	Must meet	Each must meet		
11	Tender has met all scope of requirements and specifications without any material deviation, reservation or omission.	Must meet	Must meet		
12	The tenderer is not insolvent, in receivership, bankrupt or in the process of being wound up.	Must meet	Each must meet		
13	The tender is valid for the required number of days.	Must meet	Must meet		
14	Must duly fill and sign all the forms in the provided formats	Must meet	Must meet		
15	Must duly fill/complete the Bill of Quantities (Bidders are required to fill on the provided BOQ as a Mandatory requirement for Uniformity during Evaluation)	Must meet	Must meet		
16	All Financial alterations ,if any, have been countersigned by the bidder	Must meet	Must meet		
17	All required information has been attached to the Original Tender document and neatly bound. (Documents submitted, as loose papers will be rejected at Preliminary evaluation)	Must meet	Must meet		
18	Must have submitted a set of One original document and two copies, perfectly bound (No spiral binding), **paginated (serialized)** to ensure compliance with section 78 (5) of Public Procurement and Asset Disposal Act, 2015 (from the first page to the last page in a continuous manner).	Must meet	Must meet		
	At this stage, the tenderers submission will either be Responsive(R) or non- responsive(NR). The non- responsive submission will be eliminated from the entire evaluation process and will not be considered further.				

	NB: Bidders are also informed to organize their evidentiary documentation in the order above for ease of reference.				

A firm lacking in any of the above details shall be dropped at this stage and shall not be progressed to the Technical Evaluation stage/Post qualification and Contract award.

3. Tender Evaluation (ITT 35)

Price evaluation: In addition to the criteria listed in ITT 35.2 (a) – (d) the following criteria shall apply:

i) **Alternative Completion Times,** if permitted under ITT 13.2, will be evaluated as follows: **N/A**

ii) **Alternative Technical Solutions** for specified parts of the Works, if permitted under ITT 13.4, will be evaluated as follows'/**A**

iii) **Other Criteria; i**f permitted under ITT 35.2(d): **N/A**

4. Multiple Contracts: N/A

14 Multiple contracts will be permitted in accordance with ITT 35.4. Tenderers are evaluated on basis of Lots and the lowest evaluated tenderer identified for each Lot. The Procuring Entity will select one Option of the two Options listed below for award of Contracts.

OPTION 1 N/A

i) If a tenderer wins only one Lot, the tenderer will be awarded a contract for that Lot, provided the tenderer meets the Eligibility and Qualification Criteria for that Lot.

ii) If a tenderer wins more than one Lot, the tender will be awarded contracts for all won Lots, provided the tenderer meets the aggregate Eligibility and Qualification Criteria for all the Lots. The tenderer will be awarded the combination of Lots for which the tenderer qualifies and the others will be considered

for award to second lowest the tenderers.

OPTION 2 N/A

The Procuring Entity will consider all possible combinations of won Lots [contract(s)] and determine the combinations with the lowest evaluated price. Tenders will then be awarded to the Tenderer or Tenderers in the combinations provided the tenderer meets the aggregate Eligibility and Qualification Criteria for all the won Lots.

5. Alternative Tenders (ITT 13.1) N/A

An alternative if permitted under ITT 13.1, will be evaluated as follows:

The Procuring Entity shall consider Tenders offered for alternatives as specified in Part2-Works Requirements. Only the technical alternatives, if any, of the Tenderer with the Best Evaluated Tender conforming to the basic technical requirements shall be considered by the Procuring Entity

6. Margin of Preference is Not Applicable

1.5 If the TDS so specifies, the Procuring Entity will grant a margin of preference of fifteen percent (15%) to be loaded one valuated price of the foreign tenderers, where the percentage of shareholding of Kenyan citizens is less than fifty-one percent (51%).

1.6 Contractors applying for such preference shall be asked to provide, as part of the data for qualification, such information, including details of ownership, as shall be required to determine whether, according to the classification established by the Procuring Entity, a particular contract or group of contractors qualifies for a margin of preference.

1.7 After Tenders have been received and reviewed by the Procuring Entity, responsive Tenders shall be assessed to ascertain their percentage of shareholding of Kenyan citizens. Responsive tenders to shall be classified into the following groups:

i) Group A: tenders offered by Kenyan Contractors and other Tenderers where Kenyan citizens hold shares of over fifty one percent (51%).

ii) Group B: tenders offered by foreign Contractors and other Tenderers where Kenyan citizens hold shares of less than fifty one percent (51%).

1.8 All evaluated tenders in each group shall, as a first evaluation step, be compared to determine the lowest tender, and the lowest evaluated tender in each group shall be further compared with each other. If, as a result of this comparison, a tender from Group A is the lowest, it shall be selected for the award. If a tender from Group B is the lowest, an amount equal to the percentage indicated in Item 3.1 of the respective tender price, including unconditional discounts and excluding provisional sums and the cost of day works, if any, shall be added to the evaluated price offered in each tender from Group B. All tenders shall then be compared using new prices with added prices to Group Band the lowest evaluated tender from Group A. If the tender from Group A is still the lowest tender, it shall be selected for award. If not, the lowest evaluated tender from Group B based on the first evaluation price shall be selected.

7. Post qualification and Contract award (ITT 39), more specifically,

a) In case the tender <u>was subject to post-qualification</u>, the contract shall be awarded to the lowest evaluated tenderer, subject to confirmation of pre-qualification data, if so required.

b) In case the tender <u>was not subject to post-qualification</u>, the tender that has been determined to be the lowest evaluated tenderer shall be considered for contract award, subject to <u>meeting each of the following conditions.</u>

i) The Tenderer shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow of **Kshs.150,000,000 (Kenya Shillings one hundred and fifty million).**

ii) Minimum <u>average</u> annual construction turnover of **Kshs.350,000,000** (**Kenya Shillings Three Hundred and Fifty Million)** calculated as total certified payments received for contracts in progress and/or completed within the last Five (5) years.

iii) At least 1 number of contract of a similar nature executed within Kenya, or the East African Community or abroad, that have been satisfactorily and substantially completed as a prime contractor, or joint venture member or sub-contractor each of minimum value **Kshs. 500,000,000 (Kenya Shillings Five Hundred million),** within the last five years

For the above or other Contracts executed during the period stipulated in (iii) above, a minimum experience in the following key activities:

a) Construction of water retaining reinforced concrete structures e.g. water treatment structures and water storage tanks involving production and placing of reinforced concrete at an average production rate of not less than 1,000m3/month.

b) Construction of water supply pipelines – HDPE, Steel & Ferrous pipelines of 400mm dia and above at a rate of at least 5km per month.

iv) Contractor's Representative and Key Personnel, which are specified below;

No.	Position	Requirements / Qualifications	Total Work Similar Experience (years)	In Similar Works Experience (years)
1.	Project Manager	BSc. Civil Engineering or equivalent Be Registered with EBK or equivalent (Foreign professionals must obtain temporary practicing from EBK within three months after communication of award.)	15	10
2.	Site Agent	BSc. Civil Engineering Be Registered with EBK or equivalent (Foreign professional must obtain temporary practicing from EBK within three months after communication of award.)	10	7
3.	Construction Engineer	B.Sc. Civil Engineering	8	5
4.	Engineering Surveyor	B.Sc. Geospatial Engineering or equivalent	10	5
5.	Technician (Pipelines)	Higher National Diploma or equivalent	8	4
6.	Technician (Concrete Works) – 2 Nr	Higher National Diploma (HND) in Civil Engineering/ Building/ Construction or equivalent	10	5
7.	Environmental and social safeguards officer	Degree in Environment science and/or social studies and Registered with NEMA as a lead expert	10	5

Propose qualified and experienced site management and technical personnel by filling the stated FORMS. The listing shall be accompanied by Curriculum Vitaes (CVs) in the format of FORMS . Further, copies of the academic certificates (masters/degree/diploma) shall be also be attached. The proposed Engineer/Professionals shall be registered/licensed by the relevant professional boards and such proof attached.

The contractor's representative must have similar or higher professional and academic qualifications and experience than that of the site agent.

v) Contractors key equipment listed on the table "Contractor's Equipment" below and more specifically listed as

No.	Equipment Type and Characteristics	Minimum Number required
1.	Concrete Batching Plant – Minimum capacity 30m^3/hr.	1
2.	Concrete mixer trucks (capacity 5m^3 to 8m^3)	2
3.	Concrete Mixers - 0.5-1.0 m^3 capacity	3
4.	Concrete Poker Vibrator 25mm – 40mm dia.	5
5.	Tipper Truck of 7/ 10 /15 tonne capacity	4
6.	Pick-up of at least 1 tonne capacity	4
7.	Rock breaker	2
8.	Compressor of normal delivery rating of 6.0 – 7.5 m^3/min, complete with attachments	2
9.	Hydraulic dual purpose backhoe excavator/loader of minimum bucket capacity of 1.0 m^3	3
10.	Mechanical pressure testing equipment for pipelines	2
11.	Generator 15kVA capacity	2
12.	RTK or Total Station for Survey Works	1
13.	Dumpers	2
14.	Portable Dewatering Pump	2
15	Water bowser	1

The proposed construction equipment/machinery/plant shall be supported with Copies of ownership documents issued by relevant machinery/equipment/plant registration or licensing entities or Verifiable ownership documents (only for non-registrable equipment/machinery/plant - in the name of bidding entity or in the case of Joint Venture in the name of one of the partners.

Bidders shall own / lease all of the above listed machine/equipment/plant. Ownership shall be determined by provision of ownership documents issued by relevant machinery/equipment/plant registration or licensing entities in the name of the bidding entities or its directors. Otherwise, lease agreements (witnessed by a competent advocate) shall be provided. Such agreements shall also be supported with certified copies of the leased equipment which shall be in the name of the lessor.

vi) other conditions depending on their seriousness.

a) **History of non-performing contracts**:
Tenderer and each member of JV in case the Tenderer is a JV, shall demonstrate that Non-performance of a contract did not occur because of the default of the Tenderer, or the member of a JV in the last ***10 years***. The required information shall be furnished in the appropriate form.

b) Pending Litigation
Financial position and prospective long-term profitability of the Single Tenderer, and in the case the Tenderer is a JV, of each member of the JV, shall remain sound according to criteria established with respect to Financial Capability under Paragraph (i) above if all pending litigation will be resolved against the Tenderer. Tenderer shall provide information on pending litigations in the appropriate form.

c) Litigation History
There shall be no consistent history of court/arbitral award decisions against the Tenderer, in the last ***10 years.*** All parties to the contract shall furnish the information in the appropriate form about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the years specified. A consistent history of awards against the Tenderer or any member of a JV may result in rejection of the tender.

QUALIFICATION FORM SUMMARY

1	2	3	*4*	*5*	*6*
Item No.	**Qualification Subject**	**Qualification Requirement**	***Document To be Completed by***	***For Procuring Entity's Use***	***Other Considerations***
1	Nationality	Nationality in accordance with ITT 3.6	Forms ELI – 1.1 and 1.2, with attachments		If JV each partner must meet
2	Tax Obligations for Kenyan Tenderers	Has produced a current tax clearance certificate or tax exemption certificate issued by Kenya Revenue Authority in accordance with ITT 3.14.	Attachment		If JV each partner must meet requirement
3	Conflict of Interest	No conflicts of interest in accordance with ITT 3.3	Form of Tender		If JV each partner must meet requirement
4	PPRA Eligibility	Not having been declared ineligible by the PPRA as described in ITT 3.7	Form of Tender		If JV each partner must meet requirement
5	State- owned Enterprise	Meets conditions of ITT 3.8	Forms ELI – 1.1 and 1.2, with		If JV each partner must meet requirement
6	Goods, equipment and services to be supplied under the contract	To have their origin in any country that is not determined ineligible under ITT 4.1	Forms ELI – 1.1 and 1.2, with attachments		
7	History of non-performing Contracts	Non-performance of a contract did not occur as a result of contractor default since 1st January 2014.	Form CON-2		If JV each partner must meet requirement
8	Suspension Based on Execution of Tender/Proposal Securing Declaration by the Procuring Entity	Not under suspension based on-execution of a Tender/Proposal Securing Declaration pursuant to ITT 19.9	Form of Tender		If JV each partner must meet requirement
9	Pending Litigation	Tender's financial position and prospective long-term profitability still sound according to criteria established in 3.1 and assuming that all pending litigation will NOT be resolved against the Tenderer.	Form CON – 2		If JV each partner must meet requirement
10	Litigation History	No consistent history of court/arbitral	Form CON – 2		t

1	2	3	*4*	*5*	
Item No.	**Qualification Subject**	**Qualification Requirement**	***Document To be Completed by***	***For Procuring Entity's Use***	
		award decisions against the Tenderer since 1st January *2014*			If JV each partner must meet requirement
11	Financial Capabilities	(i) The Tenderer shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow requirements estimated as Kenya Shillings **150 million** equivalent for the subject contract(s) net of the Tenderer's other commitments. (ii) The Tenderers shall also demonstrate, to the satisfaction of the Procuring Entity, that it has adequate sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments. (iii) The audited balance sheets or, if not required by the laws of the Tenderer's country, other financial statements acceptable to the Procuring Entity, for the last three **(3) years** shall be submitted and must demonstrate the current soundness of the Tenderer's financial position and indicate its prospective long-term profitability.	Form FIN – 3.1, with attachments		If JV each partner must meet requirement
12	Average Annual Construction Turnover	Minimum average annual construction turnover of Kenya Shillings **350** million equivalent calculated as total certified payments received for contracts in progress and/or completed within the last five **(5*) years,*** divided by **five (5) years**	Form FIN – 3.2		If JV at least one partner must meet requirement
13	General Construction Experience	Experience under construction contracts in the role of prime contractor, JV	Form EXP – 4.1		If JV at least one partner must meet

1	2	3	*4*	*5*	*6*
Item No.	**Qualification Subject**	**Qualification Requirement**	***Document To be Completed by***	***For Procuring Entity's Use***	***Other considerations***
		member, sub-contractor, or management contractor for at least the last ***5* years**, starting 1st January **2018**			
14	Specific Construction & Contract Management Experience	A minimum number of one **(1)** contract specified below that have been satisfactorily and substantially completed as a prime contractor, joint venture member, management contractor or sub-contractor between 1st January **2018** and tender submission deadline of minimum value **Ksh. 500,000,000 (Kenya shillings five hundred million)** The similarity of the contracts shall be based on relation to *a) Construction of water retaining reinforced concrete structures e.g. water treatment structures and water storage tanks involving production and placing of reinforced concrete at an average production rate of not less than 1,000m3/month.* *b) Construction of water supply pipelines – HDPE, Steel & Ferrous lined pipelines of 400mm dia and above at a rate of at least 5km per month.* Proof of award , signed contract and Certificate of completion of the contract shall be provided. A Recommendation letter from the client shall be attached, The letter	Form EXP 4.2(a)		If JV at least one partner must meet requirement

		Shall include the name of the specific project implemented and cost of the project. Details of client including an official email address who may be contacted for further information on this contract must be submitted. The bidder shall fill the FORM EXP. – 4.2 provided			

SECTION IV - TENDERING FORMS

QUALIFICATION FORMS

1. FOREIGN TENDERERS 40%RULE.
2. TENDERER'S ELIGIBILITY- CONFIDENTIAL BUSINESS QUESTIONNAIRE
3. Form EQU: EQUIPMENT.
4. FORM PER -1.
5. FORM PER-2.
6. TENDERERS QUALIFICATION WITHOUT PRE-QUALIFICATION.
   - 6.1 FORM ELI-1.1.
   - 6.2 FORM ELI-1.2.
   - 6.3 FORM CON –2.
   - 6.4 FORM FIN –3.1.
   - 6.5 FORM FIN –3.2.
   - 6.6 FORM FIN –3.3.
   - 6.7 FORM FIN –3.4.
   - 6.8 FORM EXP -4.1.
   - 6.9 FORM EXP - 4.2(a).
   - 6.9 FORM EXP - 4.2 (a) (cont.).
   - 6.10 FORM EXP -4.2 (b).

OTHER FORMS

7. FORM OFTENDER.
8. FORM OF TENDER SECURITY - DEMAND BANKGUARANTEE.
9. FORM OF TENDER SECURITY (TENDERBOND).
10. FORM OF TENDER-SECURINGDECLARATION.
11. APPENDIX TO TENDER.

TECHNICAL PROPOSAL FORMS

Site Organization.

Method Statement.

Mobilization Schedule.

Construction Schedule.

QUALIFICATION FORMS

1. FOREIGN TENDERERS 40% RULE

Pursuant to ITT 3.9, a foreign tenderer must complete this form to demonstrate that the tender fulfils this condition.

ITEM	Description of Work Item	Describe location of Source	COST in K. shillings	Comments, if any
A	**Local Labor**			
1				
2				
3				
4				
5				
B	**Sub contracts from Local sources**			
1				
2				
3				
4				
5				
C	**Local materials**			
1				
2				
3				
4				
5				
D	**Use of Local Plant and Equipment**			
1				
2				
3				
4				
5				
E	Add any other items			
1				
2				
3				
4				
5				
6				
	TOTAL COST LOCAL CONTENT			
	PERCENTAGE OF CONTRACT PRICE			

2. TENDERER'S ELIGIBILITY- CONFIDENTIAL BUSINESS QUESTIONNAIRE

Instructions to Tenderer

Tender is instructed to complete the particulars required in this Form, *one form for each entity if Tender is a JV.* Tenderer is further reminded that it is an offence to give false information on this Form.

i) Tenderer's details

	ITEM	**DESCRIPTION**
1	Name of the Procuring Entity	
2	Reference Number of the Tender	
3	Date and Time of Tender Opening	
4	Name of the Tenderer	
5	Full Address and Contact Details of the Tenderer.	1. Country 2. City 3. Location 4. Building 5. Floor 6. Postal Address 7. Name and email of contact person.
6	Current Trade License Registration Number and Expiring date	
7	Name, country and full address (*postal and physical addresses, email, and telephone number*) of Registering Body/Agency	
8	Description of Nature of Business	
9	Maximum value of business which the Tenderer handles.	
10	State if Tenders Company is listed in stock exchange, give name and full address (*postal and physical addresses, email, and telephone number*) of state which stock exchange	

General and Specific Details

ii) Sole Proprietor, provide the following details.

Name in full_____Age_____
Nationality_____Country of Origin_____
Citizenship _____

iii) Partnership, provide the following details.

	Names of Partners	Nationality	Citizenship	% Shares owned
1				
2				
3				

(iv) Registered Company, provide the following details.

i) Private or public Company _____

ii) State the nominal and issued capital of the Company

Nominal Kenya Shillings (Equivalent).....

Issued Kenya Shillings (Equivalent).....

iii) Give details of Directors as follows.

	Names of Director	Nationality	Citizenship	% Shares owned
1				
2				
3				

(v) DISCLOSURE OF INTEREST- Interest of the Firm in the Procuring Entity.

i) Are there any person/persons in…… (*Name of Procuring Entity)* who has/have an interest or relationship in this firm? Yes/No……

If yes, provide details as follows.

	Names of Person	Designation in the Procuring Entity	Interest or Relationship with Tenderer
1			
2			
3			

ii) Conflict of interest disclosure

	Type of Conflict	Disclosure YES OR NO	If YES provide details of the relationship with Tenderer
1	Tenderer is directly or indirectly controls, is controlled by or is under common control with another tenderer.		
2	Tenderer receives or has received any direct or indirect subsidy from another tenderer.		
3	Tenderer has the same legal representative as another tenderer		
4	Tender has a relationship with another tenderer, directly or through common third parties that puts it in a position to influence the tender of another tenderer, or influence the decisions of the Procuring Entity regarding this tendering process.		
5	Any of the Tenderer's affiliates participated as a consultant in the preparation of the design or technical specifications of the works that are the subject of the tender.		
6	Tenderer would be providing goods, works, non-consulting services or consulting services during implementation of the contract specified in this Tender Document.		
7	Tenderer has a close business or family relationship with a professional staff of the Procuring Entity who are directly or indirectly involved in the preparation of the Tender document or specifications of the Contract, and/or the Tender evaluation process of such contract.		
8	Tenderer has a close business or family relationship with a professional staff of the Procuring Entity who would be involved in the implementation or supervision of such Contract.		
9	Has the conflict stemming from such relationship stated in item 7 and 8 above been resolved in a manner acceptable to the Procuring Entity throughout the tendering process and execution of the Contract?		

Certification

On behalf of the Tenderer, I certify that the information given above is complete, current and accurate as at the date of submission.

Full Name_____ Title or Designation _____

_____ _____

(Signature) *(Date)*

3. FORM EQU: EQUIPMENT

The Tenderer 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 Tenderer.

Item of equipment		
Equipment information	Name of manufacturer	Model and power rating
	Capacity	Year of manufacture
Current status	Current location	
	Details of current commitments	
Source	Indicate source of the equipment ☐ Owned ☐ Rented ☐ Leased ☐ Specially manufactured	

Omit the following information for equipment owned by the Tenderer.

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

4. FORMPER-1

Contractor's Representative and Key Personnel Schedule

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

Contractor' Representative and Key Personnel.

1.	**Title of position:** Contractor's Representative	
	Name of candidate:	
	Duration of appointment:	[*insert the whole period (start and end dates) for which this position will be engaged*]
	Time commitment: for this position:	[*insert the number of days/week/months/ that has been scheduled for this position*]
	Expected time schedule for this position:	[*insert the expected time schedule for this position (e.g. attach high level Gantt chart*]
2.	**Title of position:** *[ ]*	
	Name of candidate:	
	Duration of appointment:	[*insert the whole period (start and end dates) for which this position will be engaged*]
	Time commitment: for this position:	[*insert the number of days/week/months/ that has been scheduled for this position*]
	Expected time schedule for this position:	[*insert the expected time schedule for this position (e.g. attach high level Gantt chart*]
3.	**Title of position:** *[ ]*	
	Name of candidate:	
	Duration of appointment:	[*insert the whole period (start and end dates) for which this position will be engaged*]
	Time commitment: for this position:	[*insert the number of days/week/months/ that has been scheduled for this position*]
	Expected time schedule for this position:	[*insert the expected time schedule for this position (e.g. attach high level Gantt chart*]
4.	**Title of position:** *[ ]*	
	Name of candidate:	
	Duration of appointment:	[*insert the whole period (start and end dates) for which this position will be engaged*]
	Time commitment: for this position:	[*insert the number of days/week/months/ that has been scheduled for this position*]
	Expected time schedule for this position:	[*insert the expected time schedule for this position (e.g. attach high level Gantt chart*]
	Title of position: *[insert title]*	
5.	**Name of candidate**	
	Duration of appointment:	[*insert the whole period (start and end dates) for which this position will be engaged*]
	Time commitment: for this position:	[*insert the number of days/week/months/ that has been scheduled for this position*]

	Expected time schedule for this position:	[*insert the expected time schedule for this position (e.g. attach high level Gantt chart*]

5. FORM PER-2:

Resume and Declaration - Contractor's Representative and Key Personnel

Name of Tenderer

Position [*#1*]: [*title of position from Form PER-1*]		
Personnel information	Name:	Date of birth:
	Address:	E-mail:
	Professional qualifications:	
	Academic qualifications:	
	Language proficiency: *[language and levels of speaking, reading and writing skills]*	
Details		
	Address of Procuring Entity:	
	Telephone:	Contact (manager / personnel officer):
	Fax:	
	Job title:	Years with present Procuring Entity:

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

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

DECLARATION

I, the under signed *[insert either "Contractor's Representative" or "Key Personnel" as applicable]*, certify that to the Lowest 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 Tender:

Commitment	**Details**
Commitment to duration of contract:	*[insert period (start and end dates) for which this Contractor's Representative or Key Personnel is available to work on this contract]*
Time commitment:	*[insert period (start and end dates) for which this Contractor's Representative or Key Personnel is available to work on this contract]*

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

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

Name of Contractor's Representative or Key Personnel: [*insert name*]

Signature:_____

Date: (day month year): _____

Countersignature of authorized representative of the Tenderer:

Signature:_____

Date: (day month year): _____

6. TENDERERS QUALIFICATION WITHOUT PRE-QUALIFICATION

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

6.1 FORM EL 1.1 Tenderer Information Form

Date: _____

ITT No. and title: _____

Tenderer's name
In case of Joint Venture (JV), name of each member:
Tenderer's actual or intended country of registration: *[indicate country of Constitution]*
Tenderer's actual or intended year of incorporation:
Tenderer's legal address [in country of registration]:
Tenderer's authorized representative information Name: _____ Address: _____ Telephone/Fax numbers: _____ E-mail address:
1. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of the legal entity named above, in accordance with ITT 3.6 ☐ In case of JV, letter of intent to form JV or JV agreement, in accordance with ITT 3.5 ☐ In case of state-owned enterprise or institution, in accordance with ITT 3.8, documents establishing: • Legal and financial autonomy • Operation under commercial law • Establishing that the Tenderer is not under the supervision of the Procuring Entity 2. Included are the organizational chart and a list of Board of Directors

62 FORM ELI-1.2 Tenderer's JV Information Form

(To be completed for each member of Tenderer's JV)

Date: _____

ITT No. and title: _____

Tenderer's JV 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:
1. Attached are copies of original documents of ☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above, in accordance with ITT 43.6. ☐ In case of a state-owned enterprise or institution, documents establishing legal and financial autonomy, operation in accordance with commercial law, and that they are not under the supervision of the Procuring Entity, in accordance with ITT 3.8. 2. Included are the organizational chart and a list of Board of Directors

63 FORM CON – 2 Historical Contract Non-Performance, Pending Litigation and Litigation History

Tenderer's Name:_____

Date:_____

JV Member's Name_____

ITT No. and title:_____

Non-Performed Contracts in accordance with Section III, Evaluation and Qualification Criteria			
☐ Contract non-performance did not occur since 1st January *[insert year]* specified in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.1. ☐ Contract(s) not performed since 1st January *[insert year]* 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 Kenya Shilling equivalent)**
[insert year]	*[insert amount and percentage]*	Contract Identification: *[indicate complete contract name/ number, and any other identification]* Name of Procuring Entity: *[insert full name]* Address of Procuring Entity: *[insert street/city/country]* Reason(s) for nonperformance: *[indicate main reason(s)]*	*[insert amount]*
Pending Litigation, in accordance with Section III, Evaluation and Qualification Criteria			
☐ No pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3. ☐ Pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3 as indicated below.			

Year of dispute	**Amount in dispute (currency)**	**Contract Identification**	**Total Contract Amount (currency), Kenya Shilling Equivalent (exchange rate)**
		Contract Identification: _____ Name of Procuring Entity: _____ Address of Procuring Entity: _____ Matter in dispute: _____ Party who initiated the dispute: ____ Status of dispute:	
		Contract Identification: Name of Procuring Entity: Address of Procuring Entity: Matter in dispute: Party who initiated the dispute: Status of dispute:	

Litigation History in accordance with Section III, Evaluation and Qualification Criteria

☐ No Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4.

☐ Litigation History in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.4 as indicated below.

Year of award	**Outcome as percentage of Net Worth**	**Contract Identification**	**Total Contract Amount (currency), Kenya Shilling Equivalent (exchange rate)**
[insert year]	*[insert percentage]*	Contract Identification: [indicate complete contract name, number, and any other identification] Name of Procuring Entity: *[insert full name]* Address of Procuring Entity: *[insert street/city/country]* Matter in dispute: *[indicate main issues in dispute]* Party who initiated the dispute: *[indicate "Procuring Entity" or "Contractor"]* Reason(s) for Litigation and award decision *[indicate main reason(s)]*	*[insert amount]*

6.4 FORM FIN –3.1: Financial Situation and Performance

Tenderer's Name:_____
Date:_____
JV Member's Name_____
ITT No. and title:_____

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					

**Refer to ITT 15 for the exchange rate*

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 (Kenya Shilling equivalent)
1		
2		
3		

Financial documents

The Tenderer and its parties shall provide copies of financial statements for five (5) years pursuant Section III, Evaluation and Qualifications Criteria, Sub-factor 3.1. The financial statements shall:

a) reflect the financial situation of the Tenderer or in case of JV member, and not an affiliated entity (such as parent company or group member).
b) be independently audited or certified in accordance with local legislation.
c) be complete, including all notes to the financial statements.
d) correspond to accounting periods already completed and audited.

Attached are copies of financial statements [1] for the **five (5)** years required above; and complying with the requirements

65 FORM FIN – 3.2: Average Annual Construction Turnover

Tenderer's Name:_____
Date:_____
JV Member's Name_____
ITT No. and title:_____

Annual turnover data (construction only)			
Year	**Amount Currency**	**Exchange rate**	**Kenya Shilling equivalent**
[indicate year]	*[insert amount and indicate currency]*		
Average Annual Construction Turnover *			

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

6.6 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 cashflow demands of the subject contractor contracts as specified in Section III, Evaluation and Qualification Criteria.

6.7 FORM FIN–3.4: Current Contract Commitments / Works in Progress

Tenderers and each member 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.

Current Contract Commitments					
No.	**Name of Contract**	**Procuring Entity's Contact Address, Tel,**	**Value of Outstanding Work [Current Kenya Shilling /Month Equivalent]**	**Estimated Completion Date**	**Average Monthly Invoicing Over Last Six Months [Kenya Shilling /month)]**
1					
2					
3					
4					
5					

68 FORM EXP -4.1 General Construction Experience

Tenderer's Name:_____
Date:_____
JV Member's Name:_____
ITT No. and title:_____
Page_____of_____pages

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

6.9 FORM EXP -4.2(a) Specific Construction and Contract Management Experience

Tenderer's Name:_____
Date:_____
JV Member's Name_____
ITT No. and title:_____

Similar Contract No.	**Information**			
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Sub-contractor ☐
Total Contract Amount			**Kenya Shilling**	
If member in a JV or sub-contractor, specify participation in total Contract amount				
Procuring Entity's Name:				
Address: Telephone/fax number E-mail:				

6.10 FORM EXP – 4.2(a) (cont.) Specific Construction and Contract Management Experience

Similar Contract No.	**Information**
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	

6.11 FORM EXP -4.2(b)

Construction Experience in Key Activities

Tenderer's Name:_____
Date:_____
Tenderer's JV Member Name:_____
Sub-contractor's Name[2] (as perITT34):_____
ITT No. and title:_____

All Sub-contractors for key activities must complete the information in this form as per ITT 34 and Section III, Evaluation and Qualification Criteria, Sub-Factor 4.2.

1. Key Activity No One: _

	Information			
Contract Identification				
Award date				
Completion date				
Role in Contract	Prime Contractor ☐	Member in JV ☐	Management Contractor ☐	Sub-contractor ☐
Total Contract Amount			**Kenya Shilling**	
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				
Procuring Entity's Name:				
Address: Telephone/fax number E-mail:				

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

2. Activity No. Two

3. ……

OTHER FORMS

7. FORM OF TENDER

INSTRUCTIONS TO TENDERERS

i) All italicized text is to help the Tenderer in preparing this form.

ii) The Tenderer must prepare this Form of Tender on stationery with its letterhead clearly showing the Tenderer's complete name and business address. Tenderers are reminded that this is a mandatory requirement.

iii) Tenderer must complete and sign CERTIFICATE OF INDEPENDENT TENDER DETERMINATION and the SELF DECLARATION FORMS OF THE TENDERER as listed under (xxii) below.

iv) The Form of Tender shall include the following Forms duly completed and signed by the Tenderer.

- *Tenderer's Eligibility- Confidential Business Questionnaire*
- *Certificate of Independent Tender Determination*
- *Self-Declaration of the Tenderer*

Date of this Tender submission:.....*[insert date (as day, month and year) of Tender submission]*

Tender Name and Identification:.....*[insert identification]*

Alternative No.:.....*[insert identification No if this is a Tender for an alternative]*

To: ..... *[Insert complete name of Procuring Entity]*

Dear Sirs,

1. In accordance with the Conditions of Contract, Specifications, Drawings and Bills of Quantities for the execution of the above-named Works, we, the undersigned offer to construct and complete the Works and remedy any defects therein for the sum of Kenya Shillings [*[Amount in figures]* _____Kenya Shillings *[amount in words]*_____

   The above amount includes foreign currency amount (s) of [*state figure or a percentage and currency*] [figures] _____[words]_____

   _____

   The percentage or amount quoted above does not include provisional sums, and only allows not more than two foreign currencies.

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

3. We agree to adhere by this tender until_____*[Insert date],* and it shall remain binding upon us and may be accepted at any time before that date.

4. Unless and until a formal Agreement is prepared and executed this tender together with your written acceptance thereof, shall constitute a binding Contract between us. We further understand that you are not bound to accept the lowest or any tender you may receive.

5. We, the undersigned, further declare that:

i) *No reservations:* We have examined and have no reservations to the tender document, including Addenda issued in accordance with ITT 8;

ii) *Eligibility:* We meet the eligibility requirements and have no conflict of interest in accordance with ITT 3 and 4;

iii) *Tender-Securing Declaration:* We have not been suspended nor declared ineligible by the Procuring Entity based on execution of a Tender-Securing or Proposal-Securing Declaration in the Procuring Entity's Country in accordance with ITT 19.8;

iv) *Conformity:* We offer to execute in conformity with the tendering documents and in accordance with the implementation and completion specified in the construction schedule, the following Works: [insert a brief description of the Works];

v) *Tender Price:* The total price of our Tender, excluding any discounts offered in item 1 above is: [Insert one of the options below as appropriate]

(iv) **Option1,** in case of one lot: Total price is: [*insert the total price of the Tender in words and figures, indicating the various amounts and the respective currencies*]; Or

Option2, in case of multiple lots:

a) *Total price of each lot* [*insert the total price of each lot in words and figures, indicating the various amounts and the respective currencies*]; and

b) *Total price of all lots* (sum of all lots) [*insert the total price of all lots in words and figures, indicating the various amounts and the respective currencies*];

vii) Discounts: The discounts offered and the methodology for their application are:

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

ix) 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*];

x) *Tender Validity Period:* Our Tender shall be valid for the period specified in TDS 18.1 (as amended, if applicable) from the date fixed for the Tender submission deadline specified in TDS 22.1(as amended, if applicable), and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

xi) *Performance Security:* If our Tender is accepted, we commit to obtain a Performance Security in accordance with the Tendering document;

xii) *One Tender Per Tender:* We are not submitting any other Tender(s) as an individual Tender, and we are not participating in any other Tender(s) as a Joint Venture member or as a subcontractor, and meet the requirements of ITT3.4, other than alternative Tenders submitted in accordance with ITT 13.3;

xiii) *Suspension and Debarment:* We, along with any of our subcontractors, suppliers, Engineer, 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 the Public Procurement Regulatory Authority or any other entity of the Government of Kenya, or any international organization.

xiv) *State-owned enterprise or institution:* [*select the appropriate option and delete the other*] [*We are not a state-owned enterprise or institution*]/[*We are a state-owned enterprise or institution but meet the requirements of ITT 3.7*];

xv) *Commissions, gratuities, fees:* We have paid, or will pay the following commissions, gratuities, or fees with respect to the tender 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.")

xvi) *Binding Contract:* We understand that this Tender, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding contract between us, until a formal contract is prepared and executed;

xvii) *Not Bound to Accept:* We understand that you are not bound to accept the lowest evaluated cost Tender, the Most Advantageous Tender or any other. Tender that you may receive;

xviii) *Fraud and Corruption:* We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf engages in any type of Fraud and Corruption;

xix) *Collusive practices:* We hereby certify and confirm that the tender is genuine, non-collusive and made with the intention of accepting the contract if awarded. To this effect we have signed the "Certificate of Independent Tender Determination" attached below.

xx) We undertake to adhere by the Code of Ethics for Persons Participating in Public Procurement and Asset Disposal, copy available from_____(*specify website*) during the procurement process and the execution of any resulting contract.

xxi) **Beneficial Ownership Information:** We commit to provide to the procuring entity the Beneficial Ownership Information in conformity with the Beneficial Ownership Disclosure Form upon receipt of notification of intention to enter into a contract in the event we are the successful tenderer in this subject procurement proceeding.

xxii) We, the Tenderer, have duly completed, signed and stamped the following Forms as part of our Tender:

a) Tenderer's Eligibility; Confidential Business Questionnaire – to establish we are not in any conflict to interest.

b) Certificate of Independent Tender Determination – to declare that we completed the tender without colluding with other tenderers.

c) Self-Declaration of the Tenderer– to declare that we will, if awarded a contract, not engage in any form of fraud and corruption.

d) Declaration and commitment to the Code of Ethics for Persons Participating in Public Procurement and Asset Disposal.

Further, we confirm that we have read and understood the full content and scope of fraud and corruption as informed in **"Appendix 1- Fraud and Corruption**" attached to the Form of Tender.

Name of the Tenderer: *[*insert complete name of person signing the*

Tender]

Name of the person duly authorized to sign the Tender on behalf of the Tenderer: **[*insert complete name of person duly authorized to sign the Tender*]

Title of the person signing the Tender: [*insert complete title of the person signing the Tender*]

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*]

Date signed_____day of_____,_____

Notes
** In the case of the Tender submitted by joint venture specify the name of the Joint Venture as Tenderer*
*** Person signing the Tender shall have the power of attorney given by the Tenderer to be attached with the Tender,*

a) TENDERER'S ELIGIBILITY-CONFIDENTIAL BUSINESS QUESTIONNAIRE

Instruction to Tenderer

Tender is instructed to complete the particulars required in this Form, *one form for each entity if Tender is a JV.* Tenderer is further reminded that it is an offence to give false information on this Form.

i) Tenderer's details

	ITEM	DESCRIPTION
1	Name of the Procuring Entity	
2	Reference Number of the Tender	
3	Date and Time of Tender Opening	
4	Name of the Tenderer	
5	Full Address and Contact Details of the Tenderer.	1. Country 2. City 3. Location 4. Building 5. Floor 6. Postal Address 7. Name and email of contact person.
6	Current Trade License Registration Number and Expiring date	
7	Name, country and full address (*postal and physical addresses, email, and telephone number*) of Registering Body/Agency	
8	Description of Nature of Business	
9	Maximum value of business which the Tenderer handles.	
10	State if Tenders Company is listed in stock exchange, give name and full address (*postal and physical addresses, email, and telephone number*) of state which stock exchange	

General and Specific Details

ii) Sole Proprietor, provide the following details.

Name in full_____Age_____
Nationality_____Country of Origin_____
Citizenship _____

iii) Partnership, provide the following details.

	Names of Partners	Nationality	Citizenship	% Shares owned
1				
2				
3				

(iv) Registered Company, provide the following details.

i) Private or public Company _____

ii) State the nominal and issued capital of the Company

Nominal Kenya Shillings (Equivalent).....

Issued Kenya Shillings (Equivalent).....

iii) Give details of Directors as follows.

	Names of Director	Nationality	Citizenship	% Shares owned
1				
2				
3				

(v) DISCLOSURE OF INTEREST- Interest of the Firm in the Procuring Entity.

i) Are there any person/persons in…… (*Name of Procuring Entity)* who has/have an interest or relationship in this firm? Yes/No……

If yes, provide details as follows.

	Names of Person	Designation in the Procuring Entity	Interest or Relationship with Tenderer
1			
2			
3			

ii) Conflict of interest disclosure

	Type of Conflict	Disclosure YES OR NO	If YES provide details of the relationship with Tenderer
1	Tenderer is directly or indirectly controls, is controlled by or is under common control with another tenderer.		
2	Tenderer receives or has received any direct or indirect subsidy from another tenderer.		
3	Tenderer has the same legal representative as another tenderer		
4	Tender has a relationship with another tenderer, directly or through common third parties that puts it in a position to influence the tender of another tenderer, or influence the decisions of the Procuring Entity regarding this tendering process.		
5	Any of the Tenderer's affiliates participated as a consultant in the preparation of the design or technical specifications of the works that are the subject of the tender.		
6	Tenderer would be providing goods, works, non-consulting services or consulting services during implementation of the contract specified in this Tender Document.		
7	Tenderer has a close business or family relationship with a professional staff of the Procuring Entity who are directly or indirectly involved in the preparation of the Tender document or specifications of the Contract, and/or the Tender evaluation process of such contract.		
8	Tenderer has a close business or family relationship with a professional staff of the Procuring Entity who would be involved in the implementation or supervision of such Contract.		
9	Has the conflict stemming from such relationship stated in item 7 and 8 above been resolved in a manner acceptable to the Procuring Entity throughout the tendering process and execution of the Contract?		

Certification

On behalf of the Tenderer, I certify that the information given above is complete, current and accurate as at the date of submission.

Full Name_____ Title or Designation_____

_____ _____

(Signature) *(Date)*

b) CERTIFICATE OF INDEPENDENT TENDER DETERMINATION

I, the undersigned, in submitting the accompanying Letter of Tender to the_____[Name of Procuring Entity] for:_____[Name and number of tender] in response to the request for tenders made by:_____[Name of Tenderer] do hereby make the following statements that I certify to be true and complete in every respect:

I certify, on behalf of_____[Name of Tenderer] that:

1. I have read and I understand the contents of this Certificate;

2. I understand that the Tender will be disqualified if this Certificate is found not to be true and complete in every respect;

3. I am the authorized representative of the Tenderer with authority to sign this Certificate, and to submit the Tender on behalf of the Tenderer;

4. For the purposes of this Certificate and the Tender, I understand that the word "competitor" shall include any individual or organization, other than the Tenderer, whether or not affiliated with the Tenderer, who:
   a) has been requested to submit a Tender in response to this request for tenders;
   b) could potentially submit a tender in response to this request for tenders, based on their qualifications, abilities or experience;

5. The Tenderer discloses that [check one of the following, as applicable]:
   a) The Tenderer has arrived at the Tender independently from, and without consultation, communication, agreement or arrangement with, any competitor;
   b) the Tender the Tendererred into consultations, communications, agreements or arrangements with one or more competitors regarding this request for tenders, and the Tenderer discloses, in the attached document(s), complete details thereof, including the names of the competitors and the nature of, and reasons for, such consultations, communications, agreements or arrangements;

6. In particular, without limiting the generality of paragraphs (5) (a) or (5) (b) above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:
   a) prices;
   b) methods, factors or formulas used to calculate prices;
   c) the intention or decision to submit, or not to submit, a tender; or
   d) the submission of a tender which does not meet the specifications of the request for Tenders; except as specifically disclosed pursuant to paragraph (5) (b) above;

7. In addition, there has been no consultation, communication, agreement or arrangement with any competitor regarding the quality, quantity, specifications or delivery particulars of the works or services to which this request for tenders relates, except as specifically authorized by the procuring authority or as specifically disclosed pursuant to paragraph (5) (b) above;

8. The terms of the Tender have not been, and will not be, knowingly disclosed by the Tenderer, directly or indirectly, to any competitor, prior to the date and time of the official tender opening, or of the awarding of the Contract, whichever comes first, unless otherwise required by law or as specifically disclosed pursuant to paragraph (5) (b) above.

Name_____

Title_____

Date_____

[Name, title and signature of authorized agent of Tenderer and Date]

c) SELF-DECLARATION FORMS

FORM SD1

SELF DECLARATION THAT THE PERSON/TENDERER IS NOT DEBARRED IN THE MATTER OF THE PUBLIC PROCUREMENT AND ASSET DISPOSAL ACT 2015.

I, ……., of Post Office Box ……..……. being a resident of …….. in the Republic of ……. do hereby make a statement as follows: -

1. THAT I am the Company Secretary/Chief Executive/Managing Director/Principal Officer/Director of ……...…….. *(insert name of the Company)* who is a Bidder in respect of Tender No. …….. for ……. *(insert tender title/description)* for ……. *(insert name of the Procuring entity)* and duly authorized and competent to make this statement.

2. THAT the aforesaid Bidder, its directors and subcontractors have not been debarred from participating in procurement proceeding under Part IV of the Act.

3. THAT what is deponed to herein above is true to the best of my knowledge, information and belief.

……	…….	……
(Title)	(Signature)	(Date)

Bidder Official Stamp

FORM SD2

SELF DECLARATION THAT THE TENDERER WILL NOT ENGAGE IN ANY CORRUPT OR FRAUDULENT PRACTICE

I, ……. of P. O. Box ……. being a resident of……. in the Republic of…….……. .do hereby make a statement as follows: -

1. THAT I am the Chief Executive/Managing Director/Principal Officer/Director of ……...…… *(insert name of the Company)* who is a Bidder in respect of Tender No. …….. for ……... *(insert tender title/description)* for …… *(insert name of the Procuring entity)* and duly authorized and competent to make this statement.

2. THAT the aforesaid Bidder, its servants and/or agents /subcontractors will not engage in any corrupt or fraudulent practice and has not been requested to pay any inducement to any member of the Board, Management, Staff and/or employees and/or agents of……. *(insert name of the Procuring entity)* which is the procuring entity.

3. THAT the aforesaid Bidder, its servants and/or agents /subcontractors have not offered any inducement to any member of the Board, Management, Staff and/or employees and/or agents of……... *(name of the procuring entity)*

4. THAT the aforesaid Bidder will not engage/has not engaged in any corrosive practice with other bidders participating in the subject tender

5. THAT what is deponed to herein above is true to the best of my knowledge, information and belief.

…… …… ……
(Title) (Signature) (Date)

Bidder's Official Stamp

DECLARATION AND COMMITMENT TO THE CODE OF ETHICS

I …….....…… (person) on behalf of *(Name of the Business/Company/Firm*) …….....declare that I have read and fully understood the contents of the Public Procurement & Asset Disposal Act, 2015, Regulations and the Code of Ethics for persons participating in Public Procurement and Asset Disposal and my responsibilities under the Code.

I do hereby commit to abide by the provisions of the Code of Ethics for persons participating in Public Procurement and Asset Disposal.

Name of Authorized signatory.....

Sign.....

Position.....

Office address..... Telephone.....

E-mail.....

Name of the Firm/Company.....

Date.....

(Company Seal/Rubber Stamp where applicable)
Witness

Name.....

Sign.....

Date.....

d) APPENDIX 1-FRAUD AND CORRUPTION

(Appendix 1 shall not be modified)

1. Purpose

1.1 The Government of Kenya's Anti-Corruption and Economic Crime laws and their sanction's policies and procedures, Public Procurement and Asset Disposal Act *(no. 33 of 2015)* and its Regulation, and any other Kenya's Acts or Regulations related to Fraud and Corruption, and similar offences, shall apply with respect to Public Procurement Processes and Contracts that are governed by the laws of Kenya.

2. Requirements

2.1 The Government of Kenya requires that all parties including Procuring Entities, Tenderers, (applicants/proposers), Consultants, Contractors and Suppliers; any Sub-contractors, Sub-consultants, Service providers or Suppliers; any Agents (whether declared or not); and any of their Personnel, involved and engaged in procurement under Kenya's Laws and Regulation, observe the highest standard of ethics during the procurement process, selection and contract execution of all contracts, and refrain from Fraud and Corruption and fully comply with Kenya's laws and Regulations as per paragraphs 1.1 above.

2.2 Kenya's public procurement and asset disposal act *(no. 33 of 2015)* under Section 66 describes rules to be followed and actions to be taken in dealing with Corrupt, Coercive, Obstructive, Collusive or Fraudulent practices, and Conflicts of Interest in procurement including consequences for offences committed. A few of the provisions noted below highlight Kenya's policy of no tolerance for such practices and behavior:

1) a person to whom this Act applies shall not be involved in any corrupt, coercive, obstructive, collusive or fraudulent practice; or conflicts of interest in any procurement or asset disposal proceeding;

2) A person referred to under subsection (1) who contravenes the provisions of that sub-section commits an offence;

3) Without limiting the generality of the subsection (1) and (2), the person shall be—
   a) disqualified from entering into a contract for a procurement or asset disposal proceeding; or
   b) if a contract has already been entered into with the person, the contract shall be voidable;

4) The voiding of a contract by the procuring entity under subsection (7) does not limit any legal remedy the procuring entity may have;

5) An employee or agent of the procuring entity or a member of the Board or committee of the procuring entity who has a conflict of interest with respect to a procurement—
   a) shall not take part in the procurement proceedings;
   b) shall not, after a procurement contract has been entered into, take part in any decision relating to the procurement or contract; and
   c) shall not be a subcontractor for the bidder to whom was awarded contract, or a member of the group of bidders to whom the contract was awarded, but the subcontractor appointed shall meet all the requirements of this Act.

6) An employee, agent or member described in subsection (1) who refrains from doing anything prohibited under that subsection, but for that subsection, would have been within his or her duties shall disclose the conflict of interest to the procuring entity;

7) If a person contravenes subsection (1) with respect to a conflict of interest described in subsection (5) (a) and the contract is awarded to the person or his relative or to another person in whom one of them had a direct or indirect pecuniary interest, the contract shall be terminated and all costs incurred by the public entity shall be made good by the awarding officer. Etc.

2.3 In compliance with Kenya's laws, regulations and policies mentioned above, the Procuring Entity:

a) Defines broadly, for the purposes of the above provisions, 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;

ii) "fraudulent practice" is any act or omission, including misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain financial or other benefit or to avoid an obligation;

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;

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;

v) "obstructive practice" is:

- deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede investigation by Public Procurement Regulatory Authority (PPRA) or any other appropriate authority appointed by Government of Kenya 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

- acts intended to materially impede the exercise of the PPRA's or the appointed authority's inspection and audit rights provided for under paragraph 2.3 e. below.

b) Defines more specifically, in accordance with the above procurement Act provisions set forth for fraudulent and collusive practices as follows:

"Fraudulent practice" includes a misrepresentation of fact in order to influence a procurement or disposal process or the exercise of a contract to the detriment of the procuring entity or the tenderer or the contractor, and includes collusive practices amongst tenderers prior to or after tender submission designed to establish tender prices at artificial non-competitive levels and to deprive the procuring entity of the benefits of free and open competition.

c) Rejects a proposal for award[1] of a contract if PPRA determines that the firm or individual recommended for award, 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;

d) Pursuant to the Kenya's above stated Acts and Regulations, may sanction or recommend to appropriate authority(ies) for sanctioning and debarment of a firm or individual, as applicable under the Acts and Regulations;

e) Requires that a clause be included in Tender documents and Request for Proposal documents requiring (i) Tenderers (applicants/proposers), Consultants, Contractors, and Suppliers, and their Sub-contractors, Sub-consultants, Service providers, Suppliers, Agents personnel, permit the PPRA or any other appropriate authority appointed by Government of Kenya to inspect[2] all accounts, records and other documents relating to the procurement process, selection and/or contract execution, and to have them audited by auditors appointed by the PPRA or any other appropriate authority appointed by Government of Kenya; and

f) Pursuant to Section 62 of the above Act, requires Applicants/Tenderers to submit along with their Applications/Tenders/Proposals a "Self-Declaration Form" as included in the procurement document declaring that they and all parties involved in the procurement process and contract execution have not engaged/will not engage in any corrupt or fraudulent practices.

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[1] *For the avoidance of doubt, a party's ineligibility to be awarded a contract shall include, without limitation, (i) applying for pre-qualification, expressing interest in a consultancy, and tendering, either directly or as a nominated sub-contractor, nominated consultant, nominated manufacturer or supplier, or nominated service provider, in respect of such contract, and (ii) entering into an addendum or amendment introducing a material modification to any existing contract.*

[2] *Inspections in this context usually are investigative (i.e., forensic) in nature. They involve fact-finding activities undertaken by the Investigating Authority or persons appointed by the Procuring Entity to address specific matters related to investigations/audits, such as evaluating the veracity of an allegation of possible Fraud and Corruption, through the appropriate mechanisms. Such activity includes but is not limited to: accessing and examining a firm's or individual's financial records and information, and making copies thereof as relevant; accessing and examining any other documents, data and information (whether in hard copy or electronic format) deemed relevant for the investigation/audit, and making copies thereof as relevant; interviewing staff and other relevant individuals; performing physical inspections and site visits; and obtaining third party verification of information.*

8. FORM OF TENDER SECURITY-[Option 1–Demand Bank Guarantee]

Beneficiary: _____

Request for Tenders No: _____

Date: _____

TENDER GUARANTEE No.: _____

Guarantor: _____

1. We have been informed that _____ (here in after called "the Applicant") has submitted or will submit to the Beneficiary its Tender (here in after called" the Tender") for the execution of _____ under Request for Tenders No. _____ ("the ITT").

2. Furthermore, we understand that, according to the Beneficiary's conditions, Tenders must be supported by a Tender guarantee.

3. 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 _____ (_____) upon receipt by us of the Beneficiary's complying demand, supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either the Applicant:

(a) has withdrawn its Tender during the period of Tender validity set forth in the Applicant's Letter of Tender ("the Tender Validity Period"), or any extension thereto provided by the Applicant; or

b) having been notified of the acceptance of its Tender by the Beneficiary during the Tender Validity Period or any extension there to provide by the Applicant, (i) has failed to execute the contract agreement, or (ii) has failed to furnish the Performance.

4. This guarantee will expire: (a) if the Applicant is the successful Tenderer, upon our receipt of copies of the contract agreement signed by the Applicant and the Performance Security and, or (b) if the Applicant is not the successful Tenderer, upon the earlier of (i) our receipt of a copy of the Beneficiary's notification to the Applicant of the results of the Tendering process; or (ii) thirty days after the end of the Tender Validity Period.

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

_____

[signature(s)]

Note: All italicized text is for use in preparing this form and shall be deleted from the final product.

9. FORMAT OF TENDER SECURITY [Option 2–Insurance Guarantee]

TENDER GUARANTEE No.: _____

1. Whereas …… [*Name of the tenderer]* (hereinafter called "the tenderer") has submitted its tender dated …… [*Date of submission of tender]* for the …… *[Name and/or description of the tender]* (hereinafter called "the Tender") for the execution of_____under Request for Tenders No._____("the ITT").

2. KNOW ALL PEOPLE by these presents that WE …… of …… [**Name of Insurance Company**] having our registered office at …… (hereinafter called "the Guarantor"), are bound unto ……. [*Name of Procuring Entity*] (hereinafter called "the Procuring Entity") in the sum of …… (Currency and guarantee amount) for which payment well and truly to be made to the said Procuring Entity, the Guarantor binds itself, its successors and assigns, jointly and severally, firmly by these presents.

   Sealed with the Common Seal of the said Guarantor this ___day of _____ 20 __.

3. NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Applicant:

   a) has withdrawn its Tender during the period of Tender validity set forth in the Principal's Letter of Tender ("the Tender Validity Period"), or any extension thereto provided by the principal; or

   b) having been notified of the acceptance of its Tender by the Procuring Entity during the Tender Validity Period or any extension thereto provided by the principal; (i) failed to execute the Contract agreement; or (ii) has failed to furnish the Performance Security, in accordance with the Instructions to tenderers ("ITT") of the Procuring Entity's Tendering document.

   then the guarantee undertakes to immediately pay to the Procuring Entity up to the above amount upon receipt of the Procuring Entity's first written demand, without the Procuring Entity having to substantiate its demand, provided that in its demand the Procuring Entity shall state that the demand arises from the occurrence of any of the above events, specifying which event(s) has occurred.

4. This guarantee will expire: (a) if the Applicant is the successful Tenderer, upon our receipt of copies of the contract agreement signed by the Applicant and the Performance Security and, or (b) if the Applicant is not the successful Tenderer, upon the earlier of (i) our receipt of a copy of the Beneficiary's notification to the Applicant of the results of the Tendering process; or (ii)twenty-eight days after the end of the Tender Validity Period.

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

_____	_____
[Date]	*[Signature of the Guarantor]*
_____	_____
[Witness]	*[Seal]*

Note: All italicized text is for use in preparing this form and shall be deleted from the final product.

10. FORM OF TENDER-SECURING DECLARATION

[The Bidder shall complete this Form in accordance with the instructions indicated]

Date:..... *[Insert date (as day, month and year) of Tender Submission]*

Tender No.:..... . *[Insert number of tendering processes]*

To:..... *[Insert complete name of*

Purchaser] I/We, the undersigned, declare that:

1. I/We understand that, according to your conditions, bids must be supported by a Tender-Securing Declaration.

2. I/We accept that I/we will automatically be suspended from being eligible for tendering in any contract with the Purchaser for the period of time of [insert number of months or years] starting on [insert date], if we are in breach of our obligation(s) under the bid conditions, because we–(a) have withdrawn our tender during the period of tender validity specified by us in the Tendering Data Sheet; or (b) having been notified of the acceptance of our Bid by the Purchaser during the period of bid validity, (i) fail or refuse to execute the Contract, if required, or (ii) fail or refuse to furnish the Performance Security, in accordance with the instructions to tenders.

3. I/We understand that this Tender Securing Declaration shall expire if we are not the successful Tenderer(s), upon the earlier of:
   a) our receipt of a copy of your notification of the name of the successful Tenderer; or
   b) thirty days after the expiration of our Tender.

4. I/We understand that if I am/we are/in a Joint Venture, the Tender Securing Declaration must be in the name of the Joint Venture that submits the bid, and the Joint Venture has not been legally constituted at the time of bidding, the Tender Securing Declaration shall be in the names of all future partners as named in the letter of intent.

Signed……...……...

Capacity / title (director or partner or sole proprietor, etc.) ……..…….

Name……...

Duly authorized to sign the bid for and on behalf of: *[insert complete name of*

Tenderer] Dated on……. day of…….……. *[Insert date of*

signing]

Seal or stamp

11. APPENDIX TO TENDER

Schedule of Currency requirements

Summary of currencies of the Tender for_____*[insert name of Section of the Works]*

Name of currency	***Amounts payable***
Local currency: _____	
Foreign currency #1: _____	
Foreign currency #2: _____	
Foreign currency #3: _____	
Provisional sums expressed in local currency	[To be entered by the Procuring Entity]

TECHNICAL PROPOSAL

The tender shall complete these sections as a technical proposal to indicate how he/she intends to proceed with the works. The Procuring entity will review these Proposals and determine the extent to which they meet the required standards to complete the works.

12. Site Organization

[Insert Site Organization information]

13. Method Statement

[Insert Method Statement]

14. Mobilization Schedule

[Insert Mobilization Schedule]

15. Construction Schedule

[Insert Construction Schedule]

PART 2 - WORKS' REQUIREMENTS

PART 2 - WORKS' REQUIREMENTS

SECTION V - BILLS OF QUANTITIES

1. SCOPE OF WORKS

The Works comprise of the following:

i. Construction of a 450 mm PN10 epoxy coated internally and externally steel pipe raw water main.
ii. Construction of a 400 mm PN16 HDPE pipe treated water to Maralal town.
iii. Construction of a 355mm HDPE PN16 line to existing water tank and connection to the existing tank
iv. Construction of treatment works (stilling well, chemical mixing and storage house, dosing channel, flocculation basins, sedimentation tanks, filters, backwash pump house and elevated backwash water tank, chlorine storage house, operator's office, laboratory and recycled water pump house.
v. Construction of a 500M^3 clean water tank at the water treatment works area
vi. Construction of staff houses
vii. Construction of a guard house
viii. Site ancillary works

ix. And/or all other works as instructed by the Engineer

2. Notes and Sample Items for Preparing a Bill 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

8. 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.

9. 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.

10. 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 paid by the Contractor.

11. It shall be the responsibility of the Contractor to arrange for the identification and removal of, or alteration to existing utility services where necessitated by the Works. Costs incurred will be paid under relevant items in the Bills of Quantities. The Contractor shall verify alignment of existing services e.g. KPLC Services, Telkom Services, existing water pipes, etc. The cost for these should be included in the Contractor's rates.

12. Quantities for site clearance, stripping and spreading shall be based on plain area cleared or stripped.

13. 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, except where otherwise provided for in the Bills of Quantities.

14. 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 working space and for battering or timbering etc.
    b) Timbering
    c) Dealing with water from any source whatsoever, unless specifically itemized in the Bills of Quantities
    d) Backfilling as specified
    e) Disposal of surplus spoil to approved tips identified by the Contractor in liaison with the local council, not exceeding 5 km distance

    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 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 working space to complete the work to the satisfaction of the Engineer.

The Contractor shall allow in his prices for clearly marking the excavation width of the pipe trench prior to commencement of excavation, fixing of sight rails at intervals of 30m and marking of temporary Bench Marks related to Survey of Kenya Datum at such intervals as directed by the Engineer.

Items are included for "Extra Over for Rock" on a volume basis. The rates shall include for breaking out and for any other additional costs and the items shall apply to work encountered within measured excavation. Different classifications 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 murram 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.

15. Excavation by means of mechanical equipment may not be possible in some areas due to restricted wayleaves, 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.

16. 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. 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.

17. The volume of fill will be measured net to the finished levels as shown on the drawings or as amended by the Engineer.

18. The rates for concrete shall include for 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's Representative.

19. The rates for precast concrete paving shall include for all cutting, bedding, jointing and laying to falls.

20. The rates for precast concrete edging and kerbs shall include for formwork, concrete bed and backing, all cutting, jointing and laying.

21. All formwork must be cleaned and oiled prior to use. All exposed concrete edges shall have a 20mm chamfer unless otherwise directed. The formwork rates shall also be inclusive of all necessary box outs and cut outs for individual holes up to 1 square meter.

    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 meter in area.

22. 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.

23. Wrought formwork where specified will be measured to 150mm below final ground levels.

24. 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.

25. All rates and sums in the Bills of Quantities shall be in Kenya Shillings and Cents.
26. A construction wayleave of up to 9 meters for the Raw Water Gravity Main in open fields will be allowed. Construction wayleave of up to 3 m for Water Mains within the Town will generally be allowed, if possible. In built up areas especially the Central Business District, the Contractor's rates shall include staged excavation, including double haulage of excavated interval, provision of temporary access to premises safety barriers, warning signs, etc. in order to facilitate normal business activities to be maintained without disruption. The Contractor in his planning shall allow for working after normal business working hours and at night to enable timely completion of the Works.

    In restricted spaces including heavy pedestrian and vehicular traffic areas backfilling of pipelines prior to testing will be permitted. However, no claim for additional costs will be entertained for exposing of pipelines and joints in case of failure of pressure tests. The Contractor to allow in his rates for such exigencies.

    Payment for site clearance will be based upon this width except that the Engineer reserves the right to restrict this width due to the presence of obstructions, roads, houses and the like. Payment shall then be according to the actual area cleared. In case additional working 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, roads, drains, culverts, etc. or any other existing structures damaged or uprooted by the Contractor during the Construction Works to the satisfaction of the Engineer.

27. 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.

28. Unless otherwise specified the method of measurement shall be in accordance with the Civil Engineering Standard Method of Measurement, Fourth Edition (CESMM4) published by the Institution of Civil Engineers, London, Third Edition - 2012. 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.

29. Items for buildings, electrical and mechanical works are not described using CESMM4 for clarity purposes.

30. All quantities have been measured in Metric Units.

31. Explanation of abbreviations used in the Bills of Quantities are as follows:-

L.S.	-	Lump Sum
P.C.	-	Prime Cost
PS	-	Provisional Sum

E.O.	-	Extra Over
Avg.	-	Average
Max.	-	Maximum

Min.	-	Minimum
n.e.	-	Not Exceeding
Nr.	-	Number
mm	-	Millimeter
m	-	Linear Meter
m^2	-	Square Meter
m^3	-	Cubic Meter
Ha.	-	Hectare
Drg.	-	Drawing
Kg.	-	Kilograme
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	-	Unplasticized Polyvinyl Chloride
G.I.	-	Galvanized Iron
G.M.S.	-	Galvanized Mild Steel
P.E.H.	-	Palothene
PE	-	Polyethylene
Hr.	-	Hour
FE/Fe	-	Ferrous

32. 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.

33. 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.

34. Concrete Works

a) Item : Concrete
Unit : m^3 of each class

Concrete shall be measured by the cubic meter 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 meters;

ii) mortar beds, fillets, drip moulds, rebates, recesses, grooves, chamfers and the like of 100mm 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 the requirements of Clauses 724, 401-415 inclusive and Clause 418 of the Specification.

b) Item : Blinding Concrete
Unit : m^3

Blinding concrete shall be measured by the cubic meter 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 meters. Blinding concrete over hard material shall be measured as the volume used provided that the maximum thickness of 150mm allowed for overbreak is not exceeded.

The rate for blinding concrete shall include for all costs itemized in Note 33(a) of this Preamble.

c) Item : No Fines Concrete
Unit : m^3

No fines concrete shall be measured by the cubic meter 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 33(a) of this Preamble.

d) Item : Unformed Surface Finishes
Unit : m^2 of each class of finish

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

The rate for concrete in Notes 33(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^2 of formwork for each class of finish for each range of inclinations

Except as stated below, formwork shall be measured by the square meter 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 meters. Unless otherwise stated, if the volume or area of concrete has not been deducted when measuring the concrete in accordance with Notes 33(a), (b) and (c), formwork to form or box out the void shall not be measured.

Formwork less than 300mm high to edges of slabs shall be measured by the linear meter in accordance with Note 33(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 meter 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 75mm 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 water stops, temporary openings, cleaning, dressing, stripping, filling bolt holes and any remedial work and for complying with Clauses 405, 407, 414, 415, 416, 418 and 501 t0 506 inclusive of the Specification.

f) Item : <u>Formwork to Edges of Slabs</u>
Unit : m of each class of finish

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

The rate shall include for the costs stated in Note 33(a) of this Preamble.

g) Item : <u>Water stops</u>
Unit : m of each type

Water stops shall be measured by the meter 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 water stop.

h) Item : <u>Mortar</u>
Unit : m^2

Mortar used for bedding base plates and the like shall be measured by square meter 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 the requirements of Clauses 411 and 417 of the Specification.

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 35(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 kilograms per cubic meter.

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 the requirements of Clauses 419 to 420 inclusive of the Specification.

k) Item : Fabric Reinforcement
Unit : m^2 of each type

Steel fabric reinforcement shall be measured by the square meter 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 33(j) of this Preamble.

Sewers, Drains and Pipelines

35. 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 pipe's consequent upon structures, specials and fittings being constructed in the designated positions.

36. 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.

37. Pipes, Fittings and Valves

a) uPVC pipes and fittings to SRN 300 Class 'D' (12 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 Engineer.

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

s) All Ferrous Pipes and Fittings to be PN16 unless otherwise stated in the Specifications or Bills of Quantities.

Shop Drawings

38. 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.

The Contractor's rates for electrical Works shall include for preparation and submission in triplicate of working drawings for electrical wiring, switchgear panels, etc. including submission of literature and samples for light fittings, wiring, cables, switchgear controls as specified.

Prime Cost Items

39. 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.

40. 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.

41. Profit shall include for establishment charges, profit and any other costs not included in the attendance item.

42. The rates for the supply of any mechanical and electrical equipment shall include for the submission of factory test results.
43. 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 Engineer 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.

44. 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.

45. The rates to be indicated in the Bills of Quantity shall be inclusive of Kenya Government duties and taxes (including any input VAT paid on purchase of materials etc.). The VAT to be added/shown at the end before the total in the grand summary page.

46. Specific Requirements

1) Priority Works

The Bidder is required to complete the Resident Engineer's Office to be located preferably at the Tank area, near Yamo Dam, within the specified time after the Mobilization Period at a location to be shown to the Contractor.

2) Contractor's Camps

The Employer has available land to offer for Contractor's Camps, storage of materials and preparation of concrete etc.. Any extra/additional area required will be the Contractor's responsibility to obtain at his own cost.

3) Construction Wayleaves

The Contract involves laying some sections of the Water Mains Private Land. The Employer has acquired a Construction Wayleave of 3m. The Contractor's rates will be deemed to cover costs for acquiring a wider Construction Wayleaves, if necessary, double haulage and making good, reinstatement to original condition surfaces disturbed by Construction Wayleaves. Contractor's attention is drawn to the relevant Clause in the Preamble to the Bills of Quantities in this respect.

4) Interconnection Between Existing and New Distribution Mains

The Bidder to allow for continuity of water supply to affected areas during the interconnection of existing main(s) to new main(s). The Bidder's rate(s) to allow for maintaining continuity of supply.

4. CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

BILLS OF QUANTITIES

The Works comprise of the following:

i) Construction of an approximately 1,416m long 450 mm dia PN10 epoxy coated internally and externally steel pipe raw water main
j) Construction of an approximately 5,203m long DN400 m HDPE pipe treated water to Maralal town.
k) Construction of an approximately 519m long 355mm dia HDPE PN16 line to existing water tank and connection to the existing tank
l) Construction of a 9,000m^3 per day conventional water treatment plant (stilling well, chemical mixing and storage house, dosing channel, flocculation basins, sedimentation tanks, filters, backwash pump house and elevated backwash water tank, chlorine storage house, operator's office, laboratory and recycled water pump house.
m) Construction of a 500M^3 clean water tank at the water treatment works area
n) Construction of one staff house/Resident Engineer's office
o) Construction of a guard house
p) Site ancillary works

CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

CONTRACT No. NWWDA/T/CW/050/2023-2024

GRAND SUMMARY INCLUSIVE OF DUTIES AND TAXES

BILLS OF QUANTITIES TOTAL

	DESCRIPTION OF BILL ITEMS	**AMOUNT Ksh.**
1	PRELIMINARIES AND GENERAL ITEMS	
2	RAW WATER MAIN	
3	TREATED WATER MAIN	
4	DISTRIBUTION LINE TO EXISTING WATER TANKS_LINE 1	
5	WATER TREATMENT PLANT	
6	SCHEDULE OF DAY WORKS	
7	**SUB TOTAL 1**	
8	**ADD : CONTIGENCIES 5.0%**	
9	**SUB TOTAL 2**	
10	**ADD: VAT 16%**	
	TOTAL	

BILL No. 1.0

BILL No. 1	PRELIMINARIES AND GENERAL ITEMS				
ITEM No.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (KES)**	**AMOUNT (KES)**
	Contractual Requirements				
1-A120.1	Insurance for Works, Plant, Materials, and Contractor's Documents as per Clause 18.2 of the Conditions of Contract.	Sum	1		
1-A120.2	Insurance for Contractor's Equipment as per Clause 18.2 of the Conditions of Contract.	Sum	1		
1-A120.3	Insurance against Injury to Third Party Persons and Damage to Property as per Clause 18.3 of the Conditions of Contract.	Sum	1		
	Specified Requirements				
	Accommodation for the Engineer's staff				
1-A420.1	Allow a Provisional sum of Ksh 17,000,000 for provision of Accommodation for the use of the Resident Engineer, Assistant Resident Engineer, Surveyor and two inspectors.	PS	PS	17,000,000	17,000,000.00
1-A420.32	Provisional sum for construction of a site office for the Engineer's staff (Resident Engineer's office)	PS			5000000
1-A420.33	Provisional sum for renting of a temporary office while the resident Engineer's office in item 1-A420.3 above is being constructed	PS			200000
1-A420.2	Percentage adjustment for profit, administration, attendance upon, overheads, etc. for Items 1-A420.1, **1-A420.32 and** 1-A420.33 above	%	2,,200,000		
	Services for the Engineer's Staff				
	Vehicle				
1-A420.3	Allow Provisional sum for purchase of 2No. 4WD Double-Cab Pick-ups (Not Exceeding 3000cc) for use by Engineer's Staff as instructed. Vehicles to revert to the Employer upon completion of the project	PS	PS	16,000,000	16,000,000.00
1-A420.4	Provisional Sum for provision of Comprehensive Insurance Cover, maintaining, running and servicing the above Vehicles, including all costs of transfer to the Employer at the end of Contract, road licenses etc.	PS	PS	6,000,000	6,000,000.00
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

1-A420.5	Provision of temporary Project Supervision Vehicles (2 nr.) pickups whilst the vehicles under the Contract are being procured, including cost of vehicle hire, fuels, lubricants, servicing, and any other related running costs of specifications similar to those in 1-A420.3 above	Months	3		
1-A420.6	Allow for Provision of communication facilities and services (telephone, internet, postal, courier services, etc.) for the Project / Site Offices and the Supervision Staff.	PS	PS	1,000,000	1,000,000.00
1-A420.7	Percentage adjustment for profit, administration, attendance upon, overheads, etc. for Items 1-A420.3 to 1-A420.6 above	%	23,000,000		
	Equipment for use by the Engineer's staff				
1-A420.8	Provisional Sum for furnishing and equipping of R.E's Office as specified. To revert to the Employer upon completion.	PS	PS	2,000,000	2,000,000.00
1-A420.9	Allow for monthly administration and maintenance of the office and office equipment for use by the Engineer's Staff	PS	PS	720,000	720,000.00
1-A420.10	Percentage adjustment for profit, administration, attendance upon, overheads, etc. for Items 1-A420.8 to 1-A420.9 above	%	2,720,000		
1-A420.11	Provisional Sum for provision of Survey Equipment as specified for the sole use of the Resident Engineer during the duration of the Contract and revert to the Employer upon completion.	PS	PS	3,000,000	3,000,000.00
1-A420.12	Allow a provisional sum for supply of PPEs for the use by the Engineer's Staff	PS	PS	700,000	700,000.00
1-A420.13	Percentage adjustment for profit, administration, attendance upon, overheads, etc. for Items 1-A420.11 to 1-A420.12 above	%	3,700,000		
	Attendance Upon Engineer's Staff				
	Provide the following Staff for the Resident Engineer's Office. (Note: The Staff to be employed by the Contractor)				
1-A241	Drivers, 2No.	month	36		
1-A242	Chainmen, 2No.	month	36		
1-A249.1	Office Assistant/ Cleaner, 1 No.	month	18		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

1-A249.2	Secretary, 1No.	month	18		
1-A249.3	Day and night watchmen and other security for RE's offices as specified	Man-month	72		
	Testing of Materials and Works				
1-A420.14	Provisional Sum for provision of a materials testing laboratory and specified laboratory equipment for testing of materials during construction (*To revert to the Employer upon completion*)	PS	PS	15,000,000	15,000,000.00
1-A420.15	Provisional Sum for testing of materials as specified or directed by the Engineer	PS	PS	1,500,000	1,500,000.00
1-A420.16	Percentage adjustment for profit, administration, attendance upon, overheads, etc. for Item 1-A420.14 to 1 A420.16 above	%	16,500,000		
1-A260	Test running the constructed infrastructure as specified for a period 30 days before handing over	Sum	1		
	Project Signboards				
1-A279	Provision, fixing, maintaining and removal of Project Signboards as shown on drawings	Nr.	3		
	Other Requirements				
1-A299.1	Setting out the Works	LS	LS		
1-A299.2	Allow for the provision of record (as-built) drawings	LS	LS		
1-A299.3	Allow for provision of Operation and Maintainance Manuals	LS	LS		
1-A299.4	Implementation of the Contractor's responsibilities in the ESSMP as priced in Annex 1_schedule A to these Bill of Quantities (*to be expended upon performance throughout the construction period, upon approval by the Engineer, and submission of quarterly environmental reports*)	LS	LS		
1-A420.17	Provisional Sum for Training of Employer's Staff during Construction, Testing and Commissioning of the Works	PS	PS	1,500,000	1,500,000.00
1-A420.18	Provisional Sum for facilitation of monthly site meetings to be expended as directed by the Engineer	PS	PS	2,000,000	2,000,000.00
1-A420.19	Provisional Sum for fees requested by various Government Authorities and Agencies for approvals and effective execution of Works	PS	PS	10,000,000	10,000,000

PAGE TOTAL CARRIED TO BILL COLLECTION PAGE	

1-A420.20	Provisional Sum for permanent relocation of existing services where necessary and instructed by the Engineer (water pipelines, fiber, etc.)	PS	PS	2,000,000	2,000,000.00
1-A420.21	Percentage adjustment for profit, administration, attendance upon, overheads, etc. for Items for Items 1-A420.17 to 1- A420.20	%	15,500,000		
	Other Provisional Sums				
1-A420.22	Allow a Provisional Sum of Ksh. 3,000,000 to cover costs of the Employer's Counterpart Staff assigned to the Project including transport, communication, allowances, etc.	PS	PS	5,000,000	5,000,000.00
1-A420.23	Allow a provisional sum for the purchase/ provision of O&M and water testing laboratory instruments as directed by the Engineer	PS	PS	3,000,000	3,000,000.00
1-A420.24	Allow a Provisional Sum for HIV/AIDS prevention activities and campaigns to be spent as directed by the Engineer.	PS	PS	1,000,000	1,000,000.00
1-A420.25	Allow a provisional sum for provision of approved standards e.g. BSS, AWWA, DIN, KSS etc. for use by the Resident Engineer's office during execution of the contract.	PS	PS	500,000	500,000.00
1A-420.26	Provisional sum for climate adaptation measures:- Tree planting etc.	PS	PS	2,000,000	2,000,000.00
1A-420.27	Provisional sum for Road Safety audits over the construction period	PS	PS	1,000,000	1,000,000.00
1A-420.28	Provisional Sum for Launching, Commissioning and branding project facilities	PS	PS	6,500,000	6,500,000.00
1A-420.29	Provisional Sum for engagement of interns during the construction period as per the Employer's Instructions	PS	PS	5,000,000	5,000,000
1A-420.30	Provisional Sum for acquisition of land and/or wayleave for construction activities through compensation	PS	PS	15,000,000	15,000,000
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

1A-420.30	Provisional Sum for any other activities required to see the project to completion, to be expended with the Engineer's Instructions	PS	PS	15000000	15000000
1-A420.31	Percentage adjustment for profit, administration, attendance upon, overheads, etc. for Items 1-420.22-1-A420.30 above	%	54,000,000		
	Method Related Charges				
	Accommodation and Buildings				
1-A31*.1	Establishment of Contractor's camps, offices, other facilities, etc. (fixed)	sum			
1-A31*.2	Removal of Contractor's camps, offices, other facilities, etc. (fixed)	sum			
	Services				
1-A32*	Provision of services to the Contractor's personnel on site; electricity, water, security, site transport, personnel transport, welfare, hoardings, and maintenance of the Contractor's camps, offices, other facilities,	months	18		
	Plant				
1-A33*.1	Mobilization of the contractor's equipment (fixed)	sum	1		
1-A33*.2	Removal of contractor's equipment from site upon completion of the works (fixed)	sum	1		
	Temporary Works				
1-A35*	Provide and maintain traffic diversions, access roads, dewatering and other requirements during construction (fixed)	LS	LS		
	OTHER METHOD RELATED CHARGES				
1-A399	The tenderer may insert hereunder 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 cost of which are not to be considered as proportional to the quantities of the other items and for which he has not allowed in the rates and prices for the other items.				

PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

BILL No. 1.0 COLLECTION PAGE

PRELIMINARIES AND GENERAL ITEMS

		Amount (Ksh.)
	Page Total, Page 1 of 6 Page Total, Page 2 of 6 Page Total, Page 3 of 6 Page Total, Page 4 of 6 Page Total, Page 5 of 6 Page Total, Page 6 of 6	
	Bill Total	

	BILL No. 2.0 **RAW WATER GRAVITY MAIN**				
ITEM No.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (KES)**	**AMOUNT (KES)**
	GENERAL ITEMS				
	TESTING OF THE WORKS				
	Testing, Disinfection & Flushing of Pipelines and Fittings. Test pressure not exceeding 15 bars				
2-A260	Testing and Commissioning of the Pipeline as specified or as directed by the Engineer. Include provision of all equipment, materials and works necessary for testing. DN450mm Epoxy coated Steel pipe	m	1,416		
2-A299	Disinfection of Pipeline as specified or as directed by the Engineer. This includes supply of all necessary Equipment, Materials, Chemicals, Water, Measurement of Residual Chlorine, etc., and safe disposal of disinfecting water. DN450mm Epoxy Coated Steel Pipe	m	1,416		
2-D	**DEMOLITION & SITE CLEARANCE**				
	GENERAL CLEARANCE				
2-D110	General site clearance along the pipeline alignment, width not exceeding 5m	ha	1		
D2	**Tree cutting (Provisional)**				
	Cut down trees, grub up roots and cart away;				
2-D210	Girth: 500mm-2m	nr	44.		
2-D220	Girth: exceeding 2m	nr	44.		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

	PIPEWORK – PIPES				
	Note:- The rates entered against the items in this section shall include for stripping top soil, laying aside and subsequently replacing over refilled trench, excavation in trench in material other than rock, shuttering where necessary, refilling and compacting as per specification, spreading surplus soil evenly over and alongside pipe trench compacting, supply lay and join pipes to correct line and level. Depths are stated from ground level to invert level (as per the Profile drawings)				
	STEEL PIPES				
	Epoxy coated Steel pipes DN 450mm PN10 in trench				
2-I432	DN450 in trenches with depth range not exceeding 1.5m	m	352		
2-I433	DN450 in trenches with depth range not exceeding 1.5 - 2m	m	99		
2-I434	DN450 in trenches with depth range 2- 2.5m	m	166		
2-I435	DN450 in trenches with depth range 2.5 - 3m	m	138		
2-I436	DN450 in trenches with depth range 3 – 3.5m	m	75		
2-I437	DN450 in trenches with depth range 3.5- 4m	m	262		
2-I438	DN450 in trenches with depth exceeding 4m	m	324		
	CLASS J: PIPE WORK - FITTINGS AND VALVES-PN 10				
	Supply, transport to site , store lay and join pipes in trenches. Include supply of jointing material, bolts, nuts, Gaskets etc. as applicable				
J3	**Epoxy Coated steel pipes and fittings**				
J31	**plain ended bends and tees DN 450**				
2-J313.1	11.25°	nr	10		
2-J313.2	22.5°	nr	2		
2-J313.3	30°	nr	4		
2-J313.4	45°	nr	3		
2-J323	Dn 450 dia tee	nr	1		
J37	**Bellmouth**				
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2-J373	DN 450 Flanged Bellmouth	nr	1		
J38	**Straight Specials**				
2-J383.1	DN 450 ,2460 mm long double flanged spigot pipe with puddle flange 360 mm from one end	nr	1		
2-J383.2	DN 450, 2000 mm long double flanged spigot pipe	nr	1		
2-J383.3	DN 450 ,1000 mm long single flanged spigot pipe	nr	1		
J34	**Couplings**				
2-J343	Ranger Coupling DN 450	nr	1		
J8	**Valves and Penstocks**				
J81	**All Flanged Gate Valves**				
	Gate Valves and line valves to be supplied complete with extension spindle n.e. 2.0 m and Tee-Key.				
2-J813	DN 450	nr	2		
	Flanged Water Meters				
2-J903	Supply, install and test diameter 450mm "Helix" Water Meter complete with all gasket bolts etc. Rate to include for all associated fittings	nr	1		
	CLASS K: PIPE WORK - CHAMBERS AND PIPE WORK ANCILLARIES				
	Chambers, ducts, culverts, crossings, thrust and anchor blocks, reinstatement and others as listed and specified in drawings.				
	Note:- Items for work in this class shall include:-Excavation, preparation of surfaces, disposal of excavated material, shoring sides of Excavation, backfilling and removal of redundant services. Concrete, reinforcement, formwork, joints and finishes. Tips for disposal of excavated material or debris to be identified by the contractor in liaison with local authority				
	Contractor in liaison with the Local Authority.				
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K21	**INSITU MASONRY CHAMBERS**				
2-K212	Provide all necessary materials and construct a Masonry walling chambers, internal dimensions 1800x1400mm . Include for supply and fixing of removable precast concrete covers, step iron, compacted granular fill, rendering of exposed blockwork etc. All as detailed on drawing No. M/W/S/SD/02. Depth 1.5-2m	nr	2		
	Crossings				
2-K632	Flying pipe river or stream with supporting columns as in accordance with drawing M/W/S/SD/21 and specification as attached	nr	1		
	Road Crossing				
2-K642	Allow for crossing existing Hedges and reinstating these after construction of the water line	nr	2		
2-K662	Allow for crossing existing Fences and reinstating these after construction of the water line	nr	2		
2-K672	Allow for crossing existing drains and reinstating these after construction of the water line	nr	5		
2-K68*	Allow for crossing of existing underground services (Specifically community water lines, sewer lines, telephone/Electricity ducts, fiber optic cable ducts etc.) Including reinstatement to the original status and liaison with the relevant authority for inspection / approval during execution of the works. Pilot excavation shall be done to establish exact location of any buried services prior to actual excavation. The rate shall be deemed to include for the pilot excavations, repairs and reinstatement of any damages to the existing buried services as a result of execution of the works	nr	3		
	Road Crossing				
2-K732.1	Breaking up, temporary and permanent reinstatement of murram road with 300mm thick approved gravel compacted in layers of 150mm to the satisfaction of the Engineer, road width not exceeding 9m	nr	2		
2-K894	Allow Pipe sleeve DN 600 HDPE Pipe PN 16	m	16		
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	Other Ancillaries				
2-K820.1	Supply and fix marker posts along water Main Route, Road crossings, change of direction, Air valves, washouts and valve chambers. All in accordance with drawing drawings and specifications as in drawing No. M/W/S/SD/11	nr	15		
	CLASS L:- PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES				
	TO LAYING AND EXCAVATION				
L1	***Extra over excavation and backfilling for excavation in Rock. Rate to include carting away and disposal. (Provisional)***				
L11	***In pipe Trenches***				
2-L111.1	Excavation in trench for rock class "A"	m³	220		
2-L111.2	Excavation in trench for rock class "B"	m³	440		
2-L111.3	Excavation in trench for rock class "C"	m³	2640		
L12	***In Chambers***				
2-L121.1	Excavation for Chambers for rock class "A"	m³	6		
2-L121.2	Excavation for Chambers for rock class "B"	m³	6		
2-L121.3	Excavation for Chambers for rock class "C"	m³	11		
	Note: - Blasting is NOT permitted for Item 2-L11 and L12				
L5	**Surrounds**				
L52	**Selected Excavated Granular Fill (Provisional)**				
	Provide, place and compact selected excavated granular fill material in bed and surround to pipes as specified and where directed by the Engineer				
2-L523	To pipes nominal bore 450mm	m	623		
	Imported Selected Fill (Provisional)				
	Provide, transport to site and place imported selected fill and compact in bed and surround to pipes as specified and where directed by the Engineer				
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2-L533	To pipes nominal bore 450mm	m	935		
	Concrete Support, Thrust Blocks and Anchor Blocks				
	Rates to include for excavation, formwork, provision and placing of concrete, backfilling etc.				
	Class 12/15 Mass concrete				
	NOTE: - The work includes pipe and fitting fixing				
	Volume : 0.2 - 0.5 m^3				
2-L733	To pipes nominal bore 300mm - 600mm	nr	10		
	Volume : 0.5 - 1 m^3				
2-L743	To pipes nominal bore 300mm - 600mm	nr	10		
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BILL No. 2.0 SUMMARY PAGE

RAW WATER GRAVITY MAIN

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BILL No. 3.0

TREATED WATER MAIN

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (KES)	AMOUNT (KES)
	GENERAL ITEMS				
	TESTING OF THE WORKS				
	Testing, Disinfection & Flushing of Pipelines and Fittings. Test pressure not exceeding 25 bars				
3-A260	Testing and Commissioning of the Pipeline as specified or as directed by the Engineer. Include provision of all equipment, materials and works necessary for testing. DN 400mm HDPE Pipe	M	5,203		
3-A299	Disinfection of Pipeline as specified or as directed by the Engineer. This includes supply of all necessary Equipment, Materials, Chemicals, Water, Measurement of Residual Chlorine, etc., and safe disposal of disinfecting water. DN400mm HDPE Pipe	M	5,203		
	DEMOLITION & SITE CLEARANCE				
	GENERAL CLEARANCE				
3-D110	General site clearance along the pipeline alignment , width not exceeding 5m	ha	3		
D2	**Tree cutting (Provisional)**				
	Cut down trees, grub up roots and cart away;				
3-D210	Girth: 500mm-2m	nr	44		
3-D220	Girth: exceeding 2m	nr	22		
	PIPES FITTINGS AND VALVES				
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	CLASS I:PIPE WORK-PIPES				
	Supply (including supply of Jointing material, bolts ,Nuts Gaskets etc. as applicable), transport to site, lay and joint pipes in trench, include for excavation, preparation of surfaces, disposal of excavated Material, shoring sides, of excavation trenches, backfilling and Final reinstatement				
	High Density Polyethylene pipes (HDPE)- PN 16				
3-I732.1	DN400 in trenches with depth range not exceeding 1.5m	M	1018		
3-I733	DN400 in trenches with depth range not exceeding 1.5 - 2m	M	1329		
3-I734	DN400 in trenches with depth range 2-2.5m	M	1307		
3-I735	DN400 in trenches with depth range 2.5 - 3m	M	734		
3-I736	DN400 in trenches with depth range 3 – 3.5m	M	282		
3-I737	DN400 in trenches with depth range 3.5-4m	M	138		
3-I738	DN400 in trenches with depth exceeding 4m	M	15		
	High Density Polyethylene pipes (HDPE)- PN 10 (Provisional)				
3-I732.2	DN400 in trenches with depth range not exceeding 1.5m	M	400		
	CLASS J: PIPE WORK - FITTINGS AND VALVES-PN 16				
	Supply (including supply of Jointing material, bolts ,Nuts Gaskets etc. as applicable), transport to site, lay and joint pipes in trench, include for excavation, preparation of surfaces, disposal of excavated Material, shoring sides, of excavation trenches, backfilling and Final reinstatement				
J61	**HDPE Bends DN 400**				
3-J613.1	11.25°	nr	7		
3-J613.2	22.5°	nr	9		
3-J613.3	30.0°	nr	5		
3-J613.4	45.0°	nr	5		
3-J613.5	60.0°	nr	1		
J32	**Junction and Branches**				
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	All Flanged Tee (Epoxy coated steel tee)				
3-J323.1	DN 400 X DN 100 (Invert Tee (For Washouts)	nr	8		
3-J323.2	DN 400 X DN 100	nr	9		
3-J323.2	DN 400 X DN 355	nr	2		
J38	**Straight Specials**				
3-J383	DN 400 ,1000mm long single flanged epoxy coated steel spigot pipe	nr	37		
3-J383	DN 400 ,2000mm long single flanged epoxy coated steel spigot pipe	nr	2		
3-J383	DN 400 ,2000mm long double flanged epoxy coated steel spigot pipe	nr	1		
3-J381	DN 100 ,1000mm long single flanged epoxy coated steel spigot pipe	nr	8		
J34	**Couplings**				
3-J343	Ranger Coupling DN 400	nr	39		
J8	**Valves and Penstocks**				
J81	**All Flanged Gate Valves**				
	Gate Valves and line valves to be supplied complete with extension spindle n.e. 2.0 m and Tee-Key.				
3-J813	DN 400	nr	3		
3-J811	DN 100	nr	8		
	Flanged Water Meters				
3-J903	Supply, install and test diameter 400mm "Helix" Water Meter complete with all gasket bolts etc. Rate to include for all associated fittings	nr	1		
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J86	**Single Orifice Air Valve**				
	Air Valves: triple action, anti-surge, anti-shock, c/w separate female threaded stop cock/isolator and isolating valve, PN 16 and all associated fittings				
3-J861	Nominal bore: 100mm	nr	9		
	CLASS K: PIPE WORK - CHAMBERS AND PIPE WORK ANCILLARIES				
	Chambers, ducts, culverts, crossings, thrust and anchor blocks, reinstatement and others as listed and specified in drawings.				
	Note:- Items for work in this class shall include:-Excavation, preparation of surfaces, disposal of excavated material, shoring sides of Excavation, backfilling and removal of redundant services. Concrete, reinforcement, formwork, joints and finishes. Tips for disposal of excavated material or debris to be identified by the contractor in liaison with local authority				
	Contractor in liaison with the Local Authority.				
K21	**INSITU MASONRY CHAMBERS**				
3-K212	Provide all necessary materials and construct Masonry walling chambers, internal dimensions 1800x1400mm . Include for supply and fixing of removable precast concrete covers, step iron, compacted granular fill, rendering of exposed blockwork etc. All as detailed on drawing No. MWS/SD/02. Depth 1.5-2m	nr	7		
3-K212	Provide all necessary materials and construct Masonry walling chambers, internal dimensions 1800x1400mm . Include for supply and fixing of removable precast concrete covers, step iron, compacted granular fill, rendering of exposed blockwork etc. All as detailed on drawing No. MWS/SD/02. Depth 2-2.5m	nr	6		
3-K212	Provide all necessary materials and construct Masonry walling chambers, internal dimensions 1800x1400mm . Include for supply and fixing of removable precast concrete covers, step iron, compacted granular fill, rendering of exposed blockwork etc. All as detailed on drawing No. MWS/SD/02. Depth 2.5-3m	nr	6		
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3-K871	Provide all material and construct masonry outfall structure on mass concrete plinths at washout drain pipes outlets	nr	9		
	Crossings				
3-K632	Flying pipe, river or stream with supporting columns as in accordance with drawing no. M/W/S/SD/21and specification as attached	nr	1		
	Road Crossing				
3-K642	Allow for crossing existing Hedges and reinstating these after construction of the water line	nr	5		
3-K662	Allow for crossing existing Fences and reinstating these after construction of the water line	nr	5		
3-K672	Allow for crossing existing drains and reinstating these after construction of the water line	nr	5		
3-K68*	Allow for crossing of existing underground services (Specifically community water lines, sewer lines, telephone/Electricity ducts, fiber optic cable ducts etc.) Including reinstatement to the original status and liaison with the relevant authority for inspection / approval during execution of the works. Pilot excavation shall be done to establish exact location of any buried services prior to actual excavation. The rate shall be deemed to include for the pilot excavations, repairs and reinstatement of any damages to the existing buried services as a result of execution of the works	nr	3		
	Road Crossing				
3-K732.1	Breaking up, temporary and permanent reinstatement of murram road with 300mm thick approved gravel compacted in layers of 150mm to the satisfaction of the Engineer , road width not exceeding 9m	nr	7		
3-K894	Allow Pipe sleeve: PN 16 DN 600 HDPE	M	16		
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	Other Ancillaries				
3-K820.1	Supply and fix marker posts along water Main Route, Road crossings, change of direction, Air valves, washouts and valve chambers. All in accordance with drawing drawings and specifications as in drawing No. M/W/S/SD/11	nr	30		
	CLASS L:- PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES				
	TO LAYING AND EXCAVATION				
L1	***Extra over excavation and backfilling for excavation in Rock. Rate to include carting away and disposal. (Provisional)***				
L11	***In pipe Trenches***				
3-L111.1	Excavation in trench for rock class "A"	m³	110		
3-L111.2	Excavation in trench for rock class "B"	m³	880		
3-L111.3	Excavation in trench for rock class "C"	m³	3850		
L12	***In Chambers***				
3-L121.1	Excavation for Chambers for rock class "A"	m³	44		
3-L121.2	Excavation for Chambers for rock class "B"	m³	66		
3-L121.3	Excavation for Chambers for rock class "C"	m³	110		
	Note:- Blasting is NOT permitted for Item 2-L11 and L12				
L5	**Surrounds**				
L52	**Selected Excavated Granular Fill (Provisional)**				
	Provide, place and compact selected excavated granular fill material in bed and surround to pipes as specified and where directed by the Engineer				
3-L523	To pipes nominal bore 400mm	M	2279		
	Imported Selected Fill (Provisional)				
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	Provide, transport to site and place imported selected fill and compact in bed and surround to pipes as specified and where directed by the Engineer				
3-L533	To pipes nominal bore 400mm	m	3419		
	Concrete Support, Thrust Blocks and Anchor Blocks				
	Rates to include for excavation, formwork, provision and placing of concrete, backfilling etc				
	Class 12/15 Mass concrete				
	NOTE: - The work includes pipe and fitting fixing				
	Volume: 0.2 - 0.5 m^3				
3-L733	To pipes nominal bore 300mm - 600mm	nr	7		
	Volume : 0.5 - 1 m^3				
3-L743	To pipes nominal bore 300mm - 600mm	nr	22		
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BILL No. 3.0 SUMMARY

TREATED WATER MAIN

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	BILL No. 4.0 **DISTRIBUTION LINE TO EXISTING WATER TANKS LINE 1**				
ITEM No.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE (KES)**	**AMOUNT (KES)**
	GENERAL ITEMS				
	TESTING OF THE WORKS				
	Testing, Disinfection & Flushing of Pipelines and Fittings. Test pressure not exceeding 25 bars				
4-A260	Testing and Commissioning of the Pipeline as specified or as directed by the Engineer. Include provision of all equipment, materials and works necessary for testing. DN 355 mm HDPE Pipe	m	519		
4-A299	Disinfection of Pipeline as specified or as directed by the Engineer. This includes supply of all necessary Equipment, Materials, Chemicals, Water, Measurement of Residual Chlorine, etc., and safe disposal of disinfecting water. DN 355mm HDPE Pipe	m	519		
	DEMOLITION & SITE CLEARANCE				
	-				
	GENERAL CLEARANCE				
4-D110	General site clearance along the pipeline alignment , width not exceeding 5m	ha	0		
D2	**Tree cutting (Provisional)**				
	Cut down trees, grub up roots and cart away;				
4-D210	Girth:500mm-2m	nr	17		
4-D220	Girth: exceeding 2m	nr	22		
	PIPES FITTINGS AND VALVES				
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	CLASS I: PIPE WORK-PIPES				
	Supply (including supply of Jointing material, bolts, Nuts Gaskets etc. as applicable), transport to site, lay and joint pipes in trench, include for excavation, preparation of surfaces, disposal of excavated Material, shoring sides, of excavation trenches, backfilling and Final reinstatement				
	High Density Polyethylene pipes (HDPE)-PN 16				
4-I732	DN355 in trenches with depth range not exceeding 1.5m	m	252		
4-I733	DN355 in trenches with depth range not exceeding 1.5 - 2m	m	255		
4-I734	DN355 in trenches with depth range2-2.5	m	1		
4-I175	DN355 in trenches with depth range 2.5-3	m	1		
4-I176	DN355 in trenches with depth range 3-3.5	m	1		
4-I177	DN355 in trenches with depth range 3.5-4	m	1		
4-I178	DN355 in trenches with depth, exceeding 4m	m	1		
	Pipes not in trench (provisional)				
4-I731	DN355 HDPE PN 16 pipe across bitumen/tarmac roads, depth range 1.5 - 2m. *Rate to allow for installation by tunneling/ micro-tunneling through any formation material. Rate to include for a 450mm dia. PN 16 HDPE Sleeve material*	m	10		
	CLASS J: PIPE WORK - FITTINGS AND VALVES-PN 16				
	Supply (including supply of Jointing material, bolts, Nuts Gaskets etc. as applicable), transport to site, lay and joint pipes in trench, include for excavation, preparation of surfaces, disposal of excavated Material, shoring sides, of excavation trenches, backfilling and Final reinstatement				
J61	**HDPE BENDS DN 400**				
4-J613.1	11.25°	nr	1		
4-J613.2	22.5°	nr	1		
4-J613.3	45.0°	nr	1		
4-J613.5	60.0°	nr	2		
J6	**Flange Adaptor (Stub End)**				
4-J653	OD 355	nr	2		
J81	**All Flanged Gate Valves**				
4-'J813	DN 350	nr	2		
	Connection to the existing tank				
	(i) Inlet Pipework to existing tank - Approved Epoxy coated cement lined steel Pipes				
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4-J393	355 mm dia. flanged spigot pipe of length 1000 mm	nr	1		
4-I332	355 mm dia. plain spigot pipe of length 3000 mm (Cut to suit)	nr	1		
4-J353	355mm dia. flange adaptor	nr	1		
4-J893	355 mm dia. flanged ball float valve	nr	1		
4-J393	355 mm dia. double flanged pipe, length 1000mm with puddle flange 600mm from one end	nr	1		
4-J313	355mm dia. all flanged 90^{o} bend	nr	1		
	CLASS K: PIPE WORK - CHAMBERS AND PIPE WORK ANCILLARIES				
	Chambers, ducts, culverts, crossings, thrust and anchor blocks, reinstatement and others as listed and specified in drawings.				
	Note:- Items for work in this class shall include:-Excavation, preparation of surfaces, disposal of excavated material, shoring sides of Excavation, backfilling and removal of redundant services. Concrete, reinforcement, formwork, joints and finishes. Tips for disposal of excavated material or debris to be identified by the contractor in liaison with local authority				
	Contractor in liaison with the Local Authority.				
K21	**INSITU MASONRY CHAMBERS**				
4-K212	Provide all necessary materials and construct Masonry walling chambers, internal dimensions 1800x1400mm . Include for supply and fixing of removable precast concrete covers, step iron, compacted granular fill, rendering of exposed blockwork etc. All as detailed on drawing No. MWS/SD/02. Depth 1.5-2m	nr	2		
	Road Crossing				
4-K642	Allow for crossing existing Hedges and reinstating these after construction of the water line	nr	10		
4-K662	Allow for crossing existing Fences and reinstating these after construction of the water line	nr	5		
4-K672	Allow for crossing existing drains and reinstating these after construction of the water line	nr	5		
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4-K68*	Allow for crossing of existing underground services (Specifically community water lines, sewer lines, telephone/Electricity ducts, fiber optic cable ducts etc.) Including reinstatement to the original status and liaison with the relevant authority for inspection / approval during execution of the works. Pilot excavation shall be done to establish exact location of any buried services prior to actual excavation. The rate shall be deemed to include for the pilot excavations, repairs and reinstatement of any damages to the existing buried services as a result of execution of the works	nr	8		
	Road Crossing				
4-K732.1	Breaking up, temporary and permanent reinstatement of murram road with 300mm thick approved gravel compacted in layers of 150mmto the satisfaction of the Engineer , road width not exceeding 9m	nr	2		
4-K894	Allow Pipe sleeve: PN 16 DN 600 HDPE	m	16		
	<u>Other Ancillaries</u>				
4-K820.1	Supply and fix marker posts along water Main Route, Road crossings, change of direction, Air valves, washouts and valve chambers. All in accordance with drawing drawings and specifications as in drawing No. M/W/S/SD/11	nr	5		
	<u>CLASS L:- PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES</u>				
	TO LAYING AND EXCAVATION				
L1	***Extra over excavation and backfilling for excavation in Rock. Rate to include carting away and disposal. (Provisional)***				
L11	***In pipe Trenches***				
4-L111.1	Excavation in trench for rock class "A"	m^3	44		
4-L111.2	Excavation in trench for rock class "B"	m^3	101		
4-L111.3	Excavation in trench for rock class "C"	m^3	539		
L12	***In Chambers***				
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4-L121.1	Excavation for Chambers for rock class "A"	m^3	2		
4-L121.2	Excavation for Chambers for rock class "B"	m^3	3		
4-L121.3	Excavation for Chambers for rock class "C"	m^3	8		
	Note:- Blasting is NOT permitted for Item 2-L11 and L12				
L5	**Surrounds**				
L52	**Selected Excavated Granular Fill (Provisional)**				
	Provide, place and compact selected excavated granular fill material in bed and surround to pipes as specified and where directed by the Engineer				
4-L523	To pipes nominal bore 355mm	m	198		
	Imported Selected Fill (Provisional)				
	Provide, transport to site and place imported selected fill and compact in bed and surround to pipes as specified and where directed by the Engineer				
4-L533	To pipes nominal bore 355mm	m	321		
	Concrete Support, Thrust Blocks and Anchor Blocks				
	Rates to include for excavation, formwork, provision and placing of concrete , backfilling etc.				
	Class 12/15 Mass concrete				
	NOTE:- The work includes pipe and fitting fixing				
	Volume : 0.2 - 0.5 m^3				
4-L733	To pipes nominal bore 300mm - 600mm	nr	1		
	Volume : 0.5 - 1 m^3				
4-L743	To pipes nominal bore 300mm - 600mm	nr	4		
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BILL No. 4.0 SUMMARY

DISTRIBUTION LINE TO EXISTING WATER TANKS_LINE 1

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BILL No. 5.1

CHEMICAL MIXING & DOSING BUILDING

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE Ksh	AMOUNT Ksh
	BUILDING WORKS				
	SUBSTRUCTURES (PROVISIONAL)				
	Excavate Surfaces to Reduce Levels Over 300mm Deep:-				
5.1-E322	Pit 0.25 - 0.5m deep	m^3	1		
5.1-E323	Pit 0.5 - 1m deep	m^3	1		
5.1-E324	Pit 1 - 2m deep	m^3	18		
5.1-E325	Pit 2 - 5m deep	m^3	1		
	Excavate Starting from Stripped Level to Receive: -				
5.1-E324	Foundations and bases of isolated piers 1 - 2 meters deep	m^3	10		
	Extra Over Excavation in Any Position for:-				
5.1-E335	Excavating in rock Class "A"	m^3	2		
5.1-E335	Excavating in rock Class "B"	m^3	2		
5.1-E335	Excavating in rock Class "C"	m^3	24		
	Approved imported Filling as Described: -				
5.1-E522	Preparation of excavated surfaces to receive blinding	m^2	30		
5.1-E615	Fill and ram imported suitable fill materials around foundations	m^3	20		
	Approved hardcore filling as described:-				
5.1-E647	Provide and deposit approved imported hardcore in maximum 150mm thick layers in making up levels including achieving satisfactory compaction	m^3	10		
5.1-E645	Provide, lay and level out fine crushed stone, sand or gravel blinding 50mm thick to surface of filling, including watering and rolling to achieve satisfactory compaction	m^2	22		
	Disposal of Surplus Spoil:-				
5.1-E532	Cart away surplus excavated materials to an approved dumping site	m^3	30		
	Anti-Termite Treatment				
5.5-E790	Termidor 25 EC or other equal approved anti-termite chemical treatment: applied by an approved professional pest control specialist:10-year warranty: strictly applied in accordance with the manufacturer's instructions	m^2	22		
	Damp-Proof Membrane				
5.1-W239	500 Gauge polythene sheeting, laid over hardcore in 2 layers	m^2	22		
	PAGE TOTAL CARRIED TO BILL COLLECTION PAGE				

	Concrete Work:				
	Provision of concrete				
5.1-F122	Designed concrete C12/15	m^3	2		
5.1-F142	Designed concrete C20/25	m^3	19		
	Placing of concrete				
5.1-F611	75mm thick mass concrete blinding under foundation concrete, column bases or over hardcore	m^3	2		
5.1-F7**	Foundation trenches, column bases and sub-structure walling in foundations.	m^3	11		
5.1-F72*.1	150mm thick surface bed	m^3	1		
5.1-F72*.2	300mm thick surface bed	m^3	5		
5.1-F75*	Isolated columns and piers in foundations	m^3	2		
	Reinforcement				
	Fabric Reinforcement No. A142 Mesh Size 150 x 150mm Weighing 2.22 kgs Per m^2				
5.1-G562	Fabric reinforcement with minimum 150mm wide side and end laps, laid in bed	m^2	18		
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm^2				
5.1-G523	Diameter: 10mm	Kg	1200		
5.1-G525	Diameter: 16mm	Kg	1000		
	Formwork				
	Provide and Fix Shuttering Including Propping, Strutting and Striking, all as Specified				
	Sawn Formwork - Class F1 Finish:-				
5.1-G343	Foundation trenches, column bases and sub-structure walling in foundations.	m^2	25		
	Wrot Formwork - Class F3 Finish:-				
5.1-G343	Edges of beds not exceeding 300mm wide	m	22		
	Walling.				
	Natural Stone Block Walling, Medium Chisel Dressed, reinforced with 20 swg Hoop Iron at Every Alternate Course, and Bedded, Jointed and Pointed in Cement Mortar (1:3):-				
	PAGE TOTAL CARRIED TO BILL COLLECTION PAGE				

5.1-U121	200 mm Walling	m^2	12		
	Damp-Proof Course:				
	Bituminous Felt Damp-Proof Course as Described:-				
5.1-W239	200mm Wide under walls	m	18		
	SUPERSTRUCTURE				
	CONCRETE, FORMWORK, REINFORCEMENT				
	Provision of concrete				
5.1-F142.1	Designed concrete class 20/25	m^3	35		
	Placing of concrete				
5.1-F75*	Columns, beams, walls and stairs	m^3	10		
5.1-F7**	Base slabs , walls, and supports to tanks, channels, and dosers	m^3	14		
5.1-F732	suspended floor and landing slabs	m^3	5		
5.1-F749	Construct dosing pipes channel and overflow/scour channel at a slope, internal size 200mm wide x 150mm deep on concrete floor slab including forming rebate 55mm wide x 55mm deep to top inner edges of channel walls to receive precast concrete cover.	m^3	6		
	Formwork				
	Provide and Fix Shuttering Including Propping, Strutting and Striking, all as Specified				
	Sawn Formwork - Class F1 Finish:-				
5.1-G315	Horizontal soffits of suspended floor and landing slabs	m^2	26		
5.1-G343	Edges of slabs of steps not exceeding 300mm wide	m	53		
5.1-G823	Raking open string edge of staircase not exceeding 325mm (extreme) high including cutting bottom edge to profile of treads and risers	m	12		
	Wrot Formwork - Class F3 Finish:-				
5.1-G345	Vertical sides of tanks, doser and channel walls	m^2	35		
5.1-G315	Horizontal soffits of suspended tank slabs and partitions	m^2	3		
5.1-G343	Vertical sides of walls 300mm thick	m^2	31		
5.1-G343	Vertical sides of columns	m^2	41		
5.1-G343	Sides and soffits of beams	m^2	65		
5.1-G345	Sloping soffits of staircases	m^2	10		
5.1-G343	Edges of beds and risers of steps not exceeding 300mm wide	m	46		
	Concrete Surface Finish				
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5.1-W449	Provide all materials and lay cement screed (1:3) to required falls as directed (average 50mm thick) in chemical mixing tanks.	m^2	6		
	Reinforcement				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²				
5.1-G522	Diameter: 8mm	Kg	170		
5.1-G523	Diameter: 10mm	Kg	330		
5.1-G524	Diameter: 12mm	Kg	1,000		
5.1-G525	Diameter: 16mm	Kg	1,230		
	Precast Reinforced Concrete Lintel, in concrete class 20/25 ,200mm deep reinforced with 4 No. 10mm Diameter Mild Steel Bars and 8mm Diameter Mild Steel Links at 200mm Centers, Finished Smooth on all Exposed Surfaces, including all Moulds and Formwork, Hoisting, Bedding and Flush Pointing in Cement and Sand Mortar (1:3) :-				
5.1-H113	Lintel 200mm wide x 3900mm long	Nr	2		
	Fixing Chemical Dosing Pipes				
5.1-Z519	Provide all materials and anchor the chemical dosing pipes to Chemical Dosing Channel wall.	Item	L.S		
	WALLING				
	External Walls				
	Selected Machine Dressed Natural Stone Block Walling, reinforced with 20 swg Hoop Iron at Every Alternate Course, and Bedded, Jointed and Pointed in Cement Mortar (1:3):-				
5.1-U121	200mm thick walling	m^2	36		
	Labours				
5.1-U178	Fair raking and cutting walls externally	m^2	36		
	Precast Concrete Cills				
5.1-H810	200mm Thick x 275mm wide precast concrete cill bedded, jointed and pointed in cement mortar on top of 200mm wall	m	4		
	ROOF COVERINGS				
	Gauge 28 pre-painted IT5 approved roofing sheets, colour to approval of the Engineer				
5.1-W321	Roof covering;150mm laps on one end and one and a half corrugation side lap; and nailing to 75X50mm celcured sawn cypress purlins	m^2	40		
	PAGE TOTAL CARRIED TO BILL COLLECTION PAGE				

	Accessories, fixing as necessary to roof sheets				
5.1-W327	Ridge cap	LM	14		
	CARPENTRY AND JOINERY				
	Carpentry				
	Roof Trusses				
	Double Pitch Roof Truss With 600mm Eaves Projection, in 150 x 50mm Rafters, Ceiling Joists, Struts and Ties in Sawn Cypress Grade II Seasoned and Pressure Impregnated with Wood Preservative and Timber Joints with Bolted and Nailed Connections to the Engineer's Approval:-				
5.1-Z118	Equal scissor truss 4500mm clear span and 1000mm high	Nr	3		
	Other Roof Members				
	Sawn Cypress Grade II Maximum Moisture Content 12% Seasoned and Pressure Impregnated with Wood Preservative and Timber Joints with Bolted and Nailed Connections to the Engineer's Approval: -				
5.1-O214.1	150 x 50mm Intermediate, hip and valley rafters	m	60		
5.1-O214.2	150 x 75mm Purlins	m	34		
5.1-O214.3	180 x 50mm Ridge board	m	10		
5.1-O214.4	100 x 50mm Wall plate tied to wall with 20 s.w.g. hoop iron at 900mm centers and bedded in cement mortar (1:4) on top of wall	m	19		
	Joinery				
	General Timbers				
	Wrot Prime Grade Cypress, Including Finishing With Three Coats First Quality Gloss Paint :-				
5.1-O224	250 x 50mm Fascia board	m	25		
	METALWORK				
	Steel Doors				
	Pressed Metal Louvre Doors				
	Supply and fix the following Pressed Metal Louvre Doors with 100 x 50mm Stiles and Top Rails, 150 x 50mm Middle and Bottom Rails with Pressed Metal Infill Louvres and 100 x 50mm Pressed Metal Frames, Including Hinges, Pad Bolts and Tower Bolts, all to Manufacturer's Details, With Three Coats Gloss Paint Complete with Opening Accessories Including Bedding and Pointing Around Frames in Cement Mortar:-				
5.1-Z323	Double door size 1800 x 2400 mm high in two equal panels (D2)	Nr	1		
	uPVC Casement Windows				
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	Supply and Fix the Following Standard Section uPVC Casement Windows, including 4mm Thick Clear Sheet Glass Glazed to Steel Casements with Putty, Complete with Opening Accessories, Including Building in Lugs to Jambs and Head and Water-Proofing and Filling Around Opening with Approved Compound;	-			
5.1-Z331	Window size 1597 x 597mm high with 1 No. fixed and 2 No. top hung panels opening outwards (W5b)	Nr	2		
	Burglar Proofing to Windows	-			
	Provide and fix burglar proofing made from 12mm x 12mm M.S. square bars at 150mm vertically and 200mm centers horizontally and fixed internally to wall with 12mm M.S. Fish tail lugs at 600mm centers painted with one coat primer and 3 coats gloss paint, to the following windows:	-			
5.1-M479	To windows size 1597 x 597mm (W5b)	Nr	2		
	Balustrades and Railings				
	Balustrade Unit 1000mm High comprising 32mm Diameter Galvanized Pipe Top, Middle and Bottom Rails and 40mm Diameter Galvanized Pipe Balusters Spaced at Maximum 1500mm Centers and Bottom End Bent, Fanged and Built into Mortice in Concrete, Painted with undercoat and Approved Epoxy Paint:-				
5.1-N149.1	Raking balustrade	m	6		
5.1-N149.2	Level railing unit	m	14		
	Angles To Risers and Treads				
5.1-N161	40 x 40 x 3mm Thick mild steel angle fixed with fish-tailed lugs to junction of treads and risers and bedded in concrete	m	41		
	RENDERING				
	12.5mm Thick Cement and Sand Render as Described Externally on :-				
5.1-Z443	Blockwork and concrete surfaces	m^2	95		
	PLASTERING				
	12.5mm Thick Gauged Cement Plaster as Described Internally on :-				
5.1-Z413	Blockwork and concrete surfaces	m^2	55		
5.1-Z412	Sloping concrete surfaces	m^2	10		
	Screeds and backing				
	Bonded Cement and Sand (1:4) Screed Bed or Backing in One Coat, Well Bonded to Concrete or Blockwork Base as Described: -				
5.1-Z411	38mm thick screed laid level to receive porcelain or ceramic floor tiling (measured separately)	m^2	22		
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	Bonded Cement and Sand (1:4) Screed Bed in One Coat with Approved Hardener Incorporated in the Mix, well Bonded to Concrete Base as Described: -				
5.1-Z411	40mm thick paving with wood float finish on concrete	m^2	4		
5.1-Z411	38mm thick screed laid level to receive epoxy lining (measured separately)	m^2	20		
5.1-Z416	150 x 20mm thick skirting with hardener laid with a square top edge and coved junction with floor finish	m	16		
	Bonded Cement and Sand (1:5) Screed Bed in One Coat with Approved Colour Incorporated in the Mix, Well Bonded to Concrete Base as Described: -				
5.1-Z416	19mm thick paving to risers of steps	m	40		
5.1-G899.3	25mm thick paving to treads of steps 250mm wide	m	40		
	Floor Tiling				
	Acid-Proof Granito Floor Tiles Laid with Straight Joints Both Ways:-				
5.1-Z421	Floor tiles laid to floors, treads, risers or as skirting on screed or backing (measured separately)	m^2	40		
	Epoxy Floor and Wall Paint as 'Master seal 180' or Approved Equivalent Applied Strictly in Accordance with the Manufacturer's Printed Instruction including Primer, etc.: -				
5.1-V739.1	Paint to floors	m^2	20		
5.1-V739.2	Paint to mixing tank walls, partitions and on skirting and upstands	m^2	45		
	Precast Concrete Paving Slabs				
5.1-H511	Slabs size 600 x 600 x 50mm Thick laid on and including 50mm thick bed of sand and jointing and pointing in cement mortar	m^2	20		
	CEILING				
	12mm thick approved Plasterboard in sheets size 2400mm x 1200mm fixed to and including 50mm x 50mm sawn cypress Grade 2 battens at 600mm centers in both directions complete with gauge jointing material				
5.1-Z453	Ceiling laid to slope not exceeding 15 degrees fixed to underside of trusses	m^2	35		
	PAINTING AND DECORATING				
	Prepare and Apply Three Coats Exterior Quality Plastic Emulsion Paint: - Vinyl silk				
	Externally on: -				
5.1-V539	Fair-faced concrete surfaces	m^2	95		
	Prepare and Apply Three Coats Interior Quality Plastic Emulsion Paint: - Vinyl silk				
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	Internally on: -				
5.1-V559	Plastered blockwork and concrete surfaces	m^2	55		
5.1-V531	Plastered sloping concrete surfaces	m^2	10		
	Prepare and Apply 3 Coats Washable Distemper to: -				
5.1-V564	Sloping surfaces of suspended plasterboard ceiling	m^2	35		
	CHEMICAL MIXING & DOSING EQUIPMENT				
	Note: All technical details including type, material, specification, etc. to be submitted with Tender for all chemical mixing equipment and pipework. Non-submission of above requirement will result in equipment to be supplied to approval of the Engineer and the cost quoted will deem to include the required approved materials and equipment				
5.1-N299	Provide and place 6mm stainless steel chemical dissolving tray for alum as per details	Nr	2		
5.1-N299	Provide and place 6mm stainless steel chemical dissolving tray for soda ash as per details	Nr	1		
	Ranges for Chemical Mixing Tanks in Chemical Mixing Building				
	Supply all equipment to site, store, install, commission and maintain the following ranges and equipment, including all nuts, bolts, washers, packing etc.				
5.1-NI11	Three ranges complete of 25mm dia. uPVC pipework for water supply to chemical mixing tanks including for making connection to domestic water supply main as per details	Item	L.S		
5.1-N5I1	Three ranges complete of 38mm diameter uPVC pipes and fittings for outlet from chemical mixing tanks to solution feed dosers as per details	Item	L.S		
5.1-N5I1	Three ranges complete of 80mm diameter uPVC pipes and fittings for overflow and for washout to chemical mixing tanks as per details. Include for all anchoring and supporting of all pipework and fittings.	Item	L.S		
5.1-N5I1	Three ranges of pipework of 25mm diameter uPVC Pipes and fittings from dosers to Chemical Dosing Point at Chemical Dosing and Mixing Channel.	Item	L.S		
5.1-Z529	Provide and fix gravity solution feed dosers of capacity up to 400l/hr., complete with all accessories for alum dosing.	Nr	2		
5.1-Z529	-Ditto - but for gravity solution feed dosers of capacity up to 400l/hr., complete with all accessories for soda ash dosing.	Nr	1		
5.1-N299	Provide all materials, fabricate and fix mechanized stirrer to chemical mixing tanks as per details	Nr	3		
	MISCELLANEOUS				
5.1-H511	Provide and fix precast concrete cover slabs over chemical dosing pipe channel and scour/overflow channel, size 400mm x 290mm x 50mm thick, each slab coated with 3 layers of approved epoxy lining	Nr	20		
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BILL No. 5.1

CHEMICAL MIXING & DOSING BUILDING

	Amount (Ksh.)
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Bill Total	

BILL No. 5.2

STILLING WELL, CHEMICAL DOSING CHANNEL & FLOCCULATION BASIN

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE Ksh	AMOUNT Ksh.
	STILLING WELL				
5.2	**Excavation**				
	The rates shall include for all strutting, shuttering, stabilizing the excavation faces and keeping the excavation free of water by pumping, bailing or other means				
	Excavate for foundations, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer				
5.2-E354.1	Foundations and bases of isolated piers 1 - 2 meters deep	m^3	15		
5.2-E633	Transport approved excavated material from site and use as fill and compact in 200mm layers as specified on site as and when directed by the Engineer. Compaction tests to be done and rates to include for this.	m^3	12		
5.2-E615	Provide imported approved fill material and compact in layers of 200mm as specified on site and when directed by the Engineer. Compaction tests to be done and rates to include for this	m^3	9.5		
5.2-E617	Provide approved hardcore material and compact in layers of 200mm, blinded with final material 25mm thick	m^3	2		
5.2-E354.2	Extra over excavation item for excavation in rock Class 'A' blasting not permitted (Provisional)	m^3	2		
	-Ditto - for excavation in rock Class 'B'	m^3	7		
	-Ditto - for excavation in rock Class 'C'	m^3	10		
	Concrete Works				
	Provision of concrete				
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5.2-F122	Designed concrete class 12/15	m^3	5		
5.2-F142	Designed concrete C20/25	m^3	12.5		
	Placing of concrete				
5.2-F611	Mass concrete class 12/15 in 75mm blinding under bases of column footings	m^3	5		
5.2-F72*.1	Columns & column footings	m^3	3		
5.2-F742.1	Walls - 200mm thick walls	m^3	7		
5.2-F742.2	150mm thick baffle wall	m^3	1		
5.2-F72*.2	Base Slab	m^3	1.5		
	Reinforcement				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²:				
5.2-G522	Diameter: 8mm	Kg	80		
5.2-G524	Diameter: 12mm	Kg	1,000		
5.2-G525	Diameter: 16mm	Kg	270		
	Formwork				
	Provide and fix shuttering including propping, strutting and striking all as specified				
	(i) Vertical Formwork - Class F1 Finish				
5.2-G342.1	Sides of 200mm Base Slabs	m	18		
5.2-G343.1	Outer faces of Stilling Well Walls - width 2.8 m - 3.5 m	m^2	65		
	(ii) Vertical Formwork - Class F3 Finish				
5.2-G341	Sides of Walls - width n.e. 0.1m kicker	m	10		
5.2-G343.2	Inner faces of Stilling Well Walls - width 2.8 m - 3.5 m	m^2	52		
5.2-G342.2	Sides of baffle wall 150mm thick	m^2	7		
	(iii) Horizontal Formwork - Class F3 Finish				
5.2-G312	Soffit of baffle wall in stilling well, width 0.15m	m	2		
	Other Formwork				
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5.2-G294	Boxing out 450mm x 450mm holes in concrete walls of stilling well and making good after installation of pipework	Nr	2		
5.2-G292	-Ditto - but 200mm x 200mm holes in base slab for scour pipe	Nr	1		
	Concrete Surface Finish				
5.2-G812	Provide Class UF3 Finish for top of base slab of stilling well	m^2	5		
	Construction Joints				
	Provide and install the following water stops in construction joints including all surface treatment, formwork, forming of rebate 20mm x 20mm and sealing of rebate with polysulphide sealant all as per Drawings and Specifications.				
5.2-G652	200mm wide expandite super-cast water foil PVC or similar approved water stop in construction joints in walls.	m	15		
	Metal Work				
	All steel work to be completely cleaned by acid dipping prior to galvanizing				
5.2-G832	Provide and fix step irons in stilling well	Nr	12		
	Leak Proof Testing				
5.2-A260	Allow for leak proof testing of Stilling Well as specified	Item	L.S		
	Pipework Fittings & Valves				
	Supply, Transport to Site and Store in Secure Place Including Jointing Material, Bolts, Gaskets, Packing, Jointing Glue, etc., As Applicable				
	Raw Water Gravity Main Inlet Pipework - Approved cement lined internally and epoxy coated externally steel pipes PN 16				
5.2-J313.1	450mm dia. single flanged 90^0 bends (Mark A)	Nr	1		
5.2-J393.1	450mm dia. double flanged pipe, length 400mm with puddle flange at 200mm from one end (Mark B)	Nr	1		
5.2-J313.2	450mm dia. all flanged 90^0 bends (Mark C)	Nr	2		
5.2-J393.2	450mm dia. flanged spigot pipe, length 3000mm (cut to suit on site) (Mark D)	Nr	1		
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5.2-J353.1	450mm dia. flange adaptor (Mark E)	Nr	1		
5.2-J393.3	450mm dia. flanged spigot pipe, length 1200mm (Mark F)	Nr	1		
5.2-J393.4	450mm dia. coupling (Mark G)	Nr	1		
	Scour Pipework - Approved cement lined internally and epoxy coated externally steel pipes PN 16				
5.2-J391.1	100mm dia. Flanged spigot pipe with bell mouth and puddle flange 100mm from flanged end (Mark i)	Nr	1		
5.2-J391.2	100mm dia. flanged spigot pipe, length 1200mm (Mark ii)	Nr	1		
5.2-J351.1	100mm dia. flange adaptor (Mark iii)	Nr	2		
5.2-J811.1	100mm dia. double flanged gate valve with extension spindle 1200mm long and handwheel (Mark v)	Nr	1		
5.2-J311.1	100mm dia. double flanged 90^0 bend (Mark iv)	Nr	1		
5.2-J391.3	100mm dia. flanged spigot pipe, length 2450mm (Mark vi)	Nr	1		
5.2-J311.2	100mm dia. single flanged 90^0 bend (Mark vii)	Nr	1		
	Transport From Site Store, Install, Test & Commission Raw Water Gravity Main Inlet Pipework - Approved cement lined internally and epoxy coated externally steel pipes PN 16				
5.2-J313.3	450mm dia. single flanged 90^0 bends (Mark A)	Nr	1		
5.2-J393.5	450mm dia. double flanged pipe, length 400mm with puddle flange at 200mm from one end (Mark B)	Nr	1		
5.2-J313.4	450mm dia. all flanged 90^0 bends (Mark C)	Nr	2		
5.2-J393.6	450mm dia. flanged spigot pipe, length 3000mm (cut to suit on site) (Mark D)	Nr	1		
5.2-J353.2	450mm dia. flange adaptor (Mark E)	Nr	1		
5.2-J393.7	450mm dia. flanged spigot pipe, length 1200mm (Mark F)	Nr	1		
5.2-J393.8	450mm dia. coupling (Mark G)	Nr	1		
	Scour Pipework - Approved cement lined internally and epoxy coated externally steel pipes PN 16				
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5.2-J391.3	100mm dia. Flanged spigot pipe with bell mouth and puddle flange 100mm from flanged end (Mark i)	Nr	1		
5.2-J391.4	100mm dia. flanged spigot pipe, length 1200mm (Mark ii)	Nr	2		
5.2-J351.2	100mm dia. flange adaptor (Mark iii)	Nr	2		
5.2-J811.2	100mm dia. double flanged gate valve with extension spindle 1200mm long and handwheel (Markv)	Nr	1		
5.2-J311.3	100mm dia. single flanged 90^0 bend (Mark iv)	Nr	1		
5.2-J391.5	100mm dia. flanged spigot pipe, length 2450mm (Mark vi)	Nr	1		
5.2-J311.4	100mm dia. single flanged 90^0 bend (Mark vii)	Nr	1		
	CHEMICAL DOSING CHANNEL				
	Excavation (Provisional)				
	The rates shall include for all strutting, shuttering, stabilizing the excavation faces and keeping the excavation free of water by pumping, bailing or other means				
	Excavate for foundations, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer				
5.2-E323	Maximum depth 0.5-1m	m^3	10		
5.2-E511	Transport approved excavated material from site and use as fill and compact in 200mm layers as specified on site as and when directed by the Engineer. Compaction tests to be done and rates to include for this.	m^3	5		
5.2-E615	Provide imported approved fill material and compact in layers of 200mm as specified on site and when directed by the Engineer. Compaction tests to be done and rates to include for this	m^3	5		
	Concrete Works				
	Provision of concrete				
5.2-F122	Designed concrete class 12/15	m^3	2.7		
5.2-F142	Designed concrete class 20/25	m^3	30		
	Placing of concrete				
5.2-F611	Mass concrete class 12/15 in 75mm blinding under bases of dosing channel				
5.2-F72*	Bases of dosing channel	m^3	8		
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5.2-F74*	Walls	m^3	22		
	Reinforcement				
	Deformed high yield ribbed bars rēinforcement to BS 4449:1997 with yield strength of 460N/mm²				
5.2-G523	Diameter: 10mm	Kg	800		
5.2-G524	Diameter: 12mm	Kg	1,200		
	Formwork				
	Provide and fix shuttering including propping, strutting and striking all as specified				
	(i) Vertical Formwork - Class F1 Finish				
5.2-G343	Sides of columns, width 300mm	m	60		
5.2-G342	Sides of 200mm thick base	m	30		
5.2-G345	Outer faces of dosing channel wall - width n.e. 1.5m	m^2	90		
	(ii) Vertical Formwork - Class F3 Finish				
5.2-G341	Sides of walls, width 0.1m (100mm kicker)	m	30		
5.2-G345	Inner faces of dosing channel walls - width n.e. 1.5 m	m^2	90		
	(iii) Horizontal Formwork - Class F1 Finish				
5.2-G319	Soffit of base slabs	m^2	6		
	Precast Concrete Slabs				
	Precast concrete Class 20/25 finished fair on all surfaces and reinforced as shown on drawings. Provide and fix:				
5.2-H512	75mm thick cover slabs size 1150mm long x 500mm wide including 2 Nr. mild steel key holes cast with slab constructed as per details for Chemical Dosing channel.	Nr	60		
	Concrete Surface Finish				
5.2-G812	Provide Class UF3 Finish for top of base slab of channel	m^2	35		
	Construction Joints - Water Bar				
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	Provide and install the following water stops in construction joints including all surface treatment, formwork, forming of rebate 20mm x 20mm and sealing of rebate with polysulphide sealant all as per Drawings and Specifications.				
5.2-G652	200mm wide expandite super-cast water foil PVC or similar approved water stop in vertical construction joints in walls	m	40		
	Measuring Gauge, Weir & Flow Meter				
5.2-N290.1	Supply & fix Measuring Gauge as per details	Nr	1		
5.2-N290.2	Supply & fix thin plate measuring weir as per details	Nr	1		
5.2-N290.3	Supply, install, test and commission ultrasonic flow meter to measure and record flow in raw water open channel capable of measuring a flow rate of up to 450m^3/hr. The instrument should be complete with measurement of instantaneous flow and totalized flow. The cost should include for fixing brackets, battery backup, sensors / integrator, cables, flow connector and calibration.	Nr	1		
5.2-N290.4	Supply, install, test and commission remote indicator located in the Operator's Office Building of instantaneous flow and total flows from the raw water flow meter. Include for control cables, ducting, trenching for installation of remote indicators. Maximum length 20m from meter to remote location of indicator.	Nr	1		
	Metal Works				
	All steelwork to be completely cleaned by acid dipping prior to galvanizing.				
5.2-N140	Provide and fix 900 mm high level balustrades of 40 mm diameter CHS pipe tubing Class 'B' throughout consisting of handrail and parallel middle rail 450mm below the handrail with balusters at maximum 1500 mm centers, all as detailed	m	70		
5.2-N420	Supply and erect a Galvanized Mild Steel staircase (Dwg No: M/W/S/SD/14) for access from finished ground level to chemical dosing channel to the approval of the Engineer (Contractor to submit Shop Drawings form a reputable steel fabricator for approval prior to delivery and erection of staircase).	No.	1		
	Painting and Decorating				
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	Provide, prepare and apply one coat mordant solution, one undercoat and two coats gloss enamel paint on galvanized metal work externally on:				
5.2-V116	Hand-rail pipe and fittings including 900 mm high level balustrades	m	70		
	Galvanized Mild Steel Ladder				
	Rates to include for Supply and fixing of all Fittings Inclusive of Foundations and painting with one coat mordant solution, one undercoat and two coats gloss enamel paint				
5.2-N130	Provide all material and construct a mild steel external ladder, inclined length not exceeding 4.0m on L-Section braced columns consisting of chequered plate treads and landing welded on stringers and tubular handrails on L-Section posts **Note**: **Details shown on the drawing are only indicative. Contractor to submit to the Engineer for approval, detailed design calculations and workshop drawings of all steel work from an approved and reputable structural steel fabricator prior to fabrication.**	Item	L.S		
	FLOCCULATION BASIN: -				
	EXCAVATION				
	The rates shall include for all strutting, shuttering, stabilizing the excavation faces and keeping the excavation free of water by pumping, bailing or other means				
	Excavate below stripped level to formation level in common material, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer.				
5.2-E323	Maximum depth :0.5-1.0 m	m^3	50		
5.2-E324	-Ditto-but depth 1.0m to 2.0m	m^3	60		
5.2-E334.1	Extra over Items 5.2-E323 to 5.2-E324 for excavation in rock Class 'A', blasting not permitted (Provisional)	m^3	100		
5.2-E334.2	-Ditto- for excavation in rock Class 'B', blasting not permitted (Provisional)	m^3	130		
5.2-E334.3	-Ditto- for excavation in rock Class 'C', blasting not permitted (Provisional)	m^3	450		
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5.2-E534	Transport approved excavated material from site and use as fill and compact in 200mm layers as specified on site as and when directed by the Engineer. Compaction tests to be done and rates to include for this	m^3	300		
5.2-E615	Provide imported approved fill material and compact in layers of 200mm as specified on site and when directed by the Engineer. Compaction tests to be done and rates to include for this.	m^3	30		
5.2-E617	Provide approved hardcore material and compact in layers of 200mm, blinded with final material 25mm thick	m^3	230		
	CONCRETE WORKS				
	Provision of concrete				
5.2-F122	Designed concrete Class 12/15	m^3	56		
5.2-F142	Designed concrete class 20/25	m^3	363		
	Placing of concrete				
5.2-F611	Mass concrete Class 12/15 in 75mm blinding layer under base slab of Flocculation Basin and under bases of columns.	m^3	56		
5.2-F72*.1	Base Slab - flocculation basin	m^3	150		
5.2-F72*.2	Base Slab - flocculated water channel	m^3	1		
5.2-F74*.1	Walls - external - flocculation basin	m^3	30		
5.2-F74*.2	Walls - internal - flocculation basin	m^3	180		
5.2-F74*.3	Walls - flocculated water channel	m^3	1.5		
5.2-W441	Cement screed laid to slope thickness varying from 0 to 50mm (mix 1:3) for top of base slab of flocculation chamber	m^2	730		
	REINFORCEMENT				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²				
5.1-G522	Diameter: 8mm	Kg	4,800		
5.1-G523	Diameter: 10mm	Kg	3,800		
5.1-G524	Diameter: 12mm	Kg	15,700		
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	FORMWORK				
	Provide and fix shuttering including propping, strutting and striking all as specified				
	(I) Vertical Formwork - Class F1 Finish				
5.2-G343	Sides of 300mm thick Base Slab	m	100		
5.2-G345.1	Outer sides of walls of flocculated water channel, width n.e. 1.5m	m^2	45		
5.2-G345.2	Outer sides of walls, width n.e. 2.5m - flocculation basin	m^2	150		
	(ii) Vertical Formwork - Class F3 Finish				
5.2-G341	Sides of walls, width n.e. 0.1m kicker - flocculation basin	m	150		
5.2-G345	Inner Sides of walls, width n.e. 3.0m - flocculation basin	m^2	740		
5.2-G344	Inner sides of baffle walls - flocculated water channel, width n.e. 1.2m	m^2	1800		
	(iii) Horizontal Formwork - Class F1 Finish				
5.2-G371	Box out for 300mm x 300mm square opening as detailed (inlet orifice)	Nr	5		
5.2-G371	-Ditto - but for 300mm dia. pipe in 200mm wall of flocculation chamber (outlet orifice)	Nr	5		
5.2-G371	-Ditto - but for 150mm dia. pipe with puddle flange in 200mm base slab of flocculation basin	Nr	5		
	CONCRETE SURFACE FINISH				
5.2-G812	Provide Class UF3 Finish for top of base slab of flocculation basin	m^2	740		
5.2-G812	Provide Class UF3 finish for top of base slab of flocculated water channel	m^2	80		
	CONSTRUCTION JOINTS				
	Provide and install the following water stops in construction joints including all surface treatment, formwork, forming of rebate and sealing of rebate with polysulphide sealant all as per Drawings and Specification.				
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5.2-G652	200mm wide expandite super-cast water foil PVC or similar approved water stop in construction joints in walls (Provisional)	m	130		
	LEAK PROOF TESTING				
5.2-A269	Allow for leak proof testing of Flocculation Basin & flocculated water channel as specified	Item	L.S		
	PIPEWORK, FITTINGS & VALVES				
	Supply Transport to Site and Store in Secure Place				
	including Jointing Material, Bolts Gaskets, Packing, Jointing Glues, etc. as Applicable				
5.2-J882	300mm x 300mm square opening penstock non-rising stem type with extended spindle & head stock (Ham baker or approved equivalent)	Nr	10		
	Scour Approved Epoxy coated steel pipes PN 16				
5.2-J392	150mm dia. flanged spigot pipe, length 225mm with puddle flange at 100mm from spigot end (Mark a)	Nr	5		
5.2-J312	150mm dia. all flanged 90° bend (Mark b)	Nr	5		
5.2-J392.1	150mm dia. double flanged pipe, length 2150mm to (Mark c)	Nr	3		
5.2-J392.2	150mm dia. double flanged pipe, length 6000mm to (Mark c)	Nr	12		
5.2-J392.3	150mm dia. double flanged pipe, length 460mm (Mark d)	Nr	5		
5.2-J332	150mm x 100mm dia. all flanged concentric taper (Mark e)	Nr	5		
5.2-J391.1	150mm x 150mm x 100mm dia. all flanged radial tee (Mark f)	Nr	5		
5.2-J391.2	150mm x 150mm x 100mm dia. all flanged tee (Mark g)	Nr	5		
5.2-J392	150mm dia. flanged spigot pipe, length 700mm (Mark h)	Nr	5		
5.2-J352	150mm dia. flange adaptor (Mark i)	Nr	5		
5.2-J811	150mm dia. all flanged gate valve, Euro 20 Series, type 23 (short face to face type valves) or approved equivalent with 1200mm long extended operating spindle (Mark j)	Nr	5		
5.2-J311	150mm dia. single flanged 90^0 bends (Mark k)	Nr	5		
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	Transport From Site Store, Install, Test and Commission				
5.2-J882	300mm x 300mm square opening penstock non-rising stem type with extended spindle & head stock (Ham baker or approved equivalent)	Nr	10		
	Scour Approved Epoxy coated steel pipes PN 16				
5.2-J391	100mm dia. flanged spigot pipe, length 225mm with puddle flange at 100mm from spigot end (Mark a)	Nr	5		
5.2-J311	100mm dia. all flanged 90° bend (Mark b)	Nr	5		
5.2-J311.1	100mm dia. double flanged pipe, length 2150mm (Mark c)	Nr	5		
5.2-J311.2	100mm dia. double flanged pipe, length 6000mm (Mark c)	Nr	12		
5.2-J311.3	100mm dia. double flanged pipe, length 460mm (Mark d)	Nr	5		
5.2-J339	150mm x 100mm dia. all flanged concentric taper (Mark e)	Nr	5		
5.2-J391.1	150mm x 150mm x 100mm dia. all flanged radial tee (Mark f)	Nr	5		
5.2-J391.2	150mm x 150mm x 100mm dia. all flanged tee (Mark g)	Nr	5		
5.2-J391	150mm dia. flanged spigot pipe, length 700mm (Mark h)	Nr	5		
5.2-J351	150mm dia. flange adaptor (Mark i)	Nr	5		
5.2-J811	150mm dia. all flanged gate valve, Euro 20 Series, type 23 (short face to face type valves) or approved equivalent with 1200mm long extended operating spindle (Mark j)	Nr	5		
5.2-J311	150mm dia. single flanged 90^0 bends (Mark k)	Nr	5		
	Metal Works				
	All steelwork to be completely cleaned by acid dipping prior to galvanizing.				
5.2-N140	Provide and fix 900 mm high level balustrades of 40 mm diameter tubing Class 'B' throughout consisting of handrail and parallel middle rail 450mm below the handrail with balusters at maximum 1500 mm centers, all as detailed	m	300		
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	Painting and Decorating				
	Provide, prepare and apply one coat mordant solution, one undercoat and two coats gloss enamel paint on galvanized metal work externally on:				
5.2-V316	Hand-rail pipe and fittings including 900 mm high level balustrades	m	300		
	MISCELLANEOUS ITEMS				
5.2-V380	Allow for painting of exposed sections of Raw Water Gravity Main with 3 coats of approved oil gloss paint. Colour codes to be advised by the Engineer.	Item	L.S		
5.2-V731	Provide and apply 3 coats of approved epoxy paint on one coat of epoxy primer to internal concrete surfaces of flocculation basin and chemical dosing channel, beyond chemical dosing point ('Master seal 180' as made by BASF or approved equivalent).	m^2	1200		
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BILL No. 5.2

STILLING WELL, CHEMICAL DOSING CHANNEL & FLOCCULATION BASIN

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BILL No. 5.3

SEDIMENTATION TANKS - 4Nr

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (Ksh)	AMOUNT (Ksh)
	EXCAVATION				
	The rates shall include for all strutting, shuttering, stabilizing the excavation faces, and keeping the excavation free of water by pumping, bailing or other means.				
	Bulk excavations and top soil stripping for all structures are measured under Bill No.3.13 (Site & Ancillary Works).				
	Excavate below stripped level to formation level in common material, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer.				
5.3-E323	depth n.e. 0.5-1.0 m	m^3	100		
5.3-E324	Ditto- but maximum depth 1.0 m to 2.0 m	m^3	200		
5.3-E512	Trimming surface for blinding layer of concrete sloping 3^0 (5%) to horizontal	m^2	100		
5.3-E512	-Ditto- 10^o (18%) to horizontal	m^2	90		
5.3-E569	Excavate trench for 300 mm dia. pipes in common material, trimming sides and preparing trench bottoms, backfill with approved hardcore and compact after laying of pipework depth n.e. 1.2 m. Note: Sections under Sedimentation Tank base slab shall be backfilled with Class 20/20 mass concrete surround, measured under Concrete Works.	m	30		
5.3-E633	Transport approved excavated material from site and use as fill and compact in 200 mm layers as specified on site as and where directed by the Engineer. Compaction tests to be done and rates to include for this.	m^3	300		
5.3-E335	Extra over Items 5.1.E323 to 5.1.E569 for excavation in rock Class 'A', blasting not permitted (Provisional)	m^3	200		
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5.3-E335	-Ditto- for excavation in rock Class 'B', blasting not permitted (Provisional)	m^3	200		
5.3-E335	-Ditto- for excavation in rock Class 'C', blasting not permitted (Provisional)	m^3	1000		
	CONCRETE WORKS				
	Provide, mix and place concrete as directed				
	Provision of Concrete				
5.3-F122	Designed concrete Class 12/15 in 75 mm blinding layer under base slab of sedimentation tanks	m^3	47		
5.3-F132	Designed concrete C16/20	m^3	35		
5.3-F142	Designed concrete Class 20/25	m^3	502		
	Placing of Concrete				
5.3-F611	Mass concrete Class 12/15 for 75 mm thick blinding layer under base slab of sedimentation tanks	m^3	47		
5.3-F689	Mass designed concrete Class 16/20 for surround to 300 mm dia. sludge removal pipes	m^3	35		
5.3-F721.1	Reinforced designed Concrete C20/25 for Base Slab – Sump	m^3	3.00		
5.3-F7**.1	Reinforced Concrete C20/25 for Sloping Slab - (2.5%) to horizontal	m^3	60		
5.3-F7**.2	Reinforced Concrete C20/25 for Sloping Slab - (2.5%) to horizontal	m^3	100		
5.3-721.2	Reinforced Concrete C20/25 for Base Slab Flocculated Water Channel	m^3	8		
5.3-F721.3	Reinforced Concrete C20/25 for Base Slab-Sedimentation Tank Inlet Channel	m^3	9		
5.3-F721.4	Reinforced Concrete C20/25 for Base slab - settled water channel	m^3	9.0		
5.3-F74*.1	Reinforced Concrete C20/25 for Walls - sludge collection sump	m^3	1.0		
5.3-F74*.2	Reinforced Concrete C20/25 for Walls - Sedimentation Tanks	m^3	220		
5.3-F74*.3	Reinforced Concrete C20/25 for Walls - Flocculated Water Channel	m^3	9		
5.3-F74*.4	Reinforced Concrete C20/25 for Walls - Sedimentation Tank Inlet Channel	m^3	9.6		
5.3-F74*.5	Reinforced Concrete C20/25 for Walls - settled water channel	m^3	6.3		
5.3-F76*	Reinforced Concrete C20/25 for Tie Beams	m^3	12		
5.3-F73*.1	Reinforced Concrete C20/25 for Walkways	m^3	20		
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5.3-F173*.2	Cantilever platforms for Headstocks	m^3	0.45		
	REINFORCEMENT				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²				
	Reinforcement, all diameters				
5.3-G523	Diameter 10mm	Kg	16000		
5.3-G524	Diameter 12mm	Kg	19000		
	FORMWORK				
	Provide and fix shuttering including propping, strutting and striking all as specified				
	(i) Vertical Formwork - Class F1 Finish				
5.3-G343	Sides of 300 mm Base Slab - Sedimentation Tanks	m	180		
5.3-G343	Sides of 200 mm Base Slab - Flocculated Water Channel	m	60		
5.3-G341	Surfaces of walls, width 0.1m kicker	m	310		
5.3-G345	Outer sides of sedimentation tank, walls width n.e. 3.8m	m^2	360		
	(ii) Vertical Formwork - Class F2 Finish				
5.3-G345	Sedimentation Tank wall at expansion joints interface, width 1.4m	m^2	45		
	(iii) Vertical Formwork - Class F3 Finish				
5.3-G342	Sides of walkways width n.e. 0.2 m	m	315		
5.3-G344	Sides of tie beams, width n.e. 0.5 m	m^2	54		
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5.3-G349	Sides of Walls - Flocculated Water Channel, width 0.9 m to 1.3 m	m^2	120		
5.3-G344	Sides of Walls - Sedimentation Tank Inlet Channel, width n.e. 1.1m	m^2	96		
5.3-G345	Inner sides of sedimentation tank walls width n.e. 3.6m	m^2	375		
	(iv) Horizontal Formwork - Class F3 Finish				
5.3-G315	Soffit of flocculated water channel base	m^2	45		
5.3-G315	Soffit of sedimentation tank inlet channel	m^2	27		
5.3-G315	Soffit of settled water channel	m^2	24		
5.3-G343	Sides of cantilever supports for headstock, width n.e. 0.3 m	m	9		
5.3-G315	Inner sides of sedimentation tank walls, width n.e. 3.6m	m^2	450		
	(v) Sloping Formwork - Class F3 Finish				
5.3-G323	Sloping side of cantilever support for headstock, width n.e. 0.3 m	m	2.75		
	Other Formwork				
5.3-G271	Box out for 300mm x 300mm square hole for inlet control penstocks in concrete walls and making good after installation of penstocks	Nr	6		
5.3-G271	For 150 mm dia. cylindrical openings, 200 mm high, in base slab of inlet channel of sedimentation tank	Nr	36		
	PRECAST CONCRETE SLABS				
	Precast concrete Class 20/25 finished fair on all surfaces and reinforced as shown on drawings. Provide and fix:				
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5.3-H511	75mm thick cover slabs size 1150mm long x 500mm wide including 2 Nr. mild steel key holes cast with slab constructed as per details on Drg. No. MWS/TW/ST/03 for flocculated water channel	Nr	69		
	CONCRETE SURFACE FINISH				
5.3-G812	Provide Class UF3 Finish for top of base slab of Sedimentation Tanks, Channels, Walkways, etc.	m^2	570		
	CONSTRUCTION JOINTS				
	Provide and install the following water stops in construction joints including all surface treatment, formwork, forming of rebate 20 mm x 20 mm and sealing of rebate with polysulphide sealant all as per Drawings and Specification.				
5.3-G652	200 mm wide expandite super-cast water foil PVC or similar approved water stop in vertical/horizontal construction joints in walls	m	165		
5.3-G839	Bituminous expansion board, thickness 25mm between flocculation basin wall and flocculation water channel.	m^2	45		
	METAL WORK				
	All steelwork to be completely cleaned by acid dipping prior to galvanizing.				
	Galvanized mild steel tubular balustrades all framed and welded together, including all necessary Labours and fittings on tubings:				
5.3-N149	Provide and fix 900 mm high level balustrades of 40 mm diameter tubing Class B throughout, consisting of handrail and parallel middle rail 450 mm below the hand rail with balusters at maximum 1500 mm centers all as detailed on Drg. No. MWS/TW/ST/01	m	350		
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5.3-N290	Provide and fix 200mm x 6000mm long G.M.S V-notch weir plate as detailed on Drg. No. MWS/TW/ST/03. Include 10 mm dia. rawl bolts, 100mm long for fixing the plate and painting with approved epoxy paint	Nr	6		
5.3- A 429	Supply and erect a Galvanized Mild Steel staircase (Dwg No: M/W/S/SD/14) for access from finished ground level to sedimentation tanks walkways to the approval of the Engineer (Contractor to submit Shop Drawings form a reputable steel fabricator for approval prior to delivery and erection of staircase).	Nr	1		
	PAINTING AND DECORATING				
	Provide, prepare and apply one coat mordant solution, one undercoat and two coats gloss enamel paint on galvanized metal work externally on:				
5.3-V316	Hand-rail pipe and fittings including 900 mm high level balustrades	m	350		
5.3-V739	Provide and apply 3 coats of approved epoxy paint on one coat epoxy primer to internal concrete surfaces of Sedimentation Tanks (water line only) ('Master seal 180' as made by BASF or approved equivalent).	m^2	1155		
	LEAK PROOF TESTING				
5.3-A260	Allow for leakproof testing of all Sedimentation Tanks and flocculation water channel as specified	Item	L.S		
	PIPEWORK, FITTINGS & VALVES				
	Supply Transport to Site and Store in Secure Place				
	including Jointing Material, Bolts Gaskets, Packing, Jointing Glues, etc. as Applicable				
5.3-J882	300mm x 300mm square opening penstock non-rising stem type with extended spindle & head stock (Ham baker or approved equivalent)	Nr	4		
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	Scour Pipework - Approved cement lined internally, epoxy coated externally steel pipe PN 16)				
5.3-J312	300mm dia. single flanged 90^0 bend (Mark 1)	Nr	4		
5.3-J812	300mm dia. all flanged gate valve with extension spindle and wheel Euro 20 Series, type 23 or approved equivalent (Mark 2)	Nr	4		
5.3-J392	300mm dia. flanged spigot pipe, length 1200mm (Mark 3)	Nr	4		
5.3-J392	300mm dia. Coupling (Mark 4)	Nr	6		
5.3-J392	300mm dia. single flanged spigot, average length 13210mm long (cut to suit on site) (Mark 5)	Nr	4		
5.3-J392	300mm dia. Single flanged pipe 527 long with a puddle flange 150mm from plain end (mark 6)	Nr	4		
5.3-J312	300mm dia. all flanged 90^0 bend (Mark 7)	Nr	4		
	Transport From Site Store, Install, Test and Commission				
5.3-J882	300mm x 300mm square opening penstock non-rising stem type with extended spindle & head stock (Ham baker or approved equivalent)	Nr	8		
	Scour Pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.3-J312	300mm dia. single flanged 90^0 bend (Mark 1)	Nr	6		
5.3-J812	300mm dia. all flanged gate valve with extension spindle and wheel Euro 20 Series, type 23 or approved equivalent (Mark 2)	Nr	6		
5.3-J392	300mm dia. flanged spigot pipe, length 1200mm (Mark 3)	Nr	6		
5.3-J392	300mm dia. Coupling (Mark 4)	Nr	6		
5.3-J392	300mm dia. single flanged spigot, average length 13210mm long (cut to suit on site) (Mark 5)	Nr	3		
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BILL No. 5.3

SEDIMENTATION TANKS - 4 Nr

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BILL No. 5.4

FILTERS, FILTER GALLERY & FILTER CONTROL ROOM

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (Ksh)	AMOUNT (Ksh.)
5.4	**EXCAVATION**				
	The rates shall include for all strutting, shuttering, stabilizing the excavation faces, and keeping the excavation free of water by pumping, bailing or other means				
	Bulk excavations and top soil stripping for all structures are measured under Bill No.5.13 (Site & Ancillary Works).				
	Excavate below stripped level to formation level in common material, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer.				
5.4-E323	Maximum depth: 0.5-1m	m^3	100.0		
5.4-E324	-Ditto- depth:1-2m	m^3	150.0		
5.4-E633	Transport approved excavated material from site and use as fill and compact in 200mm layers as specified on site as and when directed by the Engineer. Compaction tests to be done and rates to include for this	m^3	100.0		
5.4-E647	Provide approved hardcore and compact in layers of 200mm, blinded with final material 25mm thick	m^3	80.0		
5.4-E335.1	Extra over Items 5.4-E323 to 5.4-E324 for excavation in rock Class 'A', blasting not permitted (Provisional)	m^3	180.0		
5.4-E335.2	-Ditto- for excavation in rock Class 'B', blasting not permitted (Provisional)	m^3	50.0		
5.4-E335.3	-Ditto- for excavation in rock Class 'C', blasting not permitted (Provisional)	m^3	700.0		
	CONCRETE WORKS				
	Provide, mix and place concrete				
	Provision of concrete				
5.4-F122	Designed concrete C12/15	m^3	49		
5.4-F142	Designed concrete C20/25	m^3	273		
	Placing of Concrete				
5.4-F611.1	Mass concrete C12/15 blinding for base slab of filters	m^3	9		
5.4-F611.2	Mass Concrete Class 12/15 blinding between filter water collection channel end wall and filter gallery wall	m^3	30.0		
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5.4-F611.3	Mass concrete C12/15blinding for **b**ase slab of filter gallery	m^3	10		
5.4-F72*.1	Reinforced Concrete C20/25 for Base slab – filter	m^3	25.0		
5.4-F72*.2	Reinforced Concrete C20/25 for Base slab - filter gallery	m^3	30.0		
5.4-F74*.1	Reinforced Concrete C20/25 for Wall - filter / filter gallery	m^3	45.0		
5.4-F74*.2	Reinforced Concrete C20/25 for Side walls – filters	m^3	45.0		
5.4-F72*.3	Reinforced Concrete C20/25 for Base slab - filter inlet channel	m^3	3.0		
5.4-F78*.1	Reinforced Concrete C20/25 for Wall - filter inlet channel	m^3	8.4		
5.4-F73*.1	Reinforced Concrete C20/25 for Cantilevered platforms for headstocks	m^3	2.3		
5.4-F78*.2	Reinforced Concrete C20/25 for Wall - filter water collecting channel	m^3	4.5		
5.4-F78*.3	Reinforced Concrete C20/25 for Walls - wash water overflow channel	m^3	15.0		
5.4-F78*.4	Reinforced Concrete C20/25 for Base - wash water channel	m^3	4.5		
5.4-F78*.5	Reinforced Concrete C20/25 for Walls - wash water collection trough	m^3	3.0		
5.4-F78*.6	Reinforced Concrete C20/25 for Base - wash water collection trough	m^3	3.6		
5.4-F78*.7	Reinforced Concrete C20/25 for Wall - filtered water channel	m^3	4.2		
5.4-F78*.8	Reinforced Concrete C20/25 for Top slab and cantilever slab - filtered water channel	m^3	3.0		
5.4-F73*.2	Reinforced Concrete C20/25 for Walkway slabs	m^3	4.5		
5.4-F78*.9	Reinforced Concrete C20/25 for External walls - filter gallery	m^3	9.0		
5.4-F76*.1	Reinforced Concrete C20/25 for Ring Beams	m^3	18.0		
5.4-F76*.2	Reinforced Concrete C20/25 for Lintels	m^3	4.5		
5.4-F78*.10	Reinforced Concrete C20/25 for internal staircase (2 nr.)	m^3	5.0		
5.4-F75*.1	Reinforced Concrete C20/25 for Columns	m^3	22.5		
5.4-F73*.2	Reinforced Concrete C20/25 for Filter control room slab	m^3	12.0		
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	REINFORCEMENT				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²:				
5.4-G522	Diameter: 8 mm	Kg	5000.0		
5.4-G523	Diameter: 10mm	Kg	11800.0		
5.4-G524	Diameter: 12mm	Kg	20200.0		
5.4-G525	T16 mm	Kg	2500.0		
5.4-G526	T20 (provisional)	Kg	30		
5.4-G527	T25 (provisional)	Kg	47		
5.4-G528	T32 or greater (provisional)	Kg	76		
	FORMWORK				
	Provide and fix shuttering including propping, strutting and striking all as specified				
	Vertical Formwork - Class F1 Finish				
5.4-G342.1	300 mm side for base slab – filter	m	75.0		
5.4-G342.2	300 mm side for base slab - filter gallery	m	81.0		
	Vertical Formwork - F2 Finish				
5.4-G345	Sides of walls - Filtered Water Channel in Filter Gallery	m^2	45.0		
5.4-G344	Ring beams (0.3 m - 0.6m)	m^2	45.0		
5.4-G345	Wall - filter / filter gallery (4.5 m - 5.0 m)	m^2	336.0		
5.4-G343	Cantilevered platforms for headstocks (0.1 m - 0.3 m)	m	9.0		
5.4-G344	Walls - wash water collection trough (0.5 m - 0.8 m)	m^2	54.0		
5.4-G345	Walls - filtered water channel (under drainage) (1.0 m - 1.5 m)	m^2	36.0		
	Vertical Formwork - F3 Finish				
5.4-G345	Side wall - filters gallery (0.5 m - 1.0 m)	m^2	75.0		
5.4-G345	Side wall - filters (3.8 m - 4.6 m)	m^2	285.0		
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5.4-G345	Walls - inlet channel (1.0 m - 1.5 m)	m^2	78.0		
5.4-G344	Walls - filter collecting channel (0.5 m - 1.0 m)	m^2	45.0		
5.4-G345	Walls - wash water overflow channel (3.0 m - 4.0m)	m^2	135.0		
5.4-G345	Walls - filter / filter gallery (4.5m - 5.0m)	m^2	243.0		
5.4-G342	150 mm side – walkways	m	45.0		
5.4-G343	300 mm side - external staircase	m	51.0		
5.4-G342.2	Sides of columns - width n.e. 0.3m	m	105.0		
5.4-G342	Sides of ring beams - width n.e. 0.2m	m	315.0		
5.4-G342	Sides of lintels - width n.e. 0.2 m	m	90.0		
5.4-G342	Sides of floor slab	m	90.0		
5.4-G343	Cantilevered platforms for headstocks (0.1 m - 0.3 m)	m	90.0		
	Horizontal Formwork - Class F2 Finish				
5.4-G314	Soffit of slab - inlet channel (0.6 m - 0.8 m)	m^2	15.0		
5.4-G313	Soffit of walkway slab (0.1 m - 0.3 m)	m^2	24.0		
5.4-G314	Soffit of roof - filtered water channel (0.3 m - 1.0 m)	m^2	210.0		
5.4-G312	Soffit of ring beams width n.e. 0.2m	m	150.0		
5.4-G312	Soffit of lintels	m	45.0		
	Horizontal Formwork - F3 Finish				
5.4-G315	Soffit of landings - external staircase (1.0 m - 1.5 m)	m^2	9.0		
5.4-G313	Slab - first floor (0.1m - 0.3m)	m^2	84.0		
5.4-G314	Soffit of wash water collection trough (0.8 m - 1.0 m)	m^2	18.0		
	Sloping Formwork - F3 Finish				
5.4-G325	Soffit of steps - external staircase (1.0m - 1.5m)	m^2	60.0		
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	CONSTRUCTION JOINTS				
5.4-G652	Provide and fix 200 mm wide approved water stop	m	300.0		
5.4-G839	Bituminous expansion board, thickness 25mm between sedimentation tank wall and filter inlet channel.	m^2	33.0		
	OPENINGS				
5.4-G352.1	Form 150 mm diameter opening through 200 mm base by placing G.I. Pipe sleeve and removing after concreting for filter inlet channel	Nr	12.0		
5.4-G352.2	- Ditto - but for 200mm diameter through 300mm wall	Nr	6.0		
	WALLING - FILTER GALLERY & FILTER CONTROL ROOM				
	External Walls				
	Selected Machine Dressed Natural Stone Block Walling, reinforced with 20 swg Hoop Iron at every third courses, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.4-U121	200mm Thick walling	m^2	350.0		
	Labours				
5.4-U178	Fair racking of the walls externally	m^2	350.0		
	ROOF COVERINGS				
	Gauge 28 pre-painted IT5 approved roofing sheets, colour to approval of the Engineer				
5.1-W321	Roof covering;150mm laps on one end and nailing to 75X50mm celcured sawn cypress purlins	m^2	190.0		
5.1-W327	Ridge cap	m	44.0		
	CARPENTRY AND JOINERY				
	Carpentry				
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	Roof Trusses				
	Double Pitch Roof Truss With 600mm eaves projection, in 150 x 50mm Rafters, Ceiling Joists, Struts and Ties in Sawn Cypress Grade II Seasoned and Pressure Impregnated with Wood Preservative and Timber Joints with Bolted and Nailed Connections to the Engineer's Approval: -				
5.4-Z118.1	Equal truss 5400mm clear span and 1110mm high	Nr	15.0		
	Other Roof Members				
	Sawn Cypress Grade II Maximum Moisture Content 12% Seasoned and Pressure Impregnated with Wood Preservative and timber joints with bolted and nailed connections to the Engineer's Approval: -				
5.4-Z118.2	150 x 50mm Intermediate, hip and valley rafters	m	340.0		
5.4-Z119.7	150 x 75mm Purlins	m	80.0		
5.4-Z119.8	180 x 50mm Ridge board	m	60.0		
5.4-Z119.9	100 x 50mm Wall plate tied to wall with 20 s.w.g. hoop iron at 900mm centers and bedded in cement mortar (1:4) on top of wall	m	120.0		
	Joinery				
	General Timbers				
	Wrot Prime Grade Cypress, Including Finishing With Three Coats First Quality Gloss Paint: -				
5.4-Z119.10	250 x 40mm Fascia board fixed with screws	m	110.0		
	Builders Work in Connection with Electrical Installations				
5.4-Z711	Allow for cutting and leaving all necessary holes, notches, mortices, sinkings and chases both in the structure and its finishes and for all making good in connection with concealed conduits or cables	Item	L.S		
	DOORS & WINDOWS - FILTER GALLERY & FILTER CONTROL ROOM				
	Steel Doors				
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	Pressed Metal Louvre Doors				
	Supply and Fix the following Pressed Metal Louvre Doors with 100 x 50mm Stiles and Top Rails, 150 x 50mm Middle and Bottom Rails With Pressed Metal Infill Louvres and 100 x 50mm Pressed Metal Frames, Including Hinges, Pad Bolts and Tower Bolts, All To Manufacturer's Details, with three with three paint complete with opening accessories including bedding and pointing around frames in Cement Mortar: -				
5.4-Z323.1	Double door size 1200 x 2400 mm high in two equal panels (D2a)	Nr	2.0		
	Steel Casement Doors				
	Supply and fix the following Standard Section Steel Casement Doors Including Hinges, Pad Bolts and Tower Bolts, all to Manufacturer's Details, including 4mm Thick Clear Sheet Glass and Glazing to Steel Casements with putty, three coats gloss paint, complete with opening accessories and bedding and pointing around frames in cement mortar: -				
5.4-Z323.2	Double door size 1200 x 2400 mm high in two equal panels (D6)	Nr	1.0		
	Steel Casement Windows				
	Supply and Fix the following Standard Section Steel Casement Windows, including 4mm Thick Clear Sheet Glass glazed to Steel Casements with putty, complete with opening accessories, including building in lugs to jambs and head and water-proofing and filling around opening with approved compound; and including burglar-proofing fabricated from 12 x 12mm mild steel square bars at 150mm centers vertically and 150mm horizontally and fixed internally to surrounding wall with 12mm mild steel fish-tailed lugs at maximum 600mm centers; all finished with three coats oil paint:-				
5.4-Z321	Window size 1197 x 1797mm high (W1)	Nr	12.0		
	PVC Gauze Screen Set on and including a Timber Framing all Round and Fixing to Wall: -				
5.4-Z321	Gauze size 1197 x 1397mm high (W3)	Nr	12.0		
	RENDERING				
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	12.5mm Thick Cement & Sand Render as Described Externally on: -				
5.4-W443.1	Blockwork and concrete surfaces	m^2	45.0		
5.4-W447	200mm Thick x 275mm wide precast concrete cill bedded, jointed and pointed in cement mortar on top of 200mm wall	m	45.0		
	SCREEDS AND BACKING				
	Bonded Cement and Sand (1:4) Screed Bed or Backing in One Coat, Well Bonded to Concrete or Blockwork Base as Described: -				
5.4-W443.1	38mm thick screed laid level to receive porcelain or ceramic floor tiling (measured separately) in filter gallery	m^2	90.0		
5.4-W443.2	-Ditto- in Filter Control Room	m^2	100.0		
	PLASTERING				
	12.5mm Thick Gauged Cement Plaster as Described Internally on: -				
5.4-W443.1	Blockwork and concrete surfaces	m^2	600.0		
5.4-W443.2	Blockwork and concrete surfaces 4.5 - 6.0m high	m^2	50.0		
	PROVIDE CLASS UF3 FINISH				
5.4-W441	Provide all materials and lay cement screed (1:4) to required falls as indicated (Avg. 50mm thick) in wash water channel	m^2	34.0		
5.4-W441	- Ditto - in filtered water channel	m^2	12.0		
	FLOOR TILING				
	Acid-Proof Granito Floor Tiles Laid with Straight Joints Both Ways: -				
5.4-Z421.1	Floor tiles laid to floors, treads, risers or as skirting on screed or backing (measured separately) in filter gallery	m^2	90.0		
5.4-Z421.2	-Ditto- in Filter Control Room	m^2	100.0		
	PAINTING AND DECORATING				
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	Prepare and Apply Three Coats Exterior Quality Plastic Emulsion Paint: -				
	Externally on: -				
5.4-V543	Fair-faced concrete surfaces	m^2	24.0		
	Prepare and Apply Three Coats Interior Quality Plastic Emulsion Paint: -				
	Internally on: -				
5.4-V563.1	Plastered blockwork and concrete surfaces	m^2	1500.0		
5.4-V563.2	Plastered blockwork and concrete surfaces 4.5 - 6.0m high	m^2	100.0		
	Prepare and Apply Three Coats Washable Distemper as Described to: -				
5.4-V594	Horizontal soffits of suspended chipboard or plasterboard ceilings	m^2	225.0		
	FILTER UNDER DRAINAGE SYSTEM AS DETAILED				
	Designed Concrete Class 20/25 Precast Concrete:				
5.4-H511	Provide all materials and fix with approved sealer, filter under drain slabs 800 mm long (in 4 pieces) x 700 mm wide x 75 mm thick as detailed on Dwg No. MWS/TW/F/04&05. Include for bolt holes and casting in 100 mm diameter pipe with puddle flange as detailed in the drawing. Include reinforcement and G.S. nipple as detailed in Dwg No: MWS/TW/F/05.	Nr	24.0		
5.4-M731	Supply and fix 16 mm diameter G.S. bolts and nuts as detailed	Nr	110.0		
5.4-J391.1	- Ditto - 100 mm diameter G.I. socketed tee with 12 mm diameter GMS nut welded on top and 12 mm diameter hole drilled as per details	Nr	96.0		
5.4-J491.2	- Ditto - 100 mm diameter uPVC Class 'E' pipe 1790 mm long lateral with 16 pairs of 10 mm diameter holes	Nr	192.0		
5.4-J491.3	- Ditto - 100 mm diameter uPVC end cap	Nr	192.0		
5.4-J491.4	- Ditto - 100 mm diameter uPVC faucet socket with G.I. male threaded on one end and PVC socket on the other end	Nr	192.0		
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5.4-J391.5	- Ditto - 12 mm diameter brass nipple with anticlockwise and clockwise (B.S.F.) threads as detailed	Nr	96.0		
	Filter Media				
5.4-W431.1	Provide gravel and form filters bed to the details. **Note**: The filter media shall be suitable for a simultaneous air/water backwash procedure	m3	55.0		
5.4-W431.2	Provide sand and form filter sand bed to the details. **Note:** The filter media shall be suitable for a simultaneous air/water backwash procedure	m3	65.0		
5.4-Z634	Provide a filter control system with reliable controllers and incorporating a slow start controller. The filter control system shall maintain an adequate head above the media surface	Lot	1.0		
5.4-W431.3	Manufacture and install a filter bed suitable for a simultaneous air / water backwash procedure (Dwg No. MWS/TW/F-01-05)	Lot	1.0		
	Support Brackets - Provide and Fix:				
5.4-L712	Mass Concrete Class 20/25 finished fair on all surfaces support blocks 220 mm x 100 mm x 330 mm for brackets for laterals as detailed	Nr	384.0		
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	METAL WORK				
	All steelwork to be completely cleaned by acid dipping prior to galvanizing.				
5.4-N290.1	Provide and fix 6 mm GMS deflector plate with 45^{o} crank at 150 mm from one end fixed to concrete with 4 nr. 12 mm diameter rawl bolts as detailed on Drg. No. MWS/TW/F/01	Nr	30.0		
5.4-N290.2	Provide and fix composite material light duty inspection cover size 600 mm x 450 mm with frames on filtered water channel	Nr	6.0		
5.4-N140	Provide and fix 900 mm high level balustrades of 40 mm diameter tubing Class 'B' throughout consisting of handrail and parallel middle rail 450mm below the handrail with balusters at maximum 1500 mm centers, all as detailed.	m	100.0		
5.4-N161	Provide and fix 40 x 40 x 3mm thick angle irons with fish tail lungs at the edges of R.C. stairs.	m	30.0		
	MISCELLANEOUS				
5.4-G271.1	Boxing out 550 mm x 550 mm holes in concrete walls or slabs and making good after laying of pipes	Nr	18.0		
5.4-G271.2	- Ditto - but 500 x 500 mm dia. Holes	Nr	6.0		
5.4-G271.3	- Ditto - but 450 x 450 mm dia. Holes	Nr	6.0		
5.4-G271.4	- Ditto - but 400 x 400 mm dia. Holes	Nr	6.0		
5.4-G271.5	- Ditto - but 600 mm x 450 mm holes for inspection chambers	Nr	6.0		
5.4-G823	Allow for cutting, grouting and making good any holes, chases etc. for all fittings and pipework fixing and electrical work in the filters, filter gallery and filter control room	Item	L.S		
5.4-A260	Allow for leak proof testing of all the filters as specified	Item	L.S		
5.4-V316	Provide, prepare and apply one coat mordant solution, one undercoat and two coats gloss enamel paint on galvanized metalwork externally on handrail pipe and fittings in 900 mm high level balustrade	m	120.0		
5.4-L712	Provide concrete support for wash water outlet and overflow measuring 740mm x 400mm x 300mm high with bituminous felt padding and 80mm x 6mm flat anchored to the support by 2 nr. 6mm diameter bolts as per detail	Nr	6.0		
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5.4-L711	Provide mass concrete class 12/15 thrust blocks under 150mm dia. gate valves as per details	Nr	6.0		
5.4-L712	-Ditto - but for 250mm dia. gate valve as per details	Nr	6.0		
5.4-L711	-Ditto but under 150mm dia. butterfly valves as per details	Nr	6.0		
5.4-V316	Allow for painting of all exposed pipework in the filter gallery with three coats of approved gloss paint. Colour codes to be advised by the Engineer.	Item	L.S		
5.4-V733	Provide and apply three coats of approved epoxy paint on one coat epoxy primer to internal concrete surfaces of filters ('Master seal 180' as made by BASF or approved equivalent).	m²	735.0		
	PIPEWORK, FITTINGS & VALVES				
	Supply, transport to site and store in secure place, including jointing material, bolts, gaskets, packing, jointing glues, etc. as applicable				
	Note: Dimensions of Pipes and Fittings to be as show on Drgs.				
	Filter inlet				
5.4-J881	300 mm C.I. circular bore Inlet Control penstock non-rising stem type complete with extension spindle and headstock with handwheel Ham Baker or approved equivalent	Nr	6.0		
5.4-J391	300mm dia. plain ended pipe 525mm long with puddle flange at 100mm from one end	Nr	6.0		
	Filtered Water Outlet Pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.4-J372	250mm dia. special flanged bell mouth 615mm long with puddle flange at 100mm from bell mouth end (Mark 1)	Nr	6.0		
5.4-J392	250mm dia. all flanged pipe, 1745mm long with puddle flange at 720mm from one end (Mark 2)	Nr	6.0		
5.4-J399	250mm dia. all flanged equal cross with reducing end 150mm dia (Mark 3)	Nr	6.0		
5.4-J391	150mm dia all flanged spigot pipe 980mm long (mark 4)	Nr	6.0		
5.4-J811 1	150mm dia. all flanged gate valve with extension spindle, length 4.5m and headstock with handwheel (Mark 5)	Nr	6.0		
5.4-J351	150mm dia. flange adaptor (Mark 6)	Nr	6.0		
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5.4-J391	150mm dia. plain pipe 970mm long with puddle flange at 100mm from one end (Mark 7)	Nr	6.0		
	Wash water Outlet- Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.4-J391	250mm dia flanged spigot pipe 420mm long with a puddle flange 150mm from one end (mark 8)	Nr	6.0		
5.4-J312	250mm dia all flanged 90^0 bend (mark 9)	Nr	6.0		
5.4-J812	250mm dia. all flanged gate valve with extension spindle, length 4.5m and headstock with handwheel to (Mark 10)	Nr	6.0		
5.4-J392	250mm dia flanged spigot 1480mm long (mark 11)	Nr	6.0		
5.4-J312	250mm dia all flanged 90^0 bend (mark 12)	Nr	6.0		
	Filtered Water Outlet Pipework - Approved cement lined internally & epoxy coated externally steel pipe PN 16)				
5.4-J339	(250mm x 150mm) dia double flanged concentric tapper 455mm long (mark 13)	Nr	6.0		
5.4-J811 1	150mm dia. all flanged gate valve with extension spindle, length 4.5m and headstock with handwheel to (Mark 14)	Nr	6.0		
5.4-J391	150mm dia all flanged spigot 400mm long (mark 15)	Nr	6.0		
5.4-J311	150mm dia all flanged 90^0 bend (mark 16)	Nr	6.0		
	Wash water Inlet - Approved cement lined internally & epoxy coated externally steel pipe PN 16)				
5.4-J812	250mm dia. all flanged gate valve with extension spindle, length 4.5m and headstock with handwheel (Mark 17)	Nr	6.0		
5.4-J311	250mm dia all flanged 90^0 bend (mark 18)	Nr	6.0		
5.4-J392	250mm dia all flanged spigot pipe 1540mm long (mark 19)	Nr	6.0		
5.4-J322	300mm dia all flanged reducing Tee with 250mm one reducing end (mark 20)	Nr	6.0		
5.4-J392	300mm dia all flanged spigot spigot pipe 3200mm long (mark 21)	Nr	6.0		
5.4-J312	300mm dia all flanged 90^0 bend (mark 22)	Nr	1.0		
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5.4-J392	300mm dia all flanged spigot pipe 883 mm long with a puddle flange 300mm from one end (mark 38)	Nr	1.0		
5.4-J312	300mm dia double flanged 90^0 bend (mark 39)	Nr	1.0		
5.4-J392	300mm all flanged spigot pipe 2509mm long (mark 40)	Nr	1.0		
5.4-J312	300mm dia double flanged 90^0 bend (mark 41)	Nr	1.0		
	Overflow Pipework - Approved Lined cement lined internally epoxy coated externally steel pipe PN 16)				
5.4-J391	200mm dia flanged spigot pipe 890mm long with a puddle flange 150mm from one end (mark 23)	Nr	6.0		
5.4-J311	200mm dia all flanged 90^0 bend (mark 24)	Nr	6.0		
5.4-J391	200mm flanged spigot pipe 4240mm long (mark 25)	Nr	6.0		
	Air Inlet Pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.4-J811	100mm dia. all flanged gate valve with extension spindle, length 0.6m and headstock with handwheel (Mark 26)	Nr	6.0		
5.4-J351	100mm flange adaptor (mark 27)	Nr	6.0		
5.4-J391	100mm all flanged spigot pipe 1870mm long (mark 28)	Nr	6.0		
5.4-J311	100mm dia all flanged 90^0 bend (mark 29)	Nr	6.0		
5.4-J391	100mm dia all flanged spigot pipe 2600mm long (mark 30)	Nr	6.0		
5.4-J321	100mm dia all flanged equal tee (mark 31)	Nr	6.0		
5.4-J391	100mm dia all flanged spigot pipe 2670mm long (mark 32)	Nr	6.0		
5.4-J391	100mm dia flanged spigot pipe 150mm long (mark 33)	Nr	6.0		
5.4-J391	100mm dia all flanged spigot pipe 3635mm long (mark 34)	Nr	6.0		
5.4-J391	100mm dia all flanged spigot pipe 1825mm long (mark 35)	Nr	1.0		
5.4-J311	100mm dia all flanged 90^0 bend (mark 36)	Nr	1.0		
5.4-J321	100mm dia all flanged equal Tee (mark 37)	Nr	6.0		
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	Transport From Site Store, Install, Test & Commission				
5.4-J881	200 mm C.I. circular bore Inlet Control penstock non-rising stem type complete with extension spindle and headstock with handwheel Ham Baker or approved equivalent	Nr	6.0		
5.4-J391	200mm dia. plain ended pipe 525mm long with puddle flange at 100mm from one end	Nr	6.0		
	Filtered Water Outlet Pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.4-J372	250mm dia. special flanged bell mouth 615mm long with puddle flange at 100mm from bell mouth end (Mark 1)	Nr	6.0		
5.4-J392	250mm dia. all flanged pipe, 1745mm long with puddle flange at 720mm from one end (Mark 2)	Nr	6.0		
5.4-J392	250mm dia. all flanged equal cross with reducing end 150mm dia (Mark 3)	Nr	6.0		
5.4-J391	150mm dia all flanged spigot pipe 980mm long (mark 4)	Nr	6.0		
5.4-J811	150mm dia. all flanged gate valve with extension spindle, length 4.5m and headstock with handwheel (Mark 5)	Nr	6.0		
5.4-J351	150mm dia. flange adaptor (Mark 6)	Nr	6.0		
5.4-J391	150mm dia. plain pipe 970mm long with puddle flange at 100mm from one end (Mark 7)	Nr	6.0		
	Wash water Outlet- Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.4-I311	250mm dia flanged spigot pipe 420mm long with a puddle flange 150mm from one end (mark 8)	Nr	6.0		
5.4-J311	250mm dia all flanged 90^0 bend (mark 9)	Nr	6.0		
5.4-J812	250mm dia. all flanged gate valve with extension spindle, length 4.5m and headstock with handwheel (Mark 10)	Nr	6.0		
5.4-J392	250mm dia flanged spigot 1480mm long (mark 11)	Nr	6.0		
5.4-J312	250mm dia all flanged 90^0 bend (mark 12)	Nr	6.0		
	Filtered Water Outlet Pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
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5.4-J332	(250mm x 150mm) dia double flanged concentric tapper 455mm long (mark 13)	Nr	6.0		
5.4-J811	150mm dia. all flanged gate valve with extension spindle, length 4.5m and headstock with handwheel (Mark 14)	Nr	6.0		
5.4-J391	150mm dia all flanged spigot 400mm long (mark 15)	Nr	6.0		
5.4-J311	150mm dia all flanged 90^0 bend (mark 16)	Nr	6.0		
	Wash water Inlet - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.4-J812	250mm dia. all flanged gate valve with extension spindle, length 4.5m and headstock with handwheel (Mark 17)	Nr	6.0		
5.4-J311	250mm dia all flanged 90^0 bend (mark 18)	Nr	6.0		
5.4-I312 .1	250mm dia all flanged spigot pipe 1540mm long (mark 19)	Nr	6.0		
5.4-J322	300mm dia all flanged reducing Tee with 250mm one reducing end (mark 20)	Nr	6.0		
5.4-I312 .2	300mm dia all flanged spigot spigot pipe 3200mm long (mark 21)	Nr	6.0		
5.4-J312.3	300mm dia all flanged 90^0 bend (mark 22)	Nr	2.0		
5.4-I312.4	300mm dia all flanged spigot pipe 883 mm long with a puddle flange 300mm from one end (mark 38)	Nr	1.0		
5.4-J312.5	300mm dia double flanged 90^0 bend (mark 39)	Nr	1.0		
5.4-I312.6	300mm all flanged spigot pipe 2509mm long (mark 40)	Nr	1.0		
5.4-J312.7	3000mm dia double flanged 90^0 bend (mark 41)	Nr	1.0		
	Overflow Pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.4-I311.1	200mm dia flanged spigot pipe 890mm long with a puddle flange 150mm from one end (mark 23)	Nr	6.0		
5.4-J311	200mm dia all flanged 90^0 bend (mark 24)	Nr	6.0		
5.4-I311.2	200mm flanged spigot pipe 4240mm long (mark 25)	Nr	6.0		
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	Air Inlet Pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.4-J811	100mm dia. all flanged gate valve with extension spindle, length 0.6m and headstock with handwheel (Mark 26)	Nr	6.0		
5.4-J351	100mm flange adaptor (mark 27)	Nr	6.0		
5.4-I311.1	100mm all flanged spigot pipe 1870mm long (mark 28)	Nr	6.0		
5.4-J311.2	100mm dia all flanged 90^0 bend (mark 29)	Nr	6.0		
5.4-I311.3	100mm dia all flanged spigot pipe 2600mm long (mark 30)	Nr	6.0		
5.4-J321	100mm dia all flanged equal tee (mark 31)	Nr	6.0		
5.4-I311.4	100mm dia all flanged spigot pipe 2670mm long (mark 32)	Nr	6.0		
5.4-I311.5	100mm dia flanged spigot pipe 150mm long (mark 33)	Nr	6.0		
5.4-I311.6	100mm dia all flanged spigot pipe 3635mm long (mark 34)	Nr	6.0		
5.4-I311.7	100mm dia all flanged spigot pipe 1825mm long (mark 35)	Nr	1.0		
5.4-J311.8	100mm dia all flanged 90^0 bend (mark 36)	Nr	1.0		
5.4-J321	100mm dia all flanged equal Tee (mark 37)	Nr	6.0		
	Air Compressor				
	Supply, transport to site and store in secure place, including jointing material, bolts, gaskets, packing, jointing glues, etc. as applicable				
	Note: Dimensions of Pipes and Fittings to be as shown on Drgs				
5.4-Z529	Stationary air-cooled, single stage, oil injected rotary screw air enclosed in a silenced canopy, complete with control panel, sequence controller (standby selector) and accessories as specified. Free air delivery: 400 l/s Maximum effective working pressure: 1.5 bars as ATLAS COPCO ZR 145-50Hz' or equal and approved, to include compressed air pre-filter of capacity 1,000 l/s vertical steel compressed air receiver of capacity 800 liters complete with accessories. Compressed air filter/regulator/lubricator air preparation unit, complete with ball valve and quick coupling. Compressor and accessories to be As ATLAS COPCO 'Maxi' or equivalent. Allow for piping etc.	Nr	2.0		
	Pipework				
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	Supply, deliver and install galvanized mild steel tubing to BS 1387 Class C with socketed joints to BS 21 and galvanized malleable iron fittings including fixing and jointing				
5.4-J391	80 mm diameter galvanized mild steel tubing Class 'C'	LM	40.0		
	Extra over GMS tubing for the following: -				
5.4-J311	Bends/Elbows: 80 mm diameter galvanized malleable iron elbow	Nr	16.0		
5.4-J321	Tees: 80 mm diameter galvanized malleable iron tee	Nr	8.0		
5.4-J391	Unions: 80 mm diameter galvanized malleable iron union	Nr	8.0		
5.4-J861	Valves: 80 mm compressed air isolating valve	Nr	8.0		
5.4-J891	Valves: 25 mm diameter automatic drains as ATLAS COPCO or equal and approved	Nr	24.0		
5.4-J891	Main pressure regulating unit, direct acting, self-relieving type with a pressure gauge suitable for 400 l/s at 2 bar. As by ATLAS COPCO or equal and approved	Nr	1.0		
5.4-J891	25 mm diameter Main automatic electronic water drains as ATLAS COPCO or equal and approved	Nr	2.0		
	Pipe supports & anchors				
5.4-L711	Allow for pipe supports and anchors	Lot	1.0		
5.4-Z512	Allow for connection of air scour system to the 6 No. Filter beds	Lot	1.0		
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BILL No. 5.4

FILTERS, FILTER GALLERY & FILTER CONTROL ROOM

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BILL No. 5.5

CHLORINE STORAGE, MIXING & DOSING BUILDING

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE Ksh	AMOUNT Ksh
	BUILDING WORKS				
	EXCAVATION				
	The rates shall include for all strutting, shuttering, stabilizing the excavation faces, and keeping the excavation free of water by pumping, bailing or other means				
	Bulk excavations and top soil stripping for all structures are measured under Bill No. 5.13 (Site & Ancillary Works).				
	SUBSTRUCTURES (PROVISIONAL)				
	Excavate Surfaces to Reduce Levels Over 300mm Deep: -				
5.5–E424	Pit 0.00 - 1.50m deep	m^3	25		
	Excavate Starting from Stripped Level to Receive: -				
5.5-E324	Foundations and bases of isolated piers 1.00 - 2.00 meters deep	m^3	40		
	Extra Over Excavation in Any Position for: -				
5.5-E335	Excavating in rock Class "A"	m^3	15		
5.5-E335	Excavating in rock Class "B"	m^3	7		
5.5-E335	Excavating in rock Class "C"	m^3	5		
	Approved imported Filling as Described: -				
5.5-E615	Fill and ram imported suitable fill materials around foundations and buildings	m^3	10		
	Approved hardcore filling as described: -				
5.5-E617	Provide and deposit approved imported hardcore in maximum 150mm thick layers in making up levels including achieving satisfactory compaction	m^3	12		
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5.5-E615	Provide, lay and level out fine crushed stone, sand or gravel blinding 50mm thick to surface of filling, including watering and rolling to achieve satisfactory compaction.	m^2	32		
	Disposal of Surplus Spoil: -				
5.5-E532	Cart away surplus excavated materials to an approved dumping site	m^3	30		
	Anti-Termite Treatment				
5.5-E790	Termidor 25 EC or other equal approved anti-termite chemical treatment: applied by an approved professional pest control specialist:10-year warranty: strictly applied in accordance with the manufacturer's instructions	m^2	32		
	Damp-Proof Membrane				
5.5-W239	500 Gauge polythene sheeting, laid over hardcore in 2 layers	m^2	32		
	Bituminous Felt Damp-Proof Course as Described: -				
5.5-W239	200mm Wide under walls	m	30		
	Concrete Work:				
	Provision of concrete				
5.5-F122	Designed concrete C12/15	m^3	2		
5.5-F142	Designed concrete C20/25 Foundation trenches, column bases and sub-structure walling in foundations.	m^3	17		
	Placing of concrete				
5.5-F611	Mass concrete for blinding, thickness 50mm	m^3	2		
5.5-F7**.1	Reinforced concrete to foundation trenches, column bases and sub-structure walling in foundations.	m^3	15		
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5.5-F7**.2	Reinforced concrete to isolated columns and piers in foundations	m^3	2		
	Reinforcement				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm² :				
	-				
5.5-G523	Diameter: 10mm	Kg	800		
5.5-G524	Diameter: 12mm	Kg	600		
	Formwork				
	Provide and Fix Shuttering Including Propping, Strutting and Striking, all as Specified				
	Sawn Formwork - Class F1 Finish: -				
5.5-G343	Foundation trenches, column bases and sub-structure walling in foundations.	m^2	20		
	Wrot Formwork - Class F3 Finish: -				
5.5-G343	Edges of beds not exceeding 300mm wide	m	10		
	Natural Stone Block Walling, Medium Chisel Dressed, reinforced with 20 swg Hoop Iron at Every Alternate Course, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.5-U121	200 mm Walling	m^2	30		
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	SUPERSTRUCTURE				
	CONCRETE, FORMWORK, REINFORCEMENT				
	Provision of concrete				
5.5-F142	Designed concrete C20/25	m^3	25		
	Placing of concrete				
5.5-F721	Reinforced concrete for 3150mm thick surface bed	m^3	5		
5.5-F722	Reinforced concrete for 300mm thick surface bed	m^3	2		
5.5-F7**.3	Reinforced concrete for Columns and beams	m^3	4		
5.5-F78*	Tanks, channels and doser supports	m^3	14		
5.5-F142	Construct dosing pipes channel and overflow/scour channel at a slope, internal size 200mm wide x 150mm deep on concrete floor slab including forming rebate 55mm wide x 55mm deep to top inner edges of channel walls to receive precast concrete cover.	m	4		
	Formwork				
	Provide and Fix Shuttering Including Propping, Strutting and Striking, all as Specified				
	Sawn Formwork - Class F1 Finish: -				
5.5-G343	Edges of slabs of steps not exceeding 300mm wide	m	2		
	Wrot Formwork - Class F3 Finish: -				
5.5-G345	Vertical sides of tanks, doser and channel walls	m^2	35		
5.5-G315	Horizontal soffits of suspended tank slabs and partitions	m^2	4		
5.5-G343	Vertical sides of walls 300mm thick	m^2	31		
5.5-G343	Vertical sides of columns	m^2	28		
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5.5-G343	Sides and soffits of beams	m^2	65		
5.5-G325	Sloping soffit and sides of roof slab	m^2	40		
5.5-G343	Edges of beds and risers of steps not exceeding 300mm wide	m	35		
	Concrete Surface Finish				
5.5-W449	Provide all materials and lay cement screed (1:3) to required falls as directed (average 50mm thick) in chlorine mixing tanks.	m^2	6		
	Reinforcement				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm² :				
	Reinforcement,				
5.5-G523	Diameter: 10mm	Kg	800		
5.5-G524	Diameter 12	Kg	1,200		
	Precast Reinforced Concrete Lintel in concrete class 20/25 ,200mm deep reinforced with 4 No. 10mm Diameter Mild Steel Bars and 6mm Diameter Mild Steel Links at 200mm Centers, Finished Smooth on all Exposed Surfaces, including all Moulds and Formwork, Hoisting, Bedding and Flush Pointing in Cement and Sand Mortar (1:3): -				
5.5-H112	Lintel 200mm wide x 2800mm long	Nr	1		
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	Fixing Chemical Dosing Pipes				
5.5-Z519	Provide all materials and anchor the chemical dosing pipes to Chemical Dosing Channel wall.	Item	LS		
	WALLING				
	External Walls				
	Selected Machine Dressed Natural Stone Block Walling, reinforced with 20 swg Hoop Iron at Every Alternate Course, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.5-U121	200mm thick walling	m^2	60		
	Labours				
5.5-U178	Extra over walling for ruled horizontal and flush vertical joints	m^2	60		
	Precast Concrete Sills				
5.5-H810	200mm Thick x 275mm wide precast concrete cill bedded, jointed and pointed in cement mortar on top of 200mm wall.	m	2		
	METALWORK				
	Steel Doors				
	Pressed Metal Louvre Doors				
	Supply and fix the following Pressed Metal Louvre Doors with 100 x 50mm Stiles and Top Rails, 150 x 50mm Middle and Bottom Rails with Pressed Metal Infill Louvres and 100 x 50mm Pressed Metal Frames, Including Hinges, Pad Bolts and Tower Bolts, All To Manufacturer's Details, With Three Coats Gloss Paint and one layer of Epoxy Paint Complete With Opening Accessories Including Bedding and Pointing Around Frames in Cement Mortar: -				
5.5-Z323	Single door size 900 x 2400 mm high (D2)	Nr	1		
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	uPVC Casement Windows				
	Supply and Fix the Following Standard Section uPVC Casement Windows, including 4mm Thick Clear Sheet Glass Glazed to Steel Casements with Putty, Complete with Opening Accessories, Including Building in Lugs to Jambs and Head and Water-Proofing and Filling Around Opening with Approved Compound;				
	-				
5.5-Z331	Window size 1197 x 1197mm high in two equal panels with upper part having 1 no. top hung ventilator and lower half having 1 no. side hung casement opening outwards (W2b)	Nr	1		
	RENDERING				
	12.5mm Thick Cement and Sand Render as Described Externally on: -				
5.5-W449	Blockwork and concrete surfaces	m^2	50		
	PLASTERING				
	12.5mm Thick Gauged Cement Plaster as Described Internally on: -				
5.5-W449	Blockwork and concrete surfaces	m^2	60		
5.5-W449	Sloping concrete surfaces	m^2	20		
	Screeds and backing				
	Bonded Cement and Sand (1:4) Screed Bed or Backing in One Coat, Well Bonded to Concrete or Blockwork Base as Described: -				
5.5-W449	38mm thick screed laid level to receive porcelain or ceramic floor tiling (measured separately)	m^2	60		
	Bonded Cement and Sand (1:4) Screed Bed in One Coat with Approved Hardener Incorporated in the Mix, well Bonded to Concrete Base as Described: -				
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5.5-W449	40mm thick paving with wood float finish on concrete	m^2	4		
5.5-W449	38mm thick screed laid level to receive epoxy lining (measured separately)	m^2	40		
5.5-W446	150 x 20mm thick skirting with hardener laid with a square top edge and coved junction with floor finish	m	15		
	Bonded Cement and Sand (1:4) Screed Bed in One Coat with Approved Colour Incorporated in the Mix, Well Bonded to Concrete Base as Described: -				
5.5-W446	19mm thick paving to risers of steps	m	20		
5.5-W446	25mm thick paving to treads of steps 250mm wide	m	20		
	Floor Tiling				
	Acid-Proof Granito Floor Tiles Laid with Straight Joints Both Ways: -				
5.5-Z421	Floor tiles laid to floors, treads, risers or as skirting on screed or backing (measured separately)	m^2	40		
	Epoxy Floor and Wall Paint as 'Master seal 180' or Approved Equivalent Applied Strictly in Accordance with the Manufacturer's Printed Instruction including Primer, etc.: -				
5.5-V739	Paint to floors	m^2	10		
5.5-V739	Paint to mixing tank walls, partitions and on skirting and upstands	m^2	45		
	Precast Concrete Paving Slabs				
5.5-H711	Slabs size 600 x 600 x 50mm Thick laid on and including 50mm thick bed of sand and jointing and pointing in cement mortar	m^2	60		
	PAINTING AND DECORATING				
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	Prepare and Apply Three Coats Exterior Quality Plastic Emulsion Paint: -				
	Externally on: -				
5.5-V539	Fair-faced concrete surfaces	m^2	50		
	Prepare and Apply Three Coats Interior Quality Plastic Emulsion Paint: -				
	Internally on: -				
5.5-V559	Plastered blockwork and concrete surfaces	m^2	60		
5.5-V531	Plastered sloping concrete surfaces	m^2	20		
	Prepare and Apply 3 Coats Washable Distemper to: -				
5.5-V564	Sloping surfaces of soffit of roof slab	m^2	35		
	CHEMICAL MIXING & DOSING EQUIPMENT				
	-				
5.5-N299	Provide and place 6mm stainless steel chlorine dissolving tray for alum as per details	Nr	2		
5.5-N299	Provide and place 6mm stainless steel chemical dissolving tray for soda ash as per details	Nr	1		
	Ranges for Chemical Mixing Tanks in Chemical Mixing Building				
	Supply all equipment to site, store, install, commission and maintain the following ranges and equipment, including all nuts, bolts, washers, packing etc.				
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5.5-I11	Three ranges complete of 25mm dia. uPVC pipework for water supply to chemical mixing tanks including for making connection to domestic water supply main as per details	Item	LS		
5.5-I11	Three ranges complete of 25mm diameter uPVC pipes and fittings for outlet from chemical mixing tanks to solution feed dosers as per details	Item	L.S		
5.5-I11	Three ranges complete of 80mm diameter uPVC pipes and fittings for overflow and for washout to chemical mixing tanks as per details on Drg. MWS/S/TW/CSMD/03 Include for all anchoring and supporting of all pipework and fittings.	Item	L.S		
5.5-I11	Three ranges of pipework of 25mm diameter uPVC Pipes and fittings from dosers to Chemical Dosing Point at Chemical Dosing and Mixing Channel.	Item	L.S		
5.5-Z529	Provide and fix gravity solution feed dosers of capacity up to 400l/hr., Opados Type or approved equivalent, complete with all accessories for chlorine dosing.	Nr	2		
5.5-Z529	-Ditto - but for gravity solution feed dosers of capacity up to 400l/hr., Opados Type or approved equivalent, complete with all accessories for soda ash dosing.	Nr	1		
5.5-N299	Provide all materials, fabricate and fix mechanized stirrer to chemical mixing tanks as per details on Drg. No. MWS/TW/CB/02	Nr	3		
	MISCELLANEOUS				
5.5-H511	Provide and fix precast concrete cover slabs over chemical dosing pipe channel and scour/overflow channel, size 400mm x 290mm x 50mm thick, each slab coated with 3 layers of approved epoxy lining	Nr	20		
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BILL No. 5.5

CHLORINE STORAGE, MIXING & DOSING BUILDING

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BILL No. 5.6

TREATED WATER TANK - 500m³ CAPACITY

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (Ksh)	AMOUNT (Ksh)
	GENERAL				
5.6-A260	Water Tightness Testing of the Tank in accordance with the Specifications to the satisfaction of the Engineer. Include for provision of water from approved source.	Item	L.S		
5.6-A260	Cleansing and Sterilization of the Tank in accordance with specifications. Rate to include for provision of water, all required chemicals and carrying out relevant tests as well as safe disposal of used water; all to Engineer's approval.	Item	L.S		
5.6-A260	Pressure Testing, Cleansing and Sterilization of all Tank Pipework (Inlet, Outlet, Washout, Overflow) in accordance with Specifications. Rate to include for provision of water, all required chemicals and carrying out relevant tests as well as safe disposal of used water; all to Engineer's approval.	Item	L.S		
	EARTHWORKS				
	The rates shall include for all strutting, shuttering, stabilizing the excavation faces, and keeping the excavation free of water by pumping, bailing or other means				
	Bulk excavations and top soil stripping for the reservoir site are measured under Bill No. 3.13 (Site & Ancillary Works Bill).				
	Excavate below stripped level to formation level in common material, part backfill after construction and remainder, cart away to tips identified by the Contractor in liaison with the Local Authorities or use as fill on site, all as directed by the Engineer.				
5.6-E323	depth 0.5-1	m^3	120		
5.6-E324	-Ditto- but maximum depth 1.0 m to 2.0 m	m^3	120		
5.6-E324	- depth 2.0 - 5.0 m	m^3	100		
5.6-E617	Provide and place approved hardcore packing, hand packed and compacted to Engineer's approval, maximum 300mm thick layer. Rate to include for provision, packing and compaction.	m^3	102		
5.6-E335.1	Extra Over excavation items for excavation in rock Class 'A', Blasting not permitted (Provisional)	m^3	100		
5.6-E335.2	-Ditto- but in rock Class 'B'	m^3	300		
5.6-E335.3	-Ditto- but in rock Class 'C'	m^3	1000		
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	CONCRETE WORKS				
	Provision of concrete				
5.6-F122	Designed concrete Class 12/15 in 75mm thick blinding layer under base slab of tank	m^3	26		
5.6-F142	Designed concrete C20/25	m^3	292		
	Placing of concrete				
5.6-F72*.1	Reinforced concrete for Base - external walls base including key and splay	m^3	130		
5.6-F72*.2	Reinforced concrete for Base slab -including laid to slopes	m^3	13		
5.6-F72*.3	Reinforced concrete for Bases to columns	m^3	1		
5.6-F72*.4	Reinforced concrete for Bases to internal baffle walls	m^3	2		
5.6-F72*.5	Reinforced concrete for Base to overflow chamber	m^3	1		
5.6-F73*	Reinforced concrete for Roof slab including all upstands	m^3	66		
5.6-F743.1	Reinforced concrete for External walls (thickness 500 mm)	m^3	39		
5.6-F743.2	Reinforced concrete for External walls (thickness 300 mm)	m^3	30		
5.6-F74*.1	Reinforced concrete for Baffle walls	m^3	5		
5.6-F74*.2	Reinforced concrete for Walls - washout sump	m^3	1		
5.6-F74*.3	Reinforced concrete for Walls - overflow chamber	m^3	2		
5.6-F75*	Reinforced concrete for Columns (excluding top flared heads)	m^3	1		
5.6-F78*	Reinforced concrete for Column Heads	m^3	1		
	REINFORCEMENT				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²: cut, bend and fix as directed: tenderers to allow in their rate, cost for cutting, bending, hoisting and fixing including all necessary binding wires, spacer blocks and stools				
	Reinforcement Bars, all diameters	Kg			
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5.6-G524	Diameter: 12mm	kg	15,660		
5.6-G563	Steel Fabric to BS 4483: A252 square mesh, nominal mass 3-4kg/m^2.	m^2	62		
	FORMWORK				
	Provide and Fix Shuttering Including Propping, Strutting and Striking, all as specified. Rate to include for formation of chamfers at concrete edges where specified.				
	(i) Vertical Formwork - Class F1 Finish				
5.6-G342	External sides of 200 mm base slab of tank	m	77		
5.6-G344	Sides of key; width 0.4 m to 1.0 m	m^2	125		
5.6-G345	External sides of washout sump, width 1.0 m to 1.5m	m^2	6		
	(ii) Vertical Formwork - Class F3 Finish				
5.6-G344.1	Internal sides of washout sumps, width 0.4 m to 1.0 m	m^2	3		
5.6-G344.2	Inner sides of access and inspection manholes, width 0.4 m to 1.0 m	m^2	3		
5.6-G345.1	Sides of overflow chamber, width 1.0 m to 1.8 m	m^2	12		
5.6-G344.3	Outer sides of access and inspection manholes upstands, 300 mm high; width 1.0 m	m^2	2		
5.6-G345.2	Inner sides of roof upstands 300 mm high, width exceeding 2 m	m^2	19		
5.6-G345.3	Outer sides of roof upstands 550 mm high width exceeding 2 m	m^2	37		
5.6-G345.4	Outer sides of external walls, width exceeding 2 m	m^2	180		
5.6-G345.5	Inner sides of external walls, wall thickness 0.3m to 0.5m, width exceeding 2.0 m	m^2	137		
5.6-G345.6	Baffle walls, width exceeding 2.0 m	m^2	57		
5.6-G349.1	Sides of columns; width 0.3 m	m	20		
5.6-G341	Sides of columns; width 0.1 m	m	3		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

5.6-G349.2	Sides of column bases; width 0.3 m	m	9		
	(iii) Horizontal Formwork - Class F3 Finish				
5.6-G314	Soffits of overflow chamber, width 0.4m to 1.0m	m^2	2		
5.6-G315	Soffit of roof slab, width exceeding 2.0 m	m^2	250		
	(iv) Sloping Formwork - Class F3 Finish				
5.6-G322.1	Splay on wall at overflow chamber, width 0.1 m to 0.3 m	m	2		
5.6-G322.2	Splay out base slab, width 0.1 m 0.3 m	m	60		
5.6-G322.3	Splay in wall, width 0.1 m to 0.3 m	m	61		
5.6-G324	Splay at column heads, width 0.4 m to 1.0 m	m^2	2		
5.6-G321.1	Allow for 75 mm x 75 mm rebate in walls of overflow chamber for precast concrete slabs	m	4		
5.6-G321.2	- Ditto - but 50 mm x 50 mm rebates for manhole covers	m	18		
5.6-G321	Allow for fillet to form 25 mm x 25 mm chamfer for all roof slab upstands and manhole upstands	m	140		
5.6-G351	Allow for 12 mm dia. half round fillet for drip mould round soffit of roof slab overhang	m	65		
5.6-G371.1	Boxing out for 200 mm diameter inlet pipe in 300mm thick concrete wall of tank and making good after installation of pipework	Nr	1		
5.6-G371.2	Boxing out for 200 mm diameter outlet pipe in 200mm thick concrete base slab of tank and making good after installation of pipework	Nr	1		
5.6-G371.3	Boxing out for 200 mm diameter overflow pipe in 200mm thick concrete base of overflow chamber and making good after installation of pipework	Nr	1		
5.6-G371.4	- Ditto - but for 200mm diameter scour pipe in 200mm thick concrete walls	Nr	1		
5.6-G371.5	- Ditto - but for 200mm diameter scour pipe in 500mm thick concrete walls	Nr	1		
	CONCRETE SURFACE FINISH				
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5.6-G812	Provide Class UF3 Finish for top of base slab of tank	m^2	192		
	CONSTRUCTION JOINTS				
	Provide and install the following water stops in construction joints including all surface treatment, formwork, forming of rebate and sealing of rebate with polysulphide sealant, all as per drawings and specification.				
5.6-G621	Open surface with filler, average width n.e. 0.5 m	m^2	37		
5.6-G641	Formed surface with filler, average width n.e. 0.5 m	m^2	70		
5.6-G652.1	Plastic horizontal water stops, rear guard type, width 200 mm	m	35		
5.6-G652.2	Plastic vertical water stops, width 200 mm	m	125		
5.6-G670	Sealed 20 mm x 20 mm rebates with polysulphide joint sealant	m	305		
	PIPEWORK - FITTINGS & VALVES				
	Supply, Transport to Site and Store in Secure Place, Including Jointing Material, Bolts, Gaskets, Packing, Jointing Glues, etc. as Applicable				
	(i) Inlet pipework for Proposed 500m³ Tank - cement lined internally epoxy coated externally steel pipe PN 16)				
5.6-J391.1	200mm dia. Flanged spigot pipe with puddle flange at 400mm from spigot end, 1200mm long (Mark 1)	Nr	1		
5.6-J391.2	200mm dia. Flanged spigot pipe, 1200mm long (Mark 2)	Nr	1		
5.6-J391.3	200mm dia. Coupling (Mark 3)	Nr	1		
	(iii) Scour pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.6-J391.1	200mm dia. Flanged Spigot pipe, 2400mm long with a puddle flange at 120mm from the spigot end (Mark i)	Nr	1		
5.6-J391.2	200mm dia. All Flanged pipe, 4350mm long (Mark ii)	Nr	1		
5.6-J811	200mm dia. All flanged Gate Valve to BS 5163 with an extended spindle 4400mm long and hand wheel (Mark iii)	Nr	1		
5.6-J311	200mm dia. Flanged 30° bend, one end beveled (Mark iv)	Nr	1		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

	(iv) Overflow pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.6-J391.1	200mm dia. Flanged Spigot pipe, 300mm long with a puddle flange at 100mm from spigot end (Mark a)	Nr	1		
5.6-J311	200mm dia. All Flanged 45^{o} bend (Mark b)	Nr	1		
5.6-J391.2	200mm dia. Flanged Spigot pipe, 2500mm long with spigot end beveled (Mark c)	Nr	1		
	(iv) Outlet pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.6-J373	400mm dia. Flanged bell mouth, 240mm long (Mark I)	Nr	1		
5.6-J383	400mm dia. All flanged spigot pipe 3014mm long with a puddle flange 1878mm from one flanged end	Nr	1		
5.6-J343	400mm dia. Coupling	Nr	1		
	Transport from Site, Store, Install, Test & Commission. Include for Excavation & Backfilling of Pipe Trenches where Applicable.				
	(i) Inlet pipework for Proposed 500m^{3} Tank - cement lined internally epoxy coated externally steel pipe PN 16)				
5.6-I321	300mm dia. Flanged spigot pipe with puddle flange at 400mm from spigot end, 1200mm long (Mark 1)	Nr	1		
5.6-J392	300mm dia. Flanged spigot pipe, 1200mm long (Mark 2)	Nr	1		
5.6-J392	300mm dia. Coupling (Mark 3)	Nr	1		
	(iii) Scour pipework – Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.6-I321	200mm dia. Flanged Spigot pipe, 2400mm long with a puddle flange at 120mm from the spigot end (Mark i)	Nr	1		
5.6-I321	200mm dia. All Flanged pipe, 4350mm long (Mark ii)	Nr	1		
5.6-J811	200mm dia. All flanged Gate Valve to BS 5163 with an extended spindle 4400mm long and hand wheel (Mark iii)	Nr	1		
5.6-J311	200mm dia. Flanged spigot 30^{o} bend, one end beveled (Mark iv)	Nr	1		
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	(iv) Overflow pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.6-J391	200mm dia. Flanged Spigot pipe, 300mm long with a puddle flange at 100mm from spigot end (Mark a)	Nr	1		
5.6-J311	200mm dia. All Flanged 45^{o} bend (Mark b)	Nr	1		
5.6-I111	200mm dia. Flanged Spigot pipe, 2500mm long with spigot end beveled (Mark c)	Nr	1		
	(iv) Outlet pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.6-J373	400mm dia. Flanged bell mouth, 240mm long (Mark l)	Nr	1		
5.6-J383	400mm dia. All flanged spigot pipe 3014mm long with a puddle flange 1878mm from one flanged end	Nr	1		
5.6-J343	400mm dia. Coupling	Nr	1		
	METALWORK				
	All steelwork to be completely cleaned by acid dipping prior to galvanizing.				
	Supply and Install:				
5.6-N130	Galvanized Mild Steel Ladders, height n.e. 6000 mm installed in the Tank, as per details on Drg. No. MWS/SD/14	Nr	1		
5.6-N130	-Ditto- but ladders height n.e. 5000mm fixed externally to walls of Tank.	Nr	4		
5.6-G832	Lockable composite covers over access and inspection manholes to tank as per details on Drg. No. MWS/SD/022, for manhole size 700mmx700mm	Nr	4		
	MISCELLANEOUS WORK				
	Provide and lay				
5.6-W646	3 layers of 4mm thick, 300mm wide, joint filling material between top of wall and the roof slab - Polyflex APP modified Membrane as supplied by Kenbro Industries or approved equivalent - including all surface preparation, etc., to the manufacturer's detailed instructions.	m	65		
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5.6-W661	500-gauge polythene sheeting on blinding below base slab	m^2	340		
5.6-W491	150 mm thick layer of pumice on roof slab of tank	m^2	240		
5.6-Z512	Supply and install vent pipes on roof of tank as per details on Drg No. (MWS/TW/TWT/01	Nr	6		
	SCOUR CHAMBER				
5.6-K236	Provide all materials, excavate for and construct reinforced concrete scour chamber size 1800mm x 1800mm x 3800mm deep.	Nr	1		
PAGE TOTAL CARRIED TO SECTION COLLECTION SHEET					

BILL No. 5.6

TREATED WATER TANK - 500m³ CAPACITY

		Amount (Ksh.)
	Page Total, Page 1 of 8 Page Total, Page 2 of 8 Page Total, Page 3 of 8 Page Total, Page 4 of 8 Page Total, Page 5 of 8 Page Total, Page 6 of 8 Page Total, Page 7 of 8 Page Total, Page 8 of 8	
	Bill Total	

BILL No. 5.7

BACKWASH WATER PUMP HOUSE

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (Ksh)	AMOUNT (Ksh.)
	BUILDING WORKS				
	SUBSTRUCTURES (PROVISIONAL)				
	Excavations and Earthworks				
	The rate shall include for all strutting, shuttering, stabilizing the excavation faces and keeping the excavation free of water by pumping, bailing or other means				
	Excavate for foundations, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer				
	Excavate 0.5 - 1.0m Starting from Reduced Level to Receive: -				
5.7-E323	Foundations and Pump House Pit	m^3	55		
	Excavate 1.0 - 2.0m Starting from Reduced Level to Receive: -				
5.7-E324	Foundations and Pump House Pit	m^3	55		
	Excavate 2.0 - 5.0m Starting from Reduced Level to Receive: -				
5.7-E325	Foundations and Pump House Pit	m^3	55		
	Extra Over Excavation in Any Position for: -				
5.7-E335	Excavating in rock Class "A"	m^3	20		
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5.7-E335	Excavating in rock Class "B"	m^3	14		
5.7-E335	Excavating in rock Class "C"	m^3	100		
	Approved Filling as Described: -				
5.7-E615	Provide and deposit approved compacted murram in maximum 150mm thick layers in making up levels under ground floor slab over 300mm including achieving satisfactory compaction	m^3	18		
5.7-E617	Provide and deposit approved hardcore fill material 300mm thick including achieving satisfactory compaction	m^3	15		
5.7-E615	Provide, lay and level out fine crushed stone, sand or gravel blinding 50mm thick to surface of filling, including watering and rolling to achieve satisfactory compaction	m^2	50		
	Approved Selected Filling: -				
5.7-E614	Fill and ram selected excavated materials around foundations and buildings	m^3	50		
	Disposal of Surplus Spoil: -				
5.7-E532	Cart away surplus excavated materials to an approved dumping site	m^3	124		
	Anti-Termite Treatment				
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5.7-E790	Termidor 25 EC or other equal approved anti-termite chemical treatment: applied by an approved professional pest control specialist:10-year warranty: strictly applied in accordance with the manufacturer's instructions	m^2	50		
	Damp-Proof Membrane				
5.7-W239	1000 Gauge polythene sheeting, laid over hardcore	m^2	50		
	Concrete Work:				
	Provision of concrete				
5.7-F122	Designed concrete C12/15	m^3	50		
5.7-F142	Designed concrete C20/25	m^3	34		
	Placing of concrete				
5.7-F611	Mass concrete for blinding works,75mm thick blinding under foundation concrete, column bases or over hardcore	m^3	50		
5.7-F7**	Reinforced concrete for foundation trenches, column bases and entrance steps	m^3	1		
5.7-F78*.1	Reinforced concrete for 150mm thick topping	m^3	5		
5.7-F78*.2	Reinforced concrete for 350mm thick surface bed	m^3	21		
5.7-F721	Reinforced concrete for 100mm thick ramp laid to slope not exceeding 15 degrees from horizontal	m^3	5		
5.7-F722	Reinforced concrete for Plinth size 1700mm long x 850mm wide x 300mm deep	m^3	2		
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5.7-X399	Drainage sump internal size 400mm long x400mm wide x 500mm deep made out of 150mm thick reinforced concrete base and walls including forming rebate 50mm wide x 75mm deep to top inner edges of sump wall to receive chequer plate cover (m.s.) and including all necessary excavation, disposal and formwork	Nr	1		
5.7-X399	Form drainage channel or cable duct internal size 200mm wide x 200mm deep in concrete floor slab including forming rebate 50mm wide x 75mm deep to top inner edges of channel wall to receive chequer plate cover (m.s.)	m	12		
5.7-X399	Form drainage channel or cable duct internal size 200mm wide and depth varying from 225mm to 250mm deep in concrete floor slab including forming rebate 50mm wide x 75mm deep to top inner edges of channel wall to receive mild steel grating cover (m.s.)	m	10		
5.7-X399	Form pocket internal size 1700mm long x 850mm wide x 150mm deep in concrete floor slab to receive pump plinth (m.s.) including all necessary formwork (floor concrete material not deducted)	Nr	4		
5.7-F142	Isolated columns and piers in foundations	m^3	3		
5.7-F142	Walls	m^3	30		
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	Reinforcement				
	Fabric Reinforcement No. A142 Mesh Size 150 x 150mm Weighing 2.22 kgs Per m^2, Including Bends, Tying Wire and Distance Blocks: -				
5.7-G561	Fabric reinforcement with minimum 150mm wide side and end laps, laid in bed	m^2	50		
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm^2: cut, bend and fix as directed: tenderers to allow in their rate, cost for cutting, bending, hoisting and fixing including all necessary binding wires, spacer blocks and stools				
	Formwork				
	Provide and Fix Shuttering Including Propping, Strutting and Striking, all as Specified				
	Sawn Formwork - Class F1 Finish: -				
5.7-G345	Vertical sides of column bases, columns, reinforced concrete walls and steps in foundations	m^2	90		
	Wrot Formwork - Class F3 Finish: -				
5.7-G343	Edges of beds, paving's, plinths and risers of steps not exceeding 400mm wide	m	70		
	Joint Filler				
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5.7-G839	20mm thick resin bonded cork filler between pump plinth and 150mm thick floor slab sealed with 25mm deep bitumen	m^2	10		
	Damp-Proof Course:				
	Bituminous Felt Damp-Proof Course as Described: -				
5.7-W239	200mm Wide under walls	m	35		
	Plinths.				
5.7-W449	15mm Cement and sand (1:3) render to plinth walls, finished with a wood float	m^2	10		
5.7-V839	Prepare and apply two coats of bituminous paint on rendered plinth walls	m^2	10		
	Construction Joints				
5.7. G652	Provide and fix 200mm wide Expedite Super cast Water foil PVC or approved similar water stop in vertical/horizontal joint in walls including all surface treatment, formwork, forming of rebate 20 x 20mm and sealing of rebate with polysulphide sealant all as per Drawings and Specifications	m	35		
	Prepare and Apply 3 Coats of Bituminous Paint: -				
	Externally to: -				
5.7-V839	Concrete walls of pump house to 150mm above finished ground level	m^2	95		
	SUPERSTRUCTURE				
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	CONCRETE, FORMWORK, REINFORCEMENT				
	Provision of concrete				
5.7-F142	Designed concrete C20/25	m^3	27		
	Placing of concrete				
5.7-F7**	Reinforced concrete for Columns, beams and stairs	m^3	7		
5.7-F731	150mm thick solid suspended floor and landing slabs	m^3	20		
	Formwork				
	Provide and Fix Shuttering Including Propping, Strutting and Striking, all as Specified				
	Sawn Formwork - Class F1 Finish: -				
5.7-G315	Horizontal soffits of suspended floor and landing slabs	m^2	15		
5.7-G823	Raking open string edge of staircase not exceeding 325mm (extreme) high including cutting bottom edge to profile of treads and risers	m	8		
	Wrot Formwork - Class F3 Finish: -				
5.7-G343	Vertical sides of columns	m^2	55		
5.7-G343	Sides and soffits of beams	m^2	40		
5.7-G345	Sloping soffits of staircases and ramps not exceeding 15 degrees from horizontal	m^2	5		
5.7-G343	Edges of beds, paving's, plinths and risers of steps not exceeding 300mm wide	m	50		
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	Reinforcement				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²:				
	Reinforcement, all diameters				
5.6-G523	Diameter: 10mm	Kg	1500		
5.6-G524	Diameter: 12mm	Kg	1500		
	WALLING				
	External Walls				
	Selected Machine Dressed Natural Stone Block Walling, reinforced with 20 swg Hoop Iron at Every alternate Course, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.7-U121	200mm thick walling	m^2	50		
	Labours				
5.7-U178	Extra over walling for ruled horizontal and flush vertical joints	m^2	50		
	Precast Concrete Cills				
5.7-H810	200mm thick x 275mm wide precast concrete cill bedded, jointed and pointed in cement mortar on top of 200mm wall	m	18		
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	ROOF COVERINGS				
	Double Pitch Roof Truss With 600mm Eaves Projection, in 150 x 50mm Rafters, Ceiling Joists, Struts and Ties in Sawn Cypress Grade II Seasoned and Pressure Impregnated with Wood Preservative and Timber Joints with Bolted and Nailed Connections to the Engineer's Approval: -				
5.7-W321	Gauge 28 pre-painted IT5 approved roofing sheets, colour to approval of the Engineer	m^2	120		
	Extra Over Roofing for: -				
5.7-W371	Ridge capping.	m	2		
5.7-W371	Hip capping	m	25		
5.7-W371	Filled ends of ridge capping or hip capping	Nr	6		
	CARPENTRY AND JOINERY				
	Carpentry				
	Roof Trusses				
	Double Pitch Roof Truss With 600mm Eaves Projection, in 150 x 50mm Rafters, Ceiling joists, Struts and Ties in Sawn Cypress Grade II Seasoned and Pressure Impregnated with Wood Preservative and timber joints with Bolted and Nailed Connections to the Engineer's Approval: -				
5.11-Z118	Equal truss 4200mm clear span and 1016mm high	Nr	6		
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	Other Roof Members				
	Sawn Cypress Grade II Maximum Moisture Content 12% Seasoned and Pressure Impregnated with Wood Preservative and Timber Joints with Bolted and Nailed Connections to the Engineer's Approval: -				
5.7-O214	150 x 50mm Intermediate, hip and valley rafters	m	120		
5.7-O214	150 x 50mm Purlins	m	225		
5.7-O214	200 x 50mm Ridge board	m	2		
5.7-O214	100 x 50mm Wall plate tied to wall with 20 s.w.g. hoop iron at 900mm centers and bedded in cement mortar (1:3) on top of wall	m	25		
	Joinery				
	General Timbers				
	Wrot Prime Grade Cypress, Including Finishing With Three Coats First Quality Gloss Paint: -				
5.7-O224	250 x 40mm Fascia board	m	35		
	DOORS, FRAMES, ETC				
	METALWORK				
	Steel Doors				
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	Pressed Metal Louvre Doors				
	Supply and Fix the Following Pressed Metal Louvre Doors with 100 x 50mm Stiles and Top Rails, 150 x 50mm Middle and Bottom Rails with Pressed Metal Infill Louvres and 100 x 50mm Pressed Metal Frames, Including Hinges, Pad Bolts and Tower Bolts, All To Manufacturer's Details, With Three Coats Gloss Paint Complete With Opening Accessories Including Bedding and Pointing Around Frames in Cement Mortar: -				
5.7-Z323	Double door size 1800 x 2400 mm high in two equal panels (D1) including cutting at top of door to allow 356mm x 174mm x 45kg/m UB Gantry Beam through.	Nr	1		
	Steel Casement Windows				
	Supply and Fix the Following Standard Section Steel Casement Windows, including 4mm Thick Clear Sheet Glass glazed to Steel Casements with Putty, Complete with Opening Accessories, including Building in Lugs to Jambs and Head and Water-Proofing and Filling Around Opening with Approved Compound; all Finished with Three Coats Oil Paint: -				
	-				
5.7-Z321	Window size 1797 x 1197mm high with 1 No. fixed and 2 No. side hung opening bottom sashes and with 2 No. fixed and 1 No. top-hung top ventilators 200mm high with permanent ventilator hood over (W1)	Nr	6		
5.7-Z321	Window size 1197 x 597mm high with 1 No. fixed and 1 No. top-hung opening bottom sashes and with permanent ventilator hood over (W5a)	Nr	3		
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	Burglar Proofing to Windows				
	Provide and fix burglar proofing made from 12mm x 12mm M.S. square bars at 150mm vertically and 200mm centers horizontally and fixed internally to wall with 12mm M.S. Fish tail lugs at 600mm centers painted with one coat primer and 3 coats gloss paint, to the following windows:				
5.7-M479	To windows size 1797 x 1197mm (W1)	Nr	6		
5.7-M479	To windows size 1197 x 597mm (W5a)	Nr	3		
	Balustrades and Railings				
	Balustrade Unit 1000mm High comprising 32mm Diameter Galvanized Pipe Top, Middle and Bottom Rails and 40mm Diameter Galvanized Pipe Balusters Spaced at Maximum 1500mm Centers and Bottom End Bent, Fanged and Built into Mortice in Concrete, including all Necessary Welding and Three Coats Gloss Paint: -				
5.7-N149	Raking balustrade	m	6		
5.7-N149	Level railing unit	m	14		
	Angles To Risers and Treads				
5.7-N161	40 x 40 x 3mm thick mild steel angle fixed with fish-tailed lugs to junction of treads and risers and bedded to concrete	m	14		
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	CEILING				
	12mm Thick Approved Chipboard to BS 2604, Part 2, density 480-640kgs, per Square Meter in Sheets Size 2400 x 1200mm Fixed to and Including 50 x 50mm Sawn Cypress Grade 2 Battens at 600mm Centers in Both Directions Complete with Gauge Jointing Material				
5.7-Z453	Horizontal ceiling fixed to underside of trusses	m^2	35		
5.7-Z159	12mm Cornice 50mm high, plugged	m	27		
5.7-Z159	Extra over ceiling lining for forming removable access trap door size 600 x 600mm with 100 x 38 mm sawn treated cypress trimming joists between tie beams,120 x 20mm (finished) Wrot cypress frame all round and 20mm blockboard removable panel set loose on top of framing	Nr	1		
	Builders Work in Connection with Electrical Installations				
5.7-Z739	Allow for cutting and leaving all necessary holes, notches, mortices, sinkings and chases both in the structure and its finishes and for all making good in connection with concealed conduits or cables	Item	L.S		
	RENDERING				
	12.5mm Thick Cement and Sand Render as Described Externally on: -				
5.7-W449	Blockwork and concrete surfaces	m^2	55		
	PLASTERING				
	12.5mm Thick Gauged Cement Plaster as Described Internally on: -				
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5.7-W449	Blockwork and concrete surfaces	m^2	95		
5.7-W449	Sloping concrete surfaces	m^2	5		
	Screeds and backing				
	Bonded Cement and Sand (1:3) Screed Bed in One Coat with Approved Hardener Incorporated in the Mix, Well Bonded to Concrete Base as Described: -				
5.7-W449	40mm thick paving with wood float finish on concrete	m^2	42		
5.7-W446	19mm thick paving to risers of steps 172mm high	m	13		
5.7-W446	25mm thick paving to treads of steps 250mm wide	m	13		
5.7-W446	150 x 20mm thick skirting laid with a square top edge and coved junction with floor finish	m	45		
5.7-G823	Raking open string edge of staircase not exceeding 325mm (extreme) high including cutting bottom edge to profile of treads and risers	m	5		
	Precast Concrete Paving Slabs				
5.7-H511	Slabs size 600 x 600 x 50mm Thick laid on and including 50mm thick bed of sand and jointing and pointing in cement mortar	m^2	90		
	PAINTING AND DECORATING				
	Prepare and Apply Three Coats Exterior Quality Plastic Emulsion Paint: -				
	Externally on: -				
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5.7-V539	Fair-faced concrete surfaces	m^2	60		
	Prepare and Apply Three Coats Interior Quality Plastic Emulsion Paint: -				
	Internally on: -				
5.7-V539	Plastered blockwork and concrete surfaces	m^2	100		
5.7-V539	Plastered sloping concrete surfaces	m^2	10		
	Prepare and Apply Three Coats Washable Distemper as Described to: -				
5.7-V564	Horizontal soffits of suspended chipboard or plasterboard ceilings	m^2	28		
	PIPEWORK, FITTINGS AND VALVES				
	Supply, Transport to Site and Store in Secure Place, Including Jointing Material, Bolts, Gaskets, Packing, Jointing Glues, etc. as Applicable				
	Backwash Pumps - Suction Main (Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.7-J312	300mm dia. flanged spigot special 45^0 bend (Mark A)	Nr	1		
5.7-J392	300mm dia. all flanged pipe, length 1350mm with Puddle Flange at 475mm from one end (Mark B)	Nr	1		
5.7-J392	300mm dia. all flanged pipe, length 2850mm (Mark C)	Nr	1		
5.7-J322	300mm x 300mm x 150mm dia. special all flanged radial invert tee (Mark D)	Nr	1		
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5.7-J391	150mm dia. all flanged pipe, length 850mm (Mark E)	Nr	2		
5.7-J311	150mm dia. all flanged 90º bend (Mark F)	Nr	2		
5.7-J391	150mm dia. all flanged pipe 525mm long (Mark G)	Nr	2		
5.7-J332	300mm x 150mm dia. double flanged Eccentric Taper (Mark H)	Nr	2		
5.7-J391	150mm dia. all flanged pipe, length 870mm with puddle flange at 400mm from one end (Mark I)	Nr	2		
5.7-J391	150mm dia. flanged spigot pipe 350mm long (Mark J)	Nr	2		
5.7-J351	150 mm dia. flange adaptor (Mark K)	Nr	2		
5.7-J811	150mm dia. all flanged gate valve to BS 5163 (Mark L)	Nr	2		
5.7-J331	150mm x 80mm dia. all flanged eccentric taper (Mark M)	Nr	2		
	Backwash Pumps - Delivery Main (Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.7-J331	100mm x 65mm dia. all flanged concentric taper with 25mm dia. male threaded tapping for Pressure Gauge (Mark a)	Nr	2		
5.7-J891	25mm dia. pressure gauge (pressure class up to 10 bars Hunter or approved equivalent (Mark b)	Nr	2		
5.7-J311	100mm dia. double flanged 90º bend (Mark c)	Nr	3		
5.7-J831	100mm dia. all flanged free acting check valve (Non return valve (Mark d)	Nr	2		
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5.7-J811	100mm dia. all flanged gate valve to BS 5163 (Mark e)	Nr	2		
5.7-J351	100mm dia. flange adaptor (Mark f)	Nr	2		
5.7-J391	100mm dia. flanged spigot pipe 380mm long (Marg g)	Nr	2		
5.7-J391	100mm dia. all flanged pipe 800mm long with puddle flange at 390mm from one end (Mark h)	Nr	2		
5.7-J391	100mm dia all flanged pipe, length 1500mm (Mark i)	Nr	2		
5.7-J391	100mm dia. all flanged pipe, length 1475mm (Mark j)	Nr	1		
5.7-J321	100mm x 100mm x 100mm dia. all flanged radial tee (Mark k)	Nr	1		
5.7-J331	100mm x 150mm dia. all flanged concentric taper (Mark l)	Nr	2		
5.7-J391	150mm dia. flanged spigot pipe 1200mm long (Mark m)	Nr	1		
5.7-J391	150mm dia. coupling (Mark n)	Nr	1		
	Transport from Site Store, Install, Test and Commission				
	Backwash Pumps - Suction Main (Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.7-J312	300mm dia. flanged spigot special 45^0 bend (Mark A)	Nr	1		
5.7-J392	300mm dia. all flanged pipe, length 1350mm with Puddle Flange at 475mm from one end (Mark B)	Nr	1		
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5.7-J392	300mm dia. all flanged pipe, length 2850mm (Mark C)	Nr	1		
5.7-J322	300mm x 300mm x 150mm dia. special all flanged radial invert tee (Mark D)	Nr	1		
5.7-J391	150mm dia. all flanged pipe, length 850mm (Mark E)	Nr	1		
5.7-J311	150mm dia. all flanged 90^{o} bend (Mark F)	Nr	1		
5.7-J391	150mm dia. all flanged pipe 525mm long (Mark G)	Nr	1		
5.7-J332	300mm x 150mm dia. double flanged Eccentric Taper (Mark H)	Nr	1		
5.7-J391	150mm dia. all flanged pipe, length 870mm with puddle flange at 400mm from one end (Mark I)	Nr	2		
5.7-J391	150mm dia. flanged spigot pipe 350mm long (Mark J)	Nr	2		
5.7-J351	150 mm dia. flange adaptor (Mark K)	Nr	2		
5.7-J811	150mm dia. all flanged gate valve to BS 5163 (Mark L)	Nr	2		
5.7-J331	150mm x 80mm dia. all flanged eccentric taper (Mark M)	Nr	2		
	Backwash Pumps - Delivery Main (Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.7-J331	100mm x 65mm dia. all flanged concentric taper with 25mm dia. male threaded tapping for Pressure Gauge (Mark a)	Nr	2		
5.7-J891	25mm dia. pressure gauge (pressure class up to 10 bars Hunter or approved equivalent (Mark b)	Nr	2		
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5.7-J311	100mm dia. double flanged 90º bend (Mark c)	Nr	3		
5.7-J831	100mm dia. all flanged free acting check valve (Non return valve (Mark d)	Nr	2		
5.7-J811	100mm dia. all flanged gate valve to BS 5163 (Mark e)	Nr	2		
5.7-J351	100mm dia. flange adaptor (Mark f)	Nr	2		
5.7-J391	100mm dia. flanged spigot pipe 380mm long (Marg g)	Nr	2		
5.7-J391	100mm dia. all flanged pipe 800mm long with puddle flange at 390mm from one end (Mark h)	Nr	2		
5.7-J391	100mm dia all flanged pipe, length 1500mm (Mark i)	Nr	2		
5.7-J391	100mm dia. all flanged pipe, length 1475mm (Mark j)	Nr	1		
5.7-J321	100mm x 100mm x 100mm dia. all flanged radial tee (Mark k)	Nr	1		
5.7-J331	100mm x 150mm dia. all flanged concentric taper (Mark l)	Nr	2		
5.7-J391	150mm dia. flanged spigot pipe 1200mm long (Mark m)	Nr	1		
5.7-J391	150mm dia coupling (Mark n)	Nr	1		
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	PUMPS				
	Backwash Pumps water Pumps				
5.7-Z523	Supply, transport to site, install, test and commission centrifugal pumps (1 duty, 1 standby) KSB ETANORM 65-50 or approved equivalent complete with motor Maximum frequency of starts: 30 starts per hour, base plate, fixing bolts, grouting, etc., for the following characteristics: Flow 19 liters per second, dynamic head **25m**, with the total efficiency of pump and motor being as high as possible (A minimum of 75%).	Nr	2		
5.7-Z772	Electrical connections from isolators to pump control panels and from control panels to electric motors, including all necessary earthing, cabling and conduiting.	Sum	4		
5.7-Z781	Electrode for stopping above pumps should the level in the tank be too low	Nr.	4		
5.7-N299	300 mm line strainer	Nr.	2		
5.7-N299	Suction Vortex plates	Nr.	2		
5.7-J872	300mm pressure relief valves	Nr.	2		
5.7-J392	400mm x 300mm waste cones for pressure relief valve	Nr.	2		
	MISCELLANEOUS				
5.7-M499	Provide and fix shop-primed gantry girder made out of 356 x 174 x 45 kilograms per meter universal beam. Include for 1,000kg capacity chain block mounted on a roller bracket on the gantry and include for the fixing of the gantry and chain block on to concrete beams with 16mm bolts, all as per details on Drg No. MWS/TW/BW/PH/03	Nr	1		
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	Provide and Install:				
5.7-N230	3mm thick 300mm wide chequered plate cover over 200mm wide cable ducts.	m	9		
5.7-N230	3mm thick 250mm wide chequered plate cover over 150mm wide cable ducts	m	3		
5.7-N180	Mild steel grating cover 240mm wide, made of 16mm round M.S. bars welded to 38mm x 38mm x 6mm MS angles, as per details on Drg. No MWS/SD/23-26	m	5		
5.7-N170	Mild steel cover over drainage sump, size 490mm x 490mm, made of 16mm round M.S. bars welded to M.S. angels as per details on Drg. No. MWS/SD/23-26	Nr	1		
5.7-N299	Suction Vortex plates	Item	L.S		
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BILL No. 5.7

PUMP HOUSE

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BILL No. 5.8

BACKWASH WATER AND SLUDGE LAGOON

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (Ksh)	AMOUNT (Ksh)
	EXCAVATION				
	The rates shall include for all strutting, shuttering, stabilizing the excavation faces, and keeping the excavation free of water by pumping, bailing or other means				
	Bulk excavations and top soil stripping for all structures are measured under Bill No. 5.13 (Site & Ancillary Works).				
	Excavate for foundations, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer				
	Excavate below stripped level to formation level in common material, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer.				
	Quantities are combined for Backwash Water and Sludge Lagoon				
5.8-E323	Maximum depth n.e. 1.0 m	m^3	450		
5.8-E324	-Ditto- but maximum depth 1.0 m to 2.0 m	m^3	425		
5.8-E325	-Ditto- but maximum depth 2.0 m to 3.0 m	m^3	200		
5.8-E335.1	Extra Over Item 5.8-E323 to 5.8-E325 for excavation in rock Class 'A', Blasting not permitted (Provisional)	m^3	175		
5.8-E335.2	Extra Over Item 5.8-E323 to 5.8-E325 for excavation in rock Class 'B', Blasting not permitted (Provisional)	m^3	245		
5.8-E335.3	Extra Over Item 5.8-E323 to 5.8-E325 for excavation in rock Class 'C', Blasting not permitted (Provisional)	m^3	185		
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5.8-E512	Preparation of excavated surfaces including trimming sides of excavation to 45 degrees slope	m^2	350		
	Fill				
5.8-E634.1	Transport approved excavated material from site and use as fill and compact in 200 mm layers as specified on site as and where directed by the Engineer. Compaction tests to be done and rates to include for this	m^3	1,200		
5.8-E634.2	-Ditto- but under concrete access ramp	m^3	80		
5.8-E637	Provide approved hardcore material and compact in layers of 200 mm, blinded with final material 25 mm thick (Provisional)	m^3	100		
	CONCRETE WORKS				
	Provide, mix and place concrete as directed:				
	Provision of concrete				
5.8-F122	Designed concrete class 12/15 in 75mm thick blinding under the base of backwash water lagoon, sludge lagoon and partition wall	m^3	29		
5.8-F142	Designed concrete C20/25	m^3	74		
	Placing of Concrete				
5.8-F611.1	Mass concrete class 12/15 in 75mm thick blinding under the base of backwash water lagoon, sludge lagoon and partition wall	m^3	14		
5.8-F611.2	Mass concrete blinding on sides of backwash water lagoon and sludge lagoon at 45 degrees slope including all necessary formwork	m^3	15		
5.8-F721.1	Base Slab of backwash water lagoon and sludge lagoon 100mm thick	m^3	27		
5.8-F721.2	100mm thick slab on sides of backwash lagoon at 45 degrees slope including all necessary formwork	m^3	20		
5.8-F721.3	200mm thick slab on top surface of access ramp at slope n.e. 15 degrees, including all necessary formwork	m^3	12		
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5.1-G823	Extra over item 5.8-F142 above for forming ribbed surface finish on concrete slab on access ramp	m^2	35		
5.8-F721.4	Base slab for 200mm thick RC Lagoon dividing wall	m^3	10		
5.8-F742	200mm thick RC Lagoon dividing wall	m^3	15		
	REINFORCEMENT				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm² :				
5.8-G52*	Reinforcement, all diameters (Provisional)	kg	5,000		
5.8-G524	Diameter: 12mm	kg	450		
5.8-G523	Diameter: 10mm	kg	279		
5.8-G566	Mesh reinforcement type A393 weighing 6.16 kg/m^2 on backwash water lagoon and sludge lagoon base slab and sloping surfaces	m^2	400		
	FORMWORK				
	Provide and fix shuttering including propping, strutting and striking, all as specified				
	Vertical Formwork - Class F1 Finish				
5.8-G342	Sides of base slab of backwash water lagoon and sludge lagoon, width n.e. 0.2m	m	80		
5.8-G342	Side of base slab of 200mm thick RC dividing wall, width n.e. 0.2m	m	55		
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5.8-G342	Sides of base slab for lagoon, width n.e. 0.2m	m	50		
	Vertical Formwork - Class F3 Finish				
5.8-G343	Side of RC wall, width n.e. 3.0m	m^2	120		
	Sloping Formwork - Class F3 Finish				
5.8-G324	Sides of sloping walls at 45 degrees slope	m^2	170		
5.8-G371	Boxing out 500mm x 500mm holes in concrete walls of backwash water lagoon and making good after installation of pipework	Nr	1		
5.8-G371	Boxing out 350mm x 350mm holes in concrete walls of backwash water and sludge lagoon and recirculation chamber. Rate includes making good after installation of pipework	Nr	11		
	MASONRY WALLING				
	Selected Coral Stone Block Walling, Fine Chisel Dressed or Machine Dressed, reinforced with 20 swg Hoop Iron at every alternate course, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.8-U121	200mm thick masonry dividing walls in sludge and backwash lagoons	m^2	11		
	CONCRETE SURFACE FINISHES				
	Granolithic Concrete				
5.8-G814	Provide all materials and lay grano-finish 75mm thick to slopes and bases of backwash water lagoon and sludge lagoon to slopes as shown in Drg. No. MWS/TW/SBWL/01	m^2	350		
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	PIPEWORK - APPROVED CEMENT LINED INTERNALLY EPOXY COATED EXTERNALLY PN 16				
	Supply, transport to site and store in secure place, including jointing materials, bolts, gaskets, packing, jointing glues, etc. as applicable				
	Sludge and Backwash water lagoon Sludge Draw-off Pipework (as shown on Drg. No. MWS/TW/SBWL/02-03)				
5.8-I311	200mm dia. Flanged spigot pipe 3.0m long with end beveled (cut to suit on site) (Mark A)	Nr	2		
5.8-J811	200mm dia. All Flanged gate valve with extended spindle and wheel (Mark B)	Nr	2		
5.8-J311	200mm dia. Flanged Spigot 90^0 Bend (Mark C)	Nr	2		
	Sludge and Backwash water lagoon overflow/Settled water draw-off pipework (as shown on Drg. No. MWS/TW/SBWL/02-03)				
5.8-I311	200mm dia. Flanged spigot pipe 5.0m long with end beveled (cut to suit on site) (Mark a)	Nr	2		
5.8-J811	200mm dia. All Flanged gate valve with extended spindle and wheel (Mark b)	Nr	2		
5.8-J311	200mm dia. Flanged Spigot 90^0 Bend (Mark c)	Nr	2		
5.8-I311	200mm dia. Plain Ended pipe 4.5m long with end beveled (cut to suit on site) (Mark d)	Nr	1		
	Transport from Site Store, Install, Test and Commission				
	Sludge and Backwash water lagoon Sludge Draw-off Pipework (as shown on Drg. No. MWS/TW/SBWL/02-03)				
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5.8-I311	200mm dia. Flanged spigot pipe 3.0m long with end beveled (cut to suit on site) (Mark A)	Nr	2		
5.8-J811	200mm dia. All Flanged gate valve with extended spindle and wheel (Mark B)	Nr	2		
5.8-J311	200mm dia. Flanged Spigot 90^0 Bend (Mark C)	Nr	2		
	Sludge and Backwash Water Lagoon Overflow/ Settled water draw-off pipework (as shown on Drg. No. MWS/TW/SBWL/02-03)				
5.8-I311	200mm dia. Flanged spigot pipe 5.0m long with end beveled (cut to suit on site) (Mark a)	Nr	2		
5.8-J811	200mm dia. All Flanged gate valve with extended spindle and wheel (Mark b)	Nr	2		`
5.8-J311	200mm dia. Flanged Spigot 90^0 Bend (Mark c)	Nr	2		
5.8-I311	200mm dia. Plain Ended pipe 4.5m long with end beveled (cut to suit on site) (Mark d)	Nr	1		
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BILL No. 5.8

BACKWASH WATER AND SLUDGE LAGOON

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BILL No. 5.9

SLUDGE DRYING BEDS

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (Ksh)	AMOUNT (Ksh)
	EXCAVATION				
	Excavation rates shall include for trimming of excavated surfaces, strutting, shuttering, stabilizing excavated faces and keeping excavation free of water by bailing out, pumping or other means				
	Bulk excavations and top soil stripping for all structures are measured under Bill No. 3.13 - Site & Ancillary Works.				
	Excavate below stripped level to formation level in common material, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer.				
	Excavate below stripped level to formation level in common material, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer.				
5.9-E323	depth 0.5 - 1.0 m	m^3	250		
5.9-E324	depth 1.0 m to 2.0 m	m^3	320		
5.9-E325	depth 2.0 m to 5.0 m	m^3	448		
5.9-I236	Excavation below formation level of drying bed floor to formation level of wall, column footings and inlet pipes, not exceeding 3.5m in depth	m^3	60		
5.9-E617	Provide approved hardcore material and compact in layers of 200mm, blinded with final material 25mm thick	m^3	90		
5.9-E332.1	Extra Over Items 5.9-E323 to 5.9-E325.2 for excavation in rock Class 'A', Blasting not permitted (Provisional)	m^3	100		
5.9-E332.2	Extra Over Items 5.9-E323 to 5.9-E325.2 for excavation in rock Class 'B', Blasting not permitted (Provisional)	m^3	190		
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5.9-E332.3	Extra Over Items 5.9-E323 to 5.9-E325.2 for excavation in rock Class 'C', Blasting not permitted (Provisional)	m^3	350		
1.13	Trim sides of excavation to 60-degree slopes	m^2	190		
	CONCRETE WORKS				
	Provision of concrete				
5.9-F122	Mass concrete Class 12/15	m^3	11.25		
5.9-F142	Designed concrete C20/25	m^3	301		
	Placing of concrete				
5.9-F722.1	Reinforced concrete for Base slab - Sludge drying beds - 300mm thick	m^3	120		
5.9-F611	Mass concrete blinding under walls, bases of sludge drying beds, and bases of sludge loading bays- thickness 75mm	m^3	11.25		
5.9-F722.2	Reinforced concrete for Base slab - Sludge Loading bays - 200mm thick	m^3	7		
5.9-F722.3	Reinforced concrete for Base slab - inlet chambers - 200mm thick	m^3	2		
5.9-F722.4	Reinforced concrete for Base slab - sludge distribution channel - 200mm thick	m^3	10		
5.9-F722.5	Reinforced concrete for Base slab - drainage channel - 300mm thick	m^3	13		
5.9-F742.1	Reinforced concrete for Walls - Sludge drying beds - 300mm thick	m^3	120		
5.9-F742.2	Reinforced concrete for Walls - sludge loading bays - 200mm thick	m^3	5		
5.9-F742.3	Reinforced concrete for Walls - inlet chambers- 200mm thick	m^3	5		
5.9-F741	Reinforced concrete for Walls - sludge distribution channel - 125mm thick	m^3	6		
5.9-F743.4	Reinforced concrete for Walls - drainage channel - 300mm thick	m^3	11		
5.9-F742	Reinforced concrete for Columns - 400mm x200mm	m^3	2		
	REINFORCEMENT				
	Provide and fix reinforcement as directed				
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5.9-G522	Diameter: 8mm	Kg	200		
5.9-G523	Diameter: 10mm	Kg	10,700		
5.9-G524	Diameter: 12mm	Kg	4,300		
5.9-G525	Diameter: 16mm	Kg	300		
	FORMWORK				
	Provide and fix shuttering including propping, strutting and striking, all as specified				
	Horizontal Formwork - Class F1 Finish				
5.9-G315.1	Soffit of Loading Bay	m^2	12		
5.9-G315.2	Soffit of inlet chambers	m^2	5		
5.9-G315.3	Soffit of Sludge Distribution channels	m^2	12		
	Vertical Formwork - Class F2 Finish				
5.9-G349.1	Sides of sludge drying beds base slab - width n.e. 0.3m	m	90		
5.9-G349.2	Sides of sludge drying beds walls - width ne. 3.5 m	m^2	130		
	Vertical Formwork - Class F3 Finish				
5.9-G349.1	Sides of sludge drying beds walls - width n.e. 3.5m	m^2	130		
5.9-G349.2	Sides of walls sludge distribution channel - width n.e. 0.3m	m^2	15		
5.9-G342.1	Sides of base sludge distribution channel - width n.e. 0.2m	m	50		
5.9-G342.2	Sides of columns - width n.e. 0.2m	m	30		
	Other Formwork				
5.9-G371.1	Boxing out 400 mm x 400 mm holes in 300mm thick concrete walls and making good for drainage pipe	Nr	1		
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5.9-G371.2	Boxing out 300 mm diameter holes in 200mm thick concrete walls of inlet chambers and making good for sludge inlet pipes	Nr	3		
	PRECAST CONCRETE				
5.9-H511	Precast concrete slabs class 20/20 finished fair on all surfaces of surface media 400mm x 600mm x 75mm thick to detail shown on Drg. No. MWS/TW/SDB/02	Nr	450		
	CONSTRUCTION JOINTS				
	Provide and install the following water stops in construction joints including all surface treatment, formwork, forming of rebate 20 mm x 20 mm and sealing of rebate with polysulphide sealant all as per Drawings and Specification				
5.9-G652	200 mm wide expandite super-cast water foil PVC or similar approved water stop in vertical/horizontal construction joints in walls	m	60		
	PIPEWORK, FITTINGS AND VALVES				
	Supply, transport to site and store in secure place, including jointing material, bolts gaskets, packing, jointing glues, etc. as applicable				
	Drainage channel pipework				
5.9-I222	225mm dia. Plain ended perforated concrete pipe 14m long	Nr	1		
	Inlet manhole pipework				
5.9-I512	200mm dia. uPVC Class 'B' pipe, 7500mm long (cut to suit on site)	Nr	1		
	Transport from Site Store, Install, Test and Commission				
5.9-I222	225mm dia. Plain ended perforated concrete pipe 14m long	Nr	1		
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	Inlet manhole pipework				
5.9-I512	200mm dia. uPVC Class 'B' pipe, 7500mm long (cut to suit on site)	Nr	1		
	METAL WORKS				
	All steel works to be completely cleaned by acid dipping prior to galvanizing				
5.9-N180	Provide and fix galvanized mild steel open mesh flooring over inlet chambers	m^2	5		
5.9-G832	Provide and fix galvanized mild steel step irons built into concrete walls	Nr	40		
5.9-G832	G.M.S hand stops at inlet chamber	Nr	2		
	MISCELLANEOUS				
5.9-W41.1	Provide and place approved filter medium of clean sharp sand 6 mm nominal size in drying bed and finish level	m^3	30		
5.9-W41.2	- Ditto - but gravel, 19 mm	m^3	20		
5.9-W41.3	- Ditto - but large stones, 38 mm	m^3	20		
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BILL No. 5.9

SLUDGE DRYING BEDS

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BILL No. 5.10
ELEVATED BACKWASH WATER TANK (108m³)

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (Ksh.)	AMOUNT (Ksh.)
	ELEVATED TANK				
5.10-N286	Supply and transport to site, install and commission a hot-pressed steel water tank with cover, capacity 108m³, size 6x6x3m (LxWxH), made of 1x1m plates, 6mm thickness, and in accordance with approved specifications on and including 18m high galvanized steel U.B and U.C. section tower, including provision of connections and vents base plates, ladder and platform on all 4 sides, etc. Allow for water level indicator, internal and external CAT ladder with side straps and of stainless steel material, painting the inside of the tank including the stays etc., with approved etching primer and three coats of non-toxic bituminous paint suitable for potable water as detailed in drawing MWS/TW/BT/01, 02, 03 & 04.	Item	1		
5.10-A260	Allow for testing, finishing and sterilizing of the tank and pipework as specified.	Item	L.S		
	CLASS E WORKS: - EXCAVATION & EARTHWORKS				
5.10- E323	Excavate in any material for tank tower foundation spread and level the excavated materials and stack surplus for re-use as directed	m³	150		
5.10- E532	Spread and level on site as directed or dispose of surplus material	m³	80		
5.10- E712	Trim, spread and level the ground around tank to form suitable drainage of surface water	m³	70		
	CONCRETE WORKS				
	Provision of concrete				
5.9-F122	Designed concrete Class 12/15 in 75 mm blinding layer under column bases	m³	2		
5.9-F142	Designed concrete C20/25	m³	235		
	Placing of concrete				
5.9-F611	Mass concrete blinding layer under column bases- thickness 75mm	m³	2		
5.9-F7**	Column bases, stub columns and bracing beam	m³	235		
	REINFORCEMENT				
	Provide and fix reinforcement as directed				
5.9-G522	Diameter: 8mm	Kg	100		
5.9-G525	Diameter: 16mm	Kg	365		
5.9-G526	Diameter: 20mm	Kg	165		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

	FORMWORK				
	Provide and fix shuttering including propping, strutting and striking, all as specified				
	Horizontal Formwork - Class F1 Finish				
5.9-G144	Sides to column bases- width n.e. 0.1.22m	m^2	20		
	Vertical Formwork - Class F3 Finish				
5.9-G349.1	Sides to stub columns and bracing beams- width n.e. 1.22m	m^2	30		
	PIPEWORK - FITTINGS & VALVES				
	Supply, Transport to Site and Store in Secure Place, Including Jointing Material, Bolts, Gaskets, Packing, Jointing Glues, etc. as Applicable				
	(i) Inlet pipework for Proposed 108m^3 Elevated Tank - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.10-J391	150mm dia. Flanged Ball Float valve (Series 1048 Biwater or approved equivalent) (Mark A)	Nr	1		
5.10-J391	150mm dia. All Flanged pipe, 300mm long with puddle flange at 125mm from one end (Puddle flange welded to tank wall panel) (Mark B)	Nr	1		
5.10-J311	150mm dia. all flanged 90° bend (Mark C)	Nr	2		
5.10-I311	150mm dia. all flanged pipe, 5,000mm long (Mark D)	Nr	1		
5.10-I311	150mm dia. flanged spigot pipe, 16,000mm long (Mark E)	Nr	1		
5.10-J351	150mm dia. flange adaptor (Mark F)	Nr	1		
5.10-I311	150mm dia. flanged spigot pipe, 1,200mm long (Mark G)	Nr	1		
5.10-J391	150mm dia. coupling (Mark H)	Nr	1		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

	(ii) Outlet Pipework for Proposed 108m³ Tank - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.10-J371	300mm dia. Flanged bell mouth, (Mark a)	Nr	1		
5.10-I321	300mm dia. All Flanged pipe, 3,100mm long with puddle flange at 160mm from one end (Puddle flange welded to base panel of the tank) (Mark b)	Nr	1		
5.10-I321	300mm dia. flanged spigot pipe 16,000mm long (Mark c)	Nr	1		
5.10-J352	300mm dia. Flange adaptor (Mark d)	Nr	2		
5.10-J312	300mm dia. all flanged 90° bend (Mark e)	Nr	1		
5.10-J392	300mm dia. all flanged pipe 1,200mm long (Mark f)	Nr	1		
5.10-J329	250x50mm dia. all flanged tee (Mark g)	Nr	1		
5.10-J811	50mm dia. all flanged gate valve (Mark h)	Nr	1		
5.10-J812	300mm dia. all flanged gate valve (Mark i)	Nr	1		
5.10-I321	300mm dia. plain ended pipe 1,200mm long (Mark j)	Nr	1		
5.10-J392	300mm dia. coupling (Mark k)	Nr	1		
	(iii) Scour & Overflow pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.10-J391	150mm dia. flanged spigot pipe, 300mm long with a puddle flange at 60mm from the spigot end (puddle flange welded to tank panel) (Mark 1)	Nr	1		
5.10-J311	150mm dia. all flanged 90° bend (Mark 2)	Nr	3		
5.10-I311	150mm dia. all flanged pipe 5800mm long (Mark 3)	Nr	1		
5.10-I311	150mm dia. flanged spigot pipe 15000mm long (Mark 4)	Nr	1		
5.10-J351	150mm dia. flange adaptor (Mark 5)	Nr	3		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

5.10-I311	150mm dia. flanged spigot pipe 1000mm long (Mark 6)	Nr	3		
5.10-J371	150mm dia. flanged bell mouth (welded to base of tank with water tight joint) (Mark 7)	Nr	1		
5.10-I311	150mm dia. all flanged pipe 3700mm long (Mark 8)	Nr	1		
5.10-I311	150mm dia. flanged spigot pipe 14000mm long (Mark 9)	Nr	1		
5.10-J391	150mm dia. coupling (Mark 10)	Nr	1		
5.10-J811	150mm dia. all flanged gate valve (Mark 11)	Nr	1		
5.10-J311	150mm dia. flanged spigot 90° bend (Mark 12)	Nr	1		
5.10-J391	150mm dia. flanged ball float valve (Series 1048 Biwater or approved equivalent) (Mark A)	Nr	1		
	Transport from Site, Store, Install, Test & Commission. Include for Excavation & Backfilling of Pipe Trenches where Applicable.				
	(i) Inlet pipework for Proposed 108m³ Elevated Tank - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.10-J391	150mm dia. flanged ball float valve (Series 1048 Biwater or approved equivalent) (Mark A)	Nr	1		
5.10-J391	150mm dia. all flanged pipe, 300mm long with puddle flange at 125mm from one end (Puddle flange welded to tank wall panel) (Mark B)	Nr	1		
5.10-J311	150mm dia. all flanged 90° bend (Mark C)	Nr	2		
5.10-I311	150mm dia. all flanged pipe, 5000mm long (Mark D)	Nr	1		
5.10-I311	150mm dia. flanged spigot pipe, 12000mm long (Mark E)	Nr	1		
5.10-J351	150mm dia. flange adaptor (Mark F)	Nr	1		
5.10-I311	150mm dia. flanged spigot pipe 1200mm long (Mark G)	Nr	1		
5.10-J391	150mm dia. coupling (Mark H)	Nr	1		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

	(ii) Outlet Pipework for Proposed 108m³ Tank - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.10-J372	250mm dia. flanged bell mouth, (Mark a)	Nr	1		
5.10-I321	250mm dia. all flanged pipe, 3100mm long with puddle flange at 160mm from one end (Puddle flange welded to base panel of the tank) (Mark b)	Nr	1		
5.10-I321	250mm dia. flanged spigot pipe 12000mm long (Mark c)	Nr	1		
5.10-J352	250mm dia. flange adaptor (Mark d)	Nr	2		
5.10-J312	250mm dia. all flanged 90° bend (Mark e)	Nr	1		
5.10-I321	250mm dia. all flanged pipe 1200mm long (Mark f)	Nr	1		
5.10-J322	250x50mm dia. All flanged tee (Mark g)	Nr	1		
5.10-J811	50mm dia. all flanged gate valve (Mark h)	Nr	1		
5.10-J812	250mm dia. all flanged gate valve (Mark i)	Nr	1		
5.10-I321	250mm dia. plain ended pipe 1200mm long (Mark j)	Nr	1		
5.10-J392	250mm dia. coupling (Mark k)	Nr	1		
	(iii) Scour & Overflow pipework - Approved cement lined internally epoxy coated externally steel pipe PN 16)				
5.10-J391	150mm dia. flanged spigot pipe, 300mm long with a puddle flange at 60mm from the spigot end (puddle flange welded to tank panel) (Mark 1)	Nr	1		
5.10-J311	150mm dia. all flanged 90° bend (Mark 2)	Nr	3		
5.10-I311	150mm dia. all flanged pipe 5800mm long (Mark 3)	Nr	1		
5.10-I311	150mm dia. flanged spigot pipe 11000mm long (Mark 4)	Nr	1		
5.10-J351	150mm dia. flange adaptor (Mark 5)	Nr	3		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

5.10-I311	150mm dia. flanged spigot pipe 1000mm long (Mark 6)	Nr	3		
5.10-J371	150mm dia. flanged bell mouth (welded to base of tank with water tight joint) (Mark 7)	Nr	1		
5.10-I311	150mm dia. all flanged pipe 3700mm long (Mark 8)	Nr	1		
5.10-I311	150mm dia. flanged spigot pipe 10000mm long (Mark 9)	Nr	1		
5.10-J391	150mm dia. coupling (Mark 10)	Nr	1		
5.10-J811	150mm dia. all flanged gate valve (Mark 11)	Nr	1		
5.10-J311	150mm dia. flanged spigot 90° bend (Mark 12)	Nr	1		
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BILL No. 5.10

ELEVATED BACKWASH WATER TANK (108m^3)

		Amount (Ksh.)
	Page Total, Page 1 of 6	
	Page Total, Page 2 of 6	
	Page Total, Page 3 of 6	
	Page Total, Page 4 of 6	
	Page Total, Page 5 of 6	
	Page Total, Page 6 of 6	
	Bill Total	

BILL No. 5.11

OPERATOR'S OFFICE, LABORATORY AND STORE

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (Ksh)	AMOUNT (Ksh)
5.11	**SUBSTRUCTURES (PROVISIONAL)**				
	Excavations and Earthworks				
	The rate shall include for all strutting, shuttering, stabilizing the excavation faces and keeping the excavation free of water by pumping, bailing or other means				
	Bulk excavations and top soil stripping for all structures are measured under Bill No. 3.13 - Site and Ancillary Works.				
	Excavate for foundations, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer				
	Excavate below stripped level to formation level in common material, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer.				
	Foundations and bases of isolated piers				
5.11-E321	depth n.e. 1.5m	m^3	59		
5.11-E335	Excavating in rock Class "A"	m^3	5		
5.11-E335	Excavating in rock Class "B"	m^3	5		
5.11-E335	Excavating in rock Class "C"	m^3	10		
	Approved Selected Filling				
5.11-E614	Fill and ram selected excavated materials around foundations and buildings	m^3	30		
	Approved Filling as Described: -				
5.11-E645	Provide and deposit approved imported murram in maximum 150mm thick layers in making up levels under ground floor slab achieving satisfactory compaction	m^3	30		
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5.11-E647	Provide and deposit approved imported hardcore in maximum 300mm thick layers in making up levels including achieving satisfactory compaction	m^3	15		
5.11-E616	deposit approved excavated hardcore in maximum 300mm thick layers in making up levels including achieving satisfactory compaction	m^3	12		
5.11-E645	Provide, lay and level out fine crushed stone, sand or gravel blinding 50mm thick to surface of filling, including watering and rolling to achieve satisfactory compaction	m^2	84		
	Disposal of Surplus Spoil: -				
5.11-E532	Cart away surplus excavated materials to an approved dumping site	m^3	54		
	Anti-Termite Treatment				
5.11-E790	Termidor 25 EC or other equal approved anti-termite chemical treatment: applied by an approved professional pest control specialist:10-year warranty: strictly applied in accordance with the manufacturer's instructions	m^2	126		
	Damp-proof Membrane				
5.11-W239	500 Gauge polythene sheeting, laid over hardcore	m^2	83		
	Concrete Work:				
	Provision of concrete				
5.11-F122	Designed concrete C12/15	m^3	3		
5.11-F142	Designed concrete C20/25	m^3	25		
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	Placing of concrete				
5.11-F611	75mm Thick mass concrete blinding under foundation concrete, column bases or over hardcore				
5.11-F7**	Reinforced concrete for foundation trenches, column bases and entrance steps	m^3	12		
5.11-F72*	Reinforced concrete for 150mm thick surface bed	m^3	12		
5.11-F75*	Isolated columns and piers in foundations	m^3	1		
	Reinforcement				
	Fabric Reinforcement No. A142 Mesh Size 200 x 200mm Weighing 2.22 kgs Per m2, Including Bends, Tying Wire and Distance Blocks to B.S 4483				
5.11-G562	Fabric reinforcement with minimum 150mm wide side and end laps, laid in bed	m^2	83		
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm² :				
5.9-G524	Diameter: 12mm	Kg	800		
5.9-G523	Diameter: 10mm	Kg	400		
	Formwork				
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	Provide and fix shuttering including propping, strutting and striking, all as specified				
	Sawn Formwork - Class F1 Finish: -				
5.11-G142	Vertical sides of column bases, columns, reinforced concrete walls and steps in foundations	m^2	22		
	Wrot Formwork - Class F3 Finish: -				
5.11-G342	Edges of beds, paving's, plinths and risers of steps not exceeding 300mm wide	m	39		
	Walling.				
	Natural Stone Block Walling, Medium Chisel Dressed, reinforced with 20 swg Hoop Iron at every alternate course, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.11-U121	200 mm Walling	m^2	65		
	Damp-Proof Course:				
	Bituminous Felt Damp-Proof Course as Described: -				
5.11-W239	200mm Wide under walls	m	57		
5.11-W239	100mm Wide ditto	m	24		
	Plinths.				
5.11-W449	15mm Cement and sand (1:3) render to plinth walls, finished with a wood float	m^2	16		
5.11-V839	Prepare and apply two coats of bituminous paint on rendered plinth walls	m^2	16		
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	SUPERSTRUCTURE				
	CONCRETE, FORMWORK, REINFORCEMENT				
	Designed Concrete Class 20/25 mm as described in:				
5.11-. F142	Provision of concrete for Columns, beams and stairs	m^3	5		
5.11- F7**	Placing of reinforced concrete for Columns, beams and stairs	m^3	5		
	Formwork				
	Sawn Formwork - Class F1 Finish: -				
5.11-G315	Horizontal soffits of suspended floor and landing slabs	m^2	8		
	Wrot Formwork - Class F3 Finish: -				
5.11-G343	Vertical sides of columns	m^2	27		
5.11-G343	Sides and soffits of beams	m^2	30		
	Reinforcement				
	Fabric Reinforcement No. A142 Mesh Size 150 x 150mm Weighing 2.22 kgs Per m^2, Including Bends, Tying Wire and Distance Blocks: -				
5.11-G562	Fabric reinforcement with minimum 150mm wide side and end laps, laid in suspended slabs	m^2	8		
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm^2 :				
	Reinforcement, all diameters			-	
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5.9-G524	Diameter: 12mm	Kg	900		
5.9-G523	Diameter: 10mm	Kg	750		
5.9-G522	Diameter: 8mm	Kg	200		
	Precast Reinforced Concrete Lintel in concrete class 20/25,200mm deep reinforced with 4 No. 12mm diameter mild steel bars and 8mm diameter mild steel links at 200mm centers, finished smooth on all exposed surfaces, including all moulds and formwork, hoisting, bedding and flush pointing in cement and sand mortar (1:3): -				
5.11-H112	Lintel 100mm wide x 1200mm long	Nr	2		
5.11-H112	Lintel 200mm wide x 1300mm long	Nr	6		
5.11-H112	Lintel 200mm wide x 1800mm long	Nr	1		
5.11-H112	Lintel 200mm wide x 1600mm long	Nr	5		
5.11-H112	Lintel 200mm wide x 1000mm long	Nr	2		
	WALLING				
	External Walls				
	Selected Machine Dressed Natural Stone Block Walling, reinforced with 20 swg Hoop Iron at every alternate course, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.11-U121	200mm Thick walling	m^2	70		
	Labours				
5.11-U178	Fair raking cutting 200mm walls external	m^2	58		
	Precast Concrete Cills				
5.11-H810	200mm Thick x 275mm wide precast concrete cill bedded, jointed and pointed in cement mortar on top of 200mm wall	m	8		
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	Internal Walls				
	Selected Machine Dressed Natural Stone Block Walling, reinforced with 20 swg Hoop Iron at every alternate course, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.11-U510	150mm Thick walling	m^2	69		
	ROOF COVERINGS				
	Gauge 28 pre-painted IT5 approved roofing sheets, colour to approval of the Engineer				
5.11-W321	Gauge 28 pre-painted IT5 approved roofing sheets, colour to approval of the Engineer	m^2	115		
5.11-W327	Ridge capping	m	7		
5.11-W327	Hip capping ditto	m	22		
	CARPENTRY AND JOINERY				
	Carpentry				
	Roof Trusses				
	Double Pitch Roof Truss With 600mm eaves projection, in 150 x 50mm Rafters, Ceiling Joists, Struts and Ties in Sawn Cypress Grade II Seasoned and Pressure Impregnated with Wood Preservative and timber joints with bolted and nailed connections to the Engineer's approval: -				
5.11-Z118	Equal truss 6200mm clear span and 1284mm high	Nr	8		
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	Other Roof Members				
	-				
	Sawn Cypress Grade II Maximum Moisture Content 12% Seasoned and Pressure Impregnated with Wood Preservative and timber joints with bolted and nailed connections to the Engineer's Approval: -				
5.11-O217.1	150 x 50mm Intermediate, hip and valley rafters	m	165		
5.11-O217.2	150 x 55mm Purlins	m	26		
5.11-O217.3	200 x 50mm Ridge board	m	7		
5.11-O217.4	100 x 50mm Wall plate tied to wall with 20 s.w.g. hoop iron at 900mm centers and bedded in cement mortar (1:3) on top of wall	m	45		
	Joinery				
	General Timbers				
	Wrot Prime Grade Cypress, Including Finishing with Three Coats First Quality Gloss Paint: -				
5.11-O224	250 x 40mm Fascia board	m	44		
	DOORS, FRAMES, ETC				
	Doors				
	Wrot Prime Grade Cypress				
	50mm Thick door with ex. 100 x 50mm thick stiles and top rails, ex. 150 x 50mm middle and bottom rails, and infilled with panels made out of ex. 100 x 50mm thick tongued and grooved battens, including 3 No. 100 mm Steel heavy duty washered butt hinges, three-lever mortice lock as "Union Ref: 2237" with set of brass lever handles and furniture, rubber door stop and three coats first quality gloss paint: -				
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5.`11-Z313.1	Single door size (D4)	Nr	6		
	50mm Thick Semi-Solid Core Flush Door with Hardwood Lipping all Round, including 3 No. 100 mm Steel Heavy Duty Washered Butt Hinges, Three-Lever Mortice Lock as "Union Ref: 2237" With Set of Brass Lever Handles and Furniture, Rubber Door Stop and Three Coats First Quality Gloss Paint: -				
5.11-Z313.2	Single door size (D5)	Nr	2		
	Door Frames				
	Wrot Prime Grade Cypress				
	Ex. 125 x 50mm Thick Wrot Prime Grade Cypress door frame with six Labours with and including 250mm girth x 25mm x 1.6mm galvanized mild steel cramps fixed at maximum 600mm centers for each jamb including all necessary Architraves and Quadrant Beads and Three Coats First Quality Gloss Paint: -				
5.11-Z314.1	Frame to fit door opening high (D5)	Nr	2		
5.11-Z314.2	Frame to fit door opening including a transome (D4)	Nr	6		-
	Fanlights				
	6mm Thick Georgian Wired Glass Panel with a 25mm gap for PV and with 60 x 20mm Wrot Prime Grade Cypress Glazing Beads: -				
5.11-Z395	Fanlight panel size 830mm wide x 230mm high	Nr	2		
	METALWORK				
	Steel Casement Windows				
	-				
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	Supply and fix the following Standard Section Steel Casement Windows, including 4mm Thick Clear Sheet Glass glazed to Steel Casements with Putty, Complete with Opening Accessories, Including Building in Lugs to Jambs and Head and Water-Proofing and Filling Around Opening with Approved Compound	-			
	-	-			
5.11-Z321.1	Window size 1197 x 1397mm high with 1 No. fixed and 1 No. side hung opening bottom sashes and with 1 No. fixed and 1 No. top-hung top ventilators 200mm high with permanent ventilator hood over (W3)	Nr	1		
5.11-Z321.2	Window size 1197 x 1197mm high with 1 No. fixed and 1 No. side hung opening bottom sashes with permanent ventilator hood over (W3a)	Nr	5		
5.11-Z321.3	Window size 597 x 597mm high with 1No. top-hung opening bottom sash and with permanent ventilator hood over (W8)	Nr	2		
	Burglar Proofing to Windows				
	Provide and fix burglar proofing made from 12mm x 12mm M.S. square bars at 150mm vertically and 200mm centers horizontally and fixed internally to wall with 12mm M.S. Fish tail lugs at 600mm centers painted with one coat primer and 3 coats gloss paint, to the following windows:				
5.11-M479.1	To windows size 1197 x 1397mm (W3)	Nr	1		
5.11-M479.2	To windows size 1197 x 1197mm (W3a)	Nr	5		
	FITTINGS				
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	Cupboard Unit 450mm Deep x 725mm Wide comprising Ex 75 x 50mm framing all round with a blockboard hinged double door, 2 No intermediate shelves all blockboard with mahogany veneer and lipping, all timber finished with three coats gloss paint, including all necessary ironmongery: -				
5.11-Z162.1	Cupboard unit 900mm long	Nr	4		
5.11-Z162.2	Cupboard unit 1000mm long	Nr	2		
5.11-Z162.3	Cupboard unit 1250mm long	Nr	1		
5.11-Z162.4	Cupboard unit 1450mm long	Nr	3		
	Drawer Unit 450mm Deep x 725mm Wide with 3 No. Drawers, all blockboard with mahogany veneer and lipping, all timber finished with three coats gloss paint, including all necessary Ironmongery: -				
5.11-Z162.5	Drawer unit 500mm long	Nr	1		
5.11-Z162.6	Drawer unit 650mm long	Nr	1		
	-				
	Storage Shelving				
	-				
	Storage Shelving Comprising 3 No. Tiers of 25mm Thick Hardwood Lipped Blockboard Supported on and Including 75 x 38mm Wrot Cypress Bearers Fixed to Wall, all Painted with Three Coats of Gloss Oil Paint: -				
5.11-Z154.1	Shelving 450mm wide	m	15		
5.11-Z154.1	Shelving 600mm wide	m	5		
	CEILING				
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	12mm thick approved chipboard to BS 2604, Part 2, density 480-640kgs, per square meter in sheets size 2400 x 1200mm fixed to and including 50 x 50mm sawn cypress Grade 2 battens at 600mm centers in both directions complete with gauge jointing material				
5.11-Z453	Horizontal ceiling fixed to underside of trusses	m^2	98		
5.11-Z159	12mm Cornice 50mm high, plugged	m	72		
5.11-Z159	Extra over ceiling lining for forming removable access trap door size 600 x 600mm with 100 x 38 mm sawn treated cypress trimming joists between tie beams,120 x 20mm (finished) Wrot cypress frame all round and 20mm blockboard removable panel set loose on top of framing	Nr	1		
	BUILDERS WORK IN CONNECTION WITH ELECTRICAL INSTALLATIONS				
5.11-Z739	Allow for cutting and leaving all necessary holes, notches, mortices, sinkings and chases both in the structure and its finishes and for all making good in connection with concealed conduits or cables	Item	L.S		
	PLUMBING AND DRAINAGE				
	Sanitary Fittings				
	Supply and fix the following including all jointing materials and joints to supply, waste and overflow pipes.				
5.11-Z530.1	White vitreous china high level washdown W.C. suite complete as "TWYFORDS Classic 10003" comprising closet with "S"-trap, No. 12030 cistern 9 liters capacity, No. 52120 valveless fittings with plastic syphon and flush bend, cistern supports, No. 50219 inlet connection and No. 50302 plastic seat and cover; pan plugged and screwed to floor and cistern to wall, including water supply to fitting and connecting to drainage system	Nr	9		
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5.11-Z530.2	White vitreous china washbasin completes as "TWYFORDS Classic 14003" with one No.54100 Aztec tap15mm, No. 54351 chain waste, No. 56005 fixing brackets including all necessary fixing, including water supply to fitting and connecting to drainage system.	Nr	9		
5.11-Z530.3	Black vulcathene laboratory sink internal size 450 x 300 x 200mm deep as "ALLIED FOUNDERS UK Model 602" complete with waste fitting and butyl rubber sealing gasket including fixing into prepared hole in concrete worktop, including dilution pot, water supply to fitting and connecting to drainage system via vulcathene piping	Nr	1		
5.11-Z530.4	Local stainless steel sink size 1000 x 500mm with single bowl and single drainer complete with 40mm waste, plug, and chain and one "Bricon" chromium plated bib tap type No. 615/041 marked “cold", including water supply to fitting and connecting to drainage system, including water supply to fitting and connecting to drainage system.	Nr	1		
5.11-Z530.5	Toilet roll holder	Nr	9		
5.11-Z781.1	Hand dryer	Nr	4		
5.11-Z530.6	Chrome plated towel rail size 25mm diameter x 900mm long complete with end brackets.	Nr	6		
5.11-Z530.7	600mm x 600mm wall mounted mirrors	Nr	9		
5.11-Z781.2	Shower fitting with an instant heating element complete with the stop corks as 'Cobra'	Nr	5		
5.11-Z530.8	Double bowl single drainer inset kitchen sink made out of 18/8 stainless steel, size 1000 x 500mm with 420 x 355 x 150mm deep bowl. The kitchen sink shall be competed with bi-flow mixer tap with an overarm swivel outlet as 'Cobra VIC-171/041' 11/2" chrome plated sink grid waste, 11/4" chrome plated bottle trap waste	Nr	1		
	Sanitary Plumbing				
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5.11-Z512.1	32mm Basin bottle "P" trap and waste outlet refs. 371.125 and 351.125, complete with plug and chain	Nr	9		
5.11-Z512.2	38mm Sink tubular "P" trap and waste outlet Refs. 361.15 and 352.15, ditto	Nr	6		
5.11-Z512.3	Gulley piece Ref: 1844.4.25	Nr	4		
5.11-K231	Gulley trap chamber internal size 203x203x150mm high with 75mm thick sides and rebated top edge for and including 210 x 210 x 63mm thick precast concrete cover including bedding UPVC gulley (m.s.) in concrete Class Q, dishing base of gulley, all necessary formwork, excavation and disposal	Nr	4		
	Testing				
5.11-A260	Allow for testing the whole of the drainage services to the satisfaction of the Engineer and Local Authority	Item	L.S		
	Cold Water Tanks				
5.11-Z524	1000 liters "ROTO" or approved equivalent cold-water tanks complete with cover and inlet and outlet connections, and ball valves including hoisting to roof slab base not exceeding 5.0m high.	Nr	5		
5.11-Z519	Allow for provisional amount for internal plumbing and sanitary drainage	Item	L.S		
	RENDERING				
	12.5mm Thick Cement and Sand Render as Described Externally on: -				
5.11-W449.1	Blockwork and concrete surfaces	m^2	38		
	PLASTERING				
	12.5mm Thick Gauged Cement Plaster as Described Internally on: -				
PAGE TOTAL CARRIED TO SECTION COLLECTION SHEET					

5.11-W449.2	Blockwork and concrete surfaces	m^2	138		
	Screeds and backing				
	Bonded Cement and Sand (1:3) Screed Bed in One Coat with Approved Hardener Incorporated in the Mix, Well Bonded to Concrete Base as Described: -				
5.11-W449.3	40mm Thick paving with wood float finish on concrete	m^2	5		
	Bonded Cement and Sand (1:3) Screed Bed or Backing in One Coat, Well Bonded to Concrete or Blockwork Base as Described: -				
5.11-W449.5	13mm Thick backing with approved plasticizer to receive wall tiles or floor tiles laid as skirting (measured separately)	m^2	72		
5.11-W449.6	38mm thick screed laid level to receive porcelain or ceramic floor tiling (measured separately)	m^2	81		
	TILING				
	Floor Tiling				
	Ceramic Floor Tiles Laid with Straight Joints Both Ways: -				
5.11-Z421	Floor tiles laid to floors, treads, risers or as skirting on screed or backing (measured separately)	m^2	81		
	Wall Tiling				
	White Glazed Wall Tiles to B.S. 4490 bedded in cement and sand (1:3) screeded backing (m.s.) with approved plasticizer and pointed in white cement as described: -				
5.11-Z423	Tiles 150 x 150 x 6mm thick	m^2	90		
	Sundries				
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5.11-Z443	PVC tiling edge to external corners of tiles (Provisional)	m	50		
	PAINTING AND DECORATING				
	Prepare and Apply Three Coats Exterior Quality Plastic Emulsion Paint: -				
	Externally on: -				
5.11-V539	Fair-faced concrete surfaces	m^2	38		
	Prepare and Apply Three Coats Interior Quality Plastic Emulsion Paint: -				
	Internally on: -				
5.11-V559	Plastered blockwork and concrete surfaces	m^2	150		
	Prepare and Apply Three Coats Washable Distemper as Described to: -				
5.11-V564	Horizontal soffits of suspended chipboard or plasterboard ceilings	m^2	120		
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CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

MARALAL WATER SUPPLY PROJECT

BILL No. 5.11

OPERATOR'S OFFICE, LABORATORY AND STORE

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CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

BILL No. 5.12

WORKS PIPELINES AND CHAMBERS

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (Ksh)	AMOUNT (Ksh.)
	INSITU CHAMBERS				
5.12-K236	Provide all necessary materials and construct reinforced concrete valve chambers, internal dimensions 1500x1500mm. Include for supply and fixing of removable precast concrete covers (With provision for spindle operation), step iron, compacted granular fill etc. with depth :3.5-4m	nr	3		
5.12-K236	Provide all necessary materials and construct reinforced concrete chambers, internal dimensions 1500x1500mm. Include for supply and fixing of 700x700 composite material manhole covers, step iron, compacted granular fill etc. with depth :3.5-4m	nr	4		
5.12-K233	Provide all necessary materials and construct reinforced concrete chambers, internal dimensions 2000x1600mm. Include for supply and fixing of 700x700 composite material manhole covers, step iron, compacted granular fill etc. with depth :2-2.5m	nr	2		
5.12-K233	Provide all necessary materials and construct reinforced concrete chambers, internal dimensions 1200x1200mm. Include for supply and fixing of 700x700 composite material manhole covers, step iron, compacted granular fill etc. with depth :2-2.5m	nr	1		
5.12-K231	Provide all necessary materials and construct reinforced concrete chambers, internal dimensions 1200x1200mm. Include for supply and fixing of 700x700 composite material manhole covers, step iron, compacted granular fill etc. with depth: n.e. 1.5 m	nr	7		
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5.12-K232	Provide all necessary materials and construct reinforced concrete chambers, internal dimensions 1200x1200mm. Include for supply and fixing of 700x700 composite material manhole covers, step iron, compacted granular fill etc. with depth :1.5-2m	nr	4		
5.12-K236	Provide all necessary materials and construct reinforced concrete chambers, internal dimensions 1200x1200mm. Include for supply and fixing of 700x700 composite material manhole covers, step iron, compacted granular fill etc. with depth :3.5-4m	nr	3		
5.12-K25	Provide all necessary materials and construct reinforced concrete chambers, internal dimensions 4400x2350mm. Include for supply and fixing of 700x700 composite material manhole covers, step iron, compacted granular fill etc. with depth :3-3.5m	nr	2		
5.12-K236	Provide all necessary materials and construct reinforced concrete chambers, internal dimensions 1800x1400mm. Include for supply and fixing of 700x700 composite material manhole covers, step iron, compacted granular fill etc. with depth :3.5-4m	nr	3		
	450mm Dia. Raw Water Gravity Main within Treatment Works - (Pipe 'A') - Approved Cement Lined Internally Epoxy Coated externally steel pipe PN 16				
5.12-I332	Excavate trench for 450mm dia. Raw Water Gravity main within treatment works site, backfill after laying of pipes and cart away surplus to tips as directed. Average depth n.e. 1.5m	m	20		
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5.12-I332.1	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	2		
5.12-I332.2	Ditto - But for excavation in rock class 'B'	m^3	3		
5.12-I332.3	Ditto - But for excavation in rock class 'C'	m^3	12		
	Pipework Fittings & Valves				
	Supply Transport to Site and Store in Secure Place				
	including Jointing Material, Bolts Gaskets, Packing, Jointing Glues, etc. as Applicable				
5.12-J393	450mm dia. Coupling (Mark 1)	Nr	1		
5.12-J393.	450mm dia. Flanged Spigot pipe 1.2m long (Mark 2)	Nr	1		
5.12-J313	450mm dia. Flanged 90^0 bend (Mark 3)	Nr	1		
5.12-J393	450mm dia. All flanged pipe 2.0 m long (Mark 4)	Nr	2		
5.12-J393	450mm dia. All Flanged Electromagnetic meter (Mark 5)	Nr	1		
5.12-J393	450mm dia. Flanged Spigot pipe 1.2m long (Mark 6)	Nr	1		
	Transport from Site Store, Install, Test and Commission				
5.12-J393.1	450mm dia. Coupling (Mark 1)	Nr	1		
5.12-J393.2	450mm dia. Flanged Spigot pipe 1.2m long (Mark 2)	Nr	1		
5.12-J313	450mm dia. Flanged 90^0 bend (Mark 3)	Nr	1		
5.12-J393.3	450mm dia. All flanged pipe 2.0 m long (Mark 4)	Nr	1		
5.12-J393.4	450mm dia. All Flanged Electromagnetic meter (Mark 5)	Nr	1		
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5.12-J393.5	450mm dia. Singe flanged pipe (Mark 6)		1		
	200mm dia. Filtered Water pipe from Filters to Treated Water Tank - (Pipe 'B') Approved epoxy coated steel pipe				
5.12-I312	Excavate trench for 200mm dia. Filtered water pipe from Filters to Treated Water Tank, backfill after laying of pipes and cart away surplus to tips as directed. Maximum depth n.e. 1.5m.	m	18		
5.12-I312.1	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	1		
5.12-I312.2	Ditto - But for excavation in rock class 'B'	m^3	12		
5.12-I312.3	Ditto - But for excavation in rock class 'C'	m^3	7		
	Pipework Fittings & Valves				
	Supply Transport to Site and Store in Secure Place				
	including Jointing Material, Bolts Gaskets, Packing, Jointing Glues, etc. as Applicable				
5.12-J371	Flanged Bellmouth DN 200, length 240mm (Mark 1)	Nr	1		
5.12-J391	200mm dia. Flanged spigot pipe with puddle flange at 400mm from spigot end, 1200mm long (Mark 2)	Nr	1		
5.12-I311	200mm dia. Plain Ended pipe, length 16m (cut to suit on site) (Mark 3)	Nr	1		
5.12-J391	200mm dia. Coupling (Mark 4)	Nr	1		
	Transport from Site Store, Install, Test and Commission				
5.12-J371.1	Flanged Bellmouth DN 200, length 240mm (Mark 1)	Nr	1		
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5.12-J391.1	200mm dia. Flanged spigot pipe with puddle flange at 400mm from spigot end, 1200mm long (Mark 2)	Nr	1		
5.12-I311.1	200mm dia. Plain Ended pipe, length 16m (cut to suit on site) (Mark 3)	Nr	1		
5.12-J391.1	200mm dia. Coupling (Mark 4)	Nr	1		
	Backwash Water Pumping Main from Pump House to Elevated Backwash Water Tank - (Pipe 'C') - Approved epoxy coated steel pipe				
5.12-I312	Excavate trench for 150mm dia. Backwash Water Pumping Main from Pump House to Elevated Backwash Tank, backfill after laying of pipes and cart away surplus to tips as directed. Average depth n.e. 1.5m	m	20		
5.12-I312.1	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	4		
5.12-I312.2	Ditto - But for excavation in rock class 'B'	m^3	4		
5.12-I312.3	Ditto - But for excavation in rock class 'C'	m^3	20		
	Pipework Fittings & Valves				
	Supply Transport to Site and Store in Secure Place				
	including Jointing Material, Bolts Gaskets, Packing, Jointing Glues, etc. as Applicable				
5.12-I311	150mm dia. Plain Ended pipe, length 12m (cut to suit on site) (Mark 1)	Nr	1		
	Transport from Site Store, Install, Test and Commission				
5.12-I311.1	150mm dia. Plain Ended pipe, length 12m (cut to suit on site) (Mark 1)	Nr	1		
	Backwash Water Gravity main from Elevated Backwash Tank to Filters - (Pipe 'D') - Approved epoxy coated steel pipe				
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5.12-I322	Excavate trench for 300mm dia. Backwash Water main from Elevated Backwash Tank to Filters, backfill after laying of pipes and cart away surplus to tips as directed. Maximum depth n.e. 1.5m	m	20		
5.12-I322.1	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	2		
5.12-I322.2	Ditto - But for excavation in rock class 'B'	m^3	5		
5.12-I322.3	Ditto - But for excavation in rock class 'C'	m^3	40		
	Pipework Fittings & Valves				
	Supply Transport to Site and Store in Secure Place				
	including Jointing Material, Bolts Gaskets, Packing, Jointing Glues, etc. as Applicable				
5.12-I322	300mm dia. Plain ended pipe 16m long with couplings for joints (Mark 1)	Nr	1		
5.12-J392	300mm dia. V.J Coupling (Mark 2)	Nr	2		
5.12-I321	300mm dia. Flanged Spigot pipe 1.0m long (Mark 3)	Nr	1		
	Transport from Site Store, Install, Test and Commission				
5.12-I322.1	300mm dia. Plain ended pipe 16m long with couplings for joints (Mark 1)	Nr	1		
5.12-J392.1	300mm dia. V.J Coupling (Mark 2)	Nr	4		
5.12-I321.1	300mm dia. Flanged Spigot pipe 1.0m long (Mark 3)	Nr	1		
	Drainage pipe from Chamber CH4 to Chamber CH16 at the Sludge Lagoon through chambers CH5, CH27 AND CH6 - (Pipe 'F') - uPVC Class 'B' S&S Pipe				
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5.12-I221	Excavate trench for 300 mm dia. Precast concrete Scour pipes from sedimentation tank, Flocculation Basin and filter backwash, backfill after laying of pipes and cart away surplus to tips as directed. Maximum depth n.e. 1.5m	m	85		
5.12-L522	Provide, lay and joint 300mm dia. Precast concrete pipes socket and spigot pipes including type B.O bed and surround. (Pipe 'F')	m	85		
5.12-I223	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	4		
5.12-I223	Ditto - But for excavation in rock class 'B'	m^3	8		
5.12-I223	Ditto - But for excavation in rock class 'C'	m^3	100		
	Supernatant Drain Pipe from backwash Lagoon and Sludge Lagoon to Chamber CH22 (Pipe 'H') - uPVC Class B S&S Pipe				
5.12-I514	Excavate trench for 200 mm dia. uPVC S&S pipe, backfill after laying of pipes and cart away surplus to tips as directed. Maximum depth n.e. 2.5m	m	35		
5.12-L521	Provide, lay and joint 200mm dia uPVC Class 'B' S&S pipe, including type B.O bed and surround. (Pipe 'H')	m	35		
5.12-I514	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	2		
5.12-I514	Ditto - But for excavation in rock class 'B'	m^3	4		
5.12-I514	Ditto - But for excavation in rock class 'C'	m^3	32		
5.12-A420	Allow a provisional sum of Ksh 500,000 for provision and installation of additional fittings, interconnection and testing the connection from ND 400mm HDPE Treated Water Main from Maralal Treatment Works to the existing tanks at Maralal Town as directed by the Engineer.	Item	PS	500,000	500,000
5.12-A420.1	Contractor's profit and overheads on item 5.12-A420 above	%	500,000		
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	Scour Pipes from Backwash Water Lagoon and Sludge Lagoon to Sludge drying Beds (Pipe 'J') - uPVC Class B S&S Pipe				
5.12-I513	Excavate trench for 200 mm dia. uPVC S&S pipe, backfill after laying of pipes and cart away surplus to tips as directed. Maximum depth n.e. 2.0m	m	30		
5.12-L521	Provide, lay and joint 200mm dia uPVC Class 'B' S&S pipe, including type B.O bed and surround. (Pipe 'G')	m	30		
5.12-I513.1	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	2		
5.12-I513.2	Ditto - But for excavation in rock class 'B'	m^3	40		
5.12-I513.3	Ditto - But for excavation in rock class 'C'	m^3	26		
	Sludge Drying Beds Bypss (Pipe 'K') - uPVC Class B S&S Pipe				
5.12-I514	Excavate trench for 200 mm dia. uPVC S&S pipe, backfill after laying of pipes and cart away surplus to tips as directed. Maximum depth n.e. 2.5m	m	50		
5.12-L521	Provide, lay and joint 200mm dia uPVC Class 'B' S&S pipe, including type B.O bed and surround. (Pipe 'G')	m	30		
5.12-I514.1	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	2		
5.12-I514.2	Ditto - But for excavation in rock class 'B'	m^3	40		
5.12-I514.3	Ditto - But for excavation in rock class 'C'	m^3	29		
	Scour/ Overflow Pipe from Treated Water Tank to Chamber CH25 - (Pipe 'L' and 'M') - Concrete S&S Pipe				
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5.12-I227	Excavate trench for 300 mm dia. Flexible Jointed Concrete Backwash water and drainage scour / overflow pipe, backfill after laying of pipes and cart away surplus to tips as directed. Maximum depth n.e. 4.0m	m	50		
5.12-L522	Provide, lay and joint 300mm dia Flexible Jointed Concrete S&S pipe. (Pipe 'L' and 'M')	m	50		
5.12-I227.1	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	15		
5.12-I227.2	Ditto - But for excavation in rock class 'B'	m^3	29		
5.12-I227.3	Ditto - But for excavation in rock class 'C'	m^3	180		
	Drainage Pipe from Pump House and backwash tank to chamber CH15 - (Pipe 'N') - 200 mm dia. uPVC S&S pipe				
5.12-I514	Excavate trench for 200mm dia. Drainage pipe from Pump House to Chamber 'CH15', backfill after laying of pipes and cart away surplus to tips as directed. Maximum depth n.e. 2.5m	m	51		
5.12-I514.1	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	10		
5.12-I514.2	Ditto - But for excavation in rock class 'B'	m^3	25		
5.12-I514.3	Ditto - But for excavation in rock class 'C'	m^3	100		
5.12-L521	Provide, lay and joint 200mm dia uPVC Class 'B' S&S pipe, including type B.O bed and surround. (Pipe 'G')	m	30		
	<u>Scour and Overflow Drainage pipe from Alum, Soda Ash and Chlorine Mixing Tanks to Chemical Soak away Pit - (Pipe 'P') - uPVC Class 'B' Pipe</u>				
5.12-I512	Excavate trench for 160 mm dia. uPVC class 'B' S&S pipe, backfill after laying of pipes and cart away surplus to tips as directed. Maximum depth n.e. 1.5m	m	150		
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5.12-L521	Provide, lay and joint 160mm dia uPVC class 'B' S&S pipe, including type B.O bed and surround.	m	150		
5.12-I512.1.1	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	10		
5.12-I512.2.2	Ditto - But for excavation in rock class 'B'	m^3	50		
5.12-I512.3.3	Ditto - But for excavation in rock class 'C'	m^3	200		
	Sewer Line from Guard House, Operator's office, Laboratory & Store to Septic Tank No.1				
5.12-I512	Excavate trench for 160 mm dia. uPVC class 'B' S&S pipe, backfill after laying of pipes and cart away surplus to tips as directed. Maximum depth n.e. 1.5m	m	50		
5.12-L521	Provide, lay and joint 160mm dia uPVC class 'B' S&S pipe, including type B.O bed and surround.	m	60		
5.12-I512.1	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	10		
5.12-I512.2	Ditto - But for excavation in rock class 'B'	m^3	18		
5.12-I512.3	Ditto - But for excavation in rock class 'C'	m^3	60		
	Sewer Line from Staff Houses to Septic Tank No.1				
5.12-I512	Excavate trench for 160 mm dia. uPVC class 'B' S&S pipe, backfill after laying of pipes and cart away surplus to tips as directed. Maximum depth n.e. 1.5m	m	80		
5.12-L521	Provide, lay and joint 160mm dia uPVC class 'B' S&S pipe, including type B.O bed and surround.	m	40		
5.12-I512.1	Extra over excavation for excavation in rock class 'A' (Blasting not permitted)	m^3	4		
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5.12-I512.2	Ditto - But for excavation in rock class 'B'	m^3	7		
5.12-I512.3	Ditto - But for excavation in rock class 'C'	m^3	53		
	Inspection Chambers				
5.12-K231	Excavate for, provide all materials and construct inspection chambers. including concrete cover as detailed on drawing. Include for backfilling and removal of surplus and C.I. steps. Depth to invert up to and n.e. 1.0m (Provisional)	Nr	9		
5.12-K231	-Ditto - but depth to invert 1.0m to 1.5m	Nr	6		
5.12-K232	-Ditto - but depth to invert 1.5m to 2.0m	Nr	3		
5.12-K231	Extra over Items 5.12-K231 to 5.12-K232 for Excavation in Rock Class 'A', Blasting not permitted	m^3	7		
5.12-Y636	Ditto - But for excavation in Rock Class 'B'	m^3	5		
5.12-Y636	Ditto - But for excavation in Rock Class 'C'	m^3	6		
	Domestic Water Supply				
5.12-A420.1	Excavate trench for, supply all materials, lay, joint, test and backfill domestic water supply distribution system within the Treatment Works Site g. All pipework and fittings to be in Galvanize Iron (GI), medium duty 5 and include gate valves, bends, tees, sockets, unions, brackets / clamps, nonreturn valves, stand pipes, including all fittings to buildings and stand pipes (the pipes and fittings for the buildings are measured elsewhere). All valves to be Pegler or approved equivalent.	Item	P. S	500,000	500,000
5.12-A420.2	Contractor's profit and overheads on item 5.12-A420.1 above	%	500,000		
	Miscellaneous				
5.12-V516	Allow for cleaning and painting with approved 3 coats of emulsion paint all exposed pipework, valves, etc. within chambers in the Treatment Works.	Item	Lump Sum		
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CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

MARALAL WATER SUPPLY PROJECT

BILL No. 5.12

WORKS PIPELINES AND CHAMBERS

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CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

BILL No. 5.13

SITE AND ANCILLARY WORKS

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (Ksh)	AMOUNT (Ksh.)
	SITE CLEARANCE AND GENERAL EXCAVATION				
	Site Clearance of Work Area of Treatment Works Site; Rate to Include for Carting Away and Disposing Cleared Material to tips identified by contractor and approved by the Engineer.				
	NOTES:				
D2	**Tree cutting (Provisional)**				
	Trees to be Cleared to be Identified by the Engineer:				
	Cut down trees, grub up roots and cart away;				
5.13-D210	Girth: 500mm-2m	nr	15		
5.13-D220	Girth: exceeding 2m	nr	10		
5.13-D110	Clear area within the treatment works site of all grass, tea bushes, shrubs, hedges and grub up roots.	ha	1		
	Top Soil Stripping				
5.13-E411	Excavate over site for roads, buildings, etc., average 150 mm deep to remove vegetable soil and stack part of material for use as and where directed by the Engineer, cart away surplus to tips	ha	0.20		
	Earthworks				
5.13-E631	Spread top soil stacked on site (5.13-E411) for reuse. Level and prepare for grassing and landscaping.	m^2	2,000		
	ROADS - INTERNAL ROADS				
	ON-SITE ACCESS ROADS_MURRAM				
	Note: For brevity item description for Permanent Works generally identify the components of works. The rate must cover for provide, place, compact and all works necessary to complete work as per Specification				
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5.13-E221	Excavate approximately 300mm below stripped surface to formation level of footpaths and roads, including compaction of area, stack approved material for reuse as fill and cart away surplus to tips identified by the Contractor in liaison with the Local Authority, as directed by the Engineer.	m^3	4500		
5.13-R117	Provide, lay and compact 300mm thick murram base course	m^2	1400		
	FOOTPATHS				
	Provide and lay:				
5.13-R117	100mm thick murram sub-base for footpaths, well compacted	m^2	400		
	FENCING AND GATES				
5.13-X135	Construction of a chain-link fence. This includes excavate for post holes, provide all materials and construct chain link fence on concrete posts at 3 m centers all as per details on Drg. No. M/W/S/SD/15 including straining posts at every 18 meters and additional straining posts at corners	m	200		
5.13-E871	Excavate for post holes, provide all materials and construct barbed wire fence on concrete posts at 3 m centers to staff houses all as per details on Drg. Drg. No. M/W/S/SD/15 including additional posts at corners	m	550		
5.13-X225	Provide all materials and construct metal gate 6.0 m wide with 1Nr 916 mm wide pedestrians gates including 4Nr pillars all as detailed on the drawings	Nr	1		
5.13-X225	-Ditto - but 3.0m but without pedestrian gate	Nr	1		
	SURFACE WATER DRAINAGE				
	Precast Concrete Drains				
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5.13-K444	Excavate trench for precast concrete invert block drain Type 'A' as shown on Drg. NO. MWS/SD/22, including trimming of sides and cart excavated material to tips. Depth to invert n.e. 1.5m	m	275		
5.13-H700	Provide, lay and joint precast concrete invert block drain Type 'A' on 100mm murram bed, including 75mm murram filling both sides for height of block. Price to include for all cutting, waste, etc. Depth n.e. 1.5m	m	275		
5.13-H700	Provide, lay and joint four courses (two each side) of precast concrete side slabs to Type 'A' drain on 75mm thick compacted murram bed	m^2	350		
	Earth Drains				
5.13-K462	Excavate trapezoidal earth drains type 1 as shown on Drg. No. MWS/SD/13 to the lines and levels directed by the Engineer. Allow for trimming of sides to correct slopes and cart excavated material to tips. Depth to invert n.e. 1.0m	m	50		-
	Culvert Pipes and Storm Water Sewers				
5.13-H700	Excavate trench depth n.e. 2.5 m, supply, lay and joint for 600mm diameter DWC SN8 pipes including concrete surround, backfill after laying of pipes, compact and cart away surplus material to tips	m	30		
5.13-L543	Mass concrete 150mm thick bed and surround type 'C' to culverts (concrete mix 1:3:6)	m^3	15		
5.13-L543	Excavate for, provide all materials and construct 225 mm thick masonry headwalls including concrete Class 20/25 footings, all in accordance with Drg. No. MWS/SD/18	Nr	6		
	CHEMICAL SOAK AWAY PITS				
5.13-K232	Excavate for, provide all materials, construct, test and commission chemical soak away pit including radial arms	Nr	2		
	SEPTIC TANKS				
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

5.13-A420	Supply and install, including excavation, etc., 2 No. Plastic Septic Tanks, Minimum Capacity 2.5m^3, including Inlet and Outlet Chambers and Pipework, Soak Pit / Radial Arms etc. all as per suppliers' instructions ("Septank" from Kentainers Ltd. or approved equivalent)	Nr	1		
	-				
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CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

BILL No. 5.13

SITE AND ANCILLARY WORKS

		Amount (Ksh.)
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	Bill Total	

CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

BILL No. 5.14

ELECTRICAL WORKS

Item No.	Description	UNIT	Quantity	Rate (Ksh.)	Amount (Ksh.)
	GENERAL ITEMS				
	Carry out comprehensive testing, including 24-hour power analysis after switching on full load, with a digital power meter (with printer) to:				
5.14-A260	i) Record and print all the power system parameters	Item	L.S		
5.14-A299.1	Prepare and submit Working Drawings. (Full set as per drawing list)	Item	L.S		
5.14-A299.2	As item no. 5.14-A299.1, but for Record (As-Installed) Drawings.	Item	L.S		
5.14-A299.3	Allow for presentation of all the required samples as per specifications, Bills of Quantities and Drawings.	Item	L.S		
5.14-A299.4	Prepare and submit Maintenance Manuals for all items installed.	Item	L.S		
5.14-A420.1	Allow for sub-contractors charges for liaison with the client comprising the following: - i) Extracting load details from the drawings ii) Calculating total load, together with necessary diversity iii) Verifying the details with the engineer. iv) Getting the required documentation and letters from Client v) Filling all the required forms, and generating correspondences for power application. vi) Presenting application and getting reference number vii) Making regular follow-ups viii) Providing attendance and materials required for power connection. ix) Filling out and submitting Commencement and Completion certificates x) Handing over all approved drawings and certificates to the client. xi) Performing all other services required for power supply to site. xii) Building/modifying all power manholes xiii) All other incidental requirements/charges.	Item	P. S	90,000	90,000
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

5.14-A420.2	Provisional Sum of Ksh 10,000,000 for provision of a transformer and interconnection works at the water treatment plant	Item	P. S	10,000,000	10,000,000
	MAINS POWER DISTRIBUTION				
	Supply, install, test, commission and set to work the following.				
5.14-A420.3	Free-standing purpose made front access main switchboard manufactured in 14 SWG galvanized mild steel sheet, Form 4B, type tested assembly, IP44 and finished in cream (or appropriate colour) powder coating, complete with the following:-				
	(a) Space for cut-out for cited meters. (b) Digital multimeter capable of measuring 3-phase voltage and current and other power system parameters (viz. kW, kVA, kWH, kvar, Frequency, Power Factor, and harmonics) (c) 1 No. 200A TP adjustable MCCB incomer complete with shunt trip unit (d) 5 No.250A TPN insulated copper bus bars (e) 4 No. 50A TPN MCCB (f) 2 No. 40A TPN MCCB (g) 1 No. 40A SPN MCCB (h) 2 No. 63A TPN MCB (i) 4 No. 10A SPN MCB (j) 3 No. 30KW, 24KW 11KW 3No Star-Delta Starter complete with the following controls: - - 1 duty and 1 stand-by pump operation - RUN/STOP/TRIP Indicating Lamps - Manual ON/OFF operation - Reset button - Running Hour Meters - Over-load relay protection - UV / OV & Phase Sequence Protection. - Emergency start/stop buttons (remote) - Motor thermistor protection if required (confirm with motor data) - 2 no. Pressure switch cut-off 1 no. on each pump - Float switch dry run protection - High and low tank water level indicator lamps (k) 75 KVAr's automatic power factor correction capacitor bank switched in 2 steps of 5 KVAr's, 3 step of 15 KVAr and 2 steps of 10 KVAr's. The bank to be made from low-loss bio-degradable capacitive units, complete with earthed enclosure. All the contactors, controls and indicator lamps, including a digital read-out screen, to be included (l) 415V three-phase surge diverter as Furse ESP 415, wired, complete with enclosure with viewing window.				
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	(m) 7 No. 20A SP/N contractor as elemecanique for the control of external lights (n) 7 No. 20A over-ride switch across the contactor above, complete with all accessories (o) 7No. Photocell/Timer for contactor in item (m) above	Item	P. S	2,000,000	2,000,000
5.14-Z769	Comprehensive protective multiple earthing of item No. 5.14-A420.3 in 1500mm long 12mm diameter pure electrolytic copper earth rod deep driven to permanent moisture level, copper clamp. 70mm² green earth lead complete with all accessories. (Note: Use parallel rods if effective earthing cannot be achieved with 1 No. rod).	Item	L.S		
5.14-Z714.1	4C 16mm² PVC/SWA/PVC copper cable for general pump, recirculation pump, chemical dosing, Chlorine storage mixing and operations office.	m	350		
5.14-Z714.2	4C 10mm² PVC/SWA/PVC copper cable.	m	250		
5.14-Z714.3	2C 6mm² PVC/SWA/PVC copper cable.	m	270		
5.14-Z762.1	Cable glands and cable lugs for the 4C 16mm² cable above.	Nr	25		
5.14-Z762.2	Cable glands and cable lugs for the 4C 10mm² cable above.	Nr	10		
5.14-Z762.3	Cable glands and cable lugs for the 2C 6mm² cable above.	Nr	50		
5.14-Z714.4	Single core 16mm² PVC yellow/green earthing/ circuit protection cable	m	320		
5.14-Z714.5	Single core 10mm² PVC yellow/green earthing/ circuit protection cable	m	140		
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5.14-Z714.6	Single core 6mm^2 PVC yellow/green earthing/ circuit protection cable	m	330		
5.14-Z751	400 x 75mm 12 gauge galvanized steel perforated cable tray for support of the cables	m	35		
5.14-Z721	Diameter 2x100mm HG PVC ducts for external power distribution.	m	270		
5.14-Z714.7	Excavate trenches for the above ducts average depth 700mm, remove soft earth, lay duct, cover with “DANGER – HATARI” tiles, back-fill with soil and compact to natural ground level.	m	180		
5.14-K231	Build 600 x 600 x 700mm deep power manhole complete with internal plaster and Medium duty composite material covers	Nr	23		
5.14-Z714.8	4C 2.5mm^2 PVC/SWA/PVC copper cable for motor controls.	m	60		
5.14-Z762.4	Cable glands and cable lugs for the 4C 2.5mm^2 cable above.	Nr	12		
5.14-Z714.8	4C 25mm^2 PVC/SWA/PVC copper cable backwash pump.	m	20		
5.14-Z762.4	Cable glands and cable lugs for the 4C 25mm^2 cable above.	Nr	15		
	PUMP HOUSE - BUILDING SERVICES WORKS				
	Supply, install, test, commission and set to work the following. All lighting fittings to be complete with lamp control gear etc. as applicable.				
	Note: Lighting and Small Power circuits to be derived directly from the main board.				
	Lighting				
5.14-Z799.1	Lighting point 1-way switched, wired in 3x1.5 sq.mm PVC insulated single core copper cable drawn in 20mm dia.GI conduit surface mounted in building fabric.	Nr	12		
5.14-Z799.2	Ditto but lighting point 2-way switched	Nr	3		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

	6 A white molded switch plates as MK Logic Plus, Clipsal E-Series or equivalent and approved: -				
5.14-Z782.1	(a) 1-gang 1-way	Nr	3		
5.14-Z782.2	(b) 2-gang 1-way	Nr	2		
5.14-Z782.3	(c) 1-gang 1-way, weatherproof	Nr	2		
	Supply, fix into position and test the following light fittings.				
5.14-Z783.1	(a) Twin 1200mm T8 LED moisture resistant fluorescent fitting, complete with diffuser, as Lipper (Type N)	Nr	6		
5.14-Z783.2	(b) Polycarbonate bulkhead with black base, tool-less gear tray fixation with honeycomb prismatic diffuser as Thorn Leopard (Type G)	Nr	6		
5.14-Z781.1	(c) Photocell for Type - G circuit	Nr	1		
	Small Power				
5.14-Z784	13A Twin metal clad switched socket outlet as MK or approved equivalent complete with wiring in 3 x 2.5 sq.mm PVC insulated single core copper cable drawn in GI steel conduit surface mounted in building fabrics.	Nr	5		
5.14-Z714.8	4C 2.5mm^2 PVC/SWA/PVC copper cable for motor controls.	m	40		
5.14-Z762.4	Cable glands and cable lugs for the 4C 2.5mm^2 cable above.	Nr	6		
5.14-Z751	400 x 75mm 12 gauge galvanized steel perforated cable tray for support of the cables	m	50		
	FILTER GALLERY AND FILTER CONTROL ROOM				
	Supply, install, test, commission and set to work the following. All lighting fittings to be complete with lamp control gear etc. as applicable.				
	Lighting				
5.14-Z799.1	Lighting point 1-way switched, wired in 3x1.5 sq.mm PVC insulated single core copper cable drawn in 20mm dia.GI conduit surface mounted in building fabric	Nr	11		
5.14-Z799.2	Ditto but lighting point 2-way switched	Nr	2		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

	6 A white molded switch plates as MK Logic Plus, Clipsal E-Series or equivalent and approved: -				
5.14-Z782.1	(a) 1-gang 1-way	Nr	2		
5.14-Z782.2	(b) 2-gang 1-way	Nr	2		
5.14-Z782.3	(c) 1-gang 1-way, weatherproof	Nr	2		
	Supply, fix into position and test the following light fittings.				
5.14-Z783.1	(a) Twin 1200mm T8 LED moisture resistant fluorescent fitting, complete with diffuser, as Lipper (Type N)	Nr	6		
5.14-Z783.3	(b) 2x 58watts IP65 rated dust and moisture resistant fluorescent fitting with injection molded GRP canopy, acrylic diffuser and stainless steel toggles, fitted with warm start high frequency ballast as Thorn Corrosion-proof 2 (Type F)	Nr	3		
5.14-Z783.2	(c) Polycarbonate bulkhead with black base, tool-less gear tray fixation with honeycomb prismatic diffuser as Thorn Leopard (Type G)	Nr	4		
5.14-Z781.1	(d) Photocell for Type - G circuit	Nr	1		
	Small Power				
5.14-Z781.2	4 Ways 100A TP MCBs flush mounted Consumer Unit complete with integral isolator and front lockable cover as Terasaki or equal and approved.	Nr	1		
5.14-Z769.1	Labelling and earthing for the above board	Item	L.S		
	MCBs for the items above:				
5.14-Z781.3	a) 10A SP.	Nr	4		
5.14-Z781.4	b) 30A SP.	Nr	2		
5.14-Z784	13A Twin metal clad switched socket outlet as MK or approved equivalent complete with wiring in 3 x 2.5 sq.mm PVC insulated single core copper cable drawn in GI steel conduit surface mounted in building fabrics.	Nr	8		
	COMPRESSOR HOUSE				
	Supply, install, test, commission and set to work the following. All lighting fittings to be complete with lamp control gear etc. as applicable.				
	Lighting				
5.14-Z799.1	Lighting point 1-way switched, wired in 3x1.5 sq.mm PVC insulated single core copper cable drawn in 20mm dia.GI conduit surface mounted in building fabric	Nr	1		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

5.14-Z799.2	Ditto but lighting point 2-way switched	Nr	1		
	6A metal clad switch plates as MK Logic Plus, Clipsal E-Series or equivalent and approved: -				
5.14-Z782.1	(a) 1-gang 1-way	Nr	1		
5.14-Z782.2	(b) 2-gang 1-way	Nr	1		
5.14-Z782.3	(c) 1-gang 1-way, weatherproof	Nr	1		
	Supply, fix into position and test the following light fittings.				
5.14-Z783.3	(a) 2x 58watts IP65 rated dust and moisture resistant fluorescent fitting with injection molded GRP canopy, acrylic diffuser and stainless steel toggles, fitted with warm start high frequency ballast as Thorn Corrosion-proof 2 (Type F)	Nr	2		
	Distribution Board & Motor Control Panel				
5.14-Z781.5	Wall-mounted purpose made front access distribution board and motor control panel manufactured in plastic, complete with the following: - (a) Digital multimeter capable of measuring 3-phase voltage and current and other power system parameters (viz. KW, KVA, KWHr, KVArs, Frequency, P.F., and harmonics) (b) 1 No. 50A TP MCCB incomer (c) 5 No. 63A TPN insulated copper bus bars (d) 4 No. 20A TPN MCB (e) 2 No. 6A TPN MCB (f) 1 No. 32A SPN MCB (g) 1 No. 10A SPN MCB (h) 1 No. 20A SPN MCB (i) Sufficient spare capacity (j) 3 No. 2.5 kW DOL Starter with O/L relay and controls complete with the following: - - RUN/STOP/TRIP Indicating Lamps - Manual ON/OFF operation - Reset button - Running Hour Meters - Over-load protection - UV / OV & Phase Sequence Protection. - Remote Push Button Station for Start/ Stop Operation - Any other protection & Indications as required. (k)2 No. 0.75 kW DOL Starter with O/L relay and controls complete with the following: - - RUN/STOP/TRIP Indicating Lamps - Manual ON/OFF operation - Reset button - Running Hour Meters - Over-load protection - UV / OV & Phase Sequence Protection.				
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	- Remote Push Button Station for Start / Stop Operation - Any other protection & Indications as required.	Item	L.S		
5.14-Z779	Labeling of all the final sub-circuits in item No. 5.14-Z781.5 above.	Item	L.S		
	Push Button Station				
5.14-Z781.6	Supply and install remote Start/Stop Push Button station to IP 54, complete with 1.2 mtr Stanchion at each blower motor location	Nr	2		
5.14-Z714.9	Supply and install 4C 1.5mm^2 PVC cable from distribution board to Push Button Station complete with conduit, termination, lugs, etc.	m	30		
	Small Power				
5.14-Z784	13A Twin metal clad switched socket outlet as MK or approved equivalent complete with wiring in 3 x 2.5 sq.mm PVC insulated single core copper cable drawn in GI steel conduit surface mounted in building fabrics.	Nr	5		
5.14-Z769	Comprehensive protective multiple earthing of item No. 5.14-Z781.5 in 1500mm long 12mm diameter pure electrolytic copper earth rod deep driven to permanent moisture level, copper clamp. 70mm^2 green earth lead complete with all accessories. (Note: Use parallel rods if effective earthing cannot be achieved with 1 No. rod).	Item	L.S		
5.14-Z714.1	4C 16mm^2 PVC/SWA/PVC copper cable for general pump, recirculation pump, chemical dosing, Chlorine storage mixing and operations office.	m	120		
5.14-Z762.1	Cable glands and cable lugs for the 4C 16mm^2 cable above.	Nr	30		
5.14-Z714.4	Single core 16mm^2 PVC yellow/green earthing/ circuit protection cable	m	120		
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	CHLORINE STORAGE, MIXING AND DOSING BUILDING				
	Supply, install, test, commission and set to work the following. All lighting fittings to be complete with lamp control gear etc. as applicable.				
	Lighting				
5.14-Z799.1	Lighting point 1-way switched, wired in 3x1.5 sq.mm PVC insulated single core copper cable drawn in 20mm dia.GI conduit surface mounted in building fabric	Nr	12		
5.14-Z799.2	Ditto but lighting point 2-way switched	Nr	1		
	6A metal clad switch plates as MK Logic Plus, Clipsal E-Series or equivalent and approved: -				
5.14-Z782.1	(a) 1-gang 1-way	Nr	1		
5.14-Z782.2	(b) 2-gang 1-way	Nr	1		
5.14-Z782.3	(c) 1-gang 1-way, weatherproof	Nr	1		
	Supply, fix into position and test the following light fittings.				
5.14-Z783.3	(a) 2x 58watts IP65 rated dust and moisture resistant fluorescent fitting with injection molded GRP canopy, acrylic diffuser and stainless steel toggles, fitted with warm start high frequency ballast as Thorn Corrosion-proof 2 (Type F)	Nr	6		
5.14-Z783.2	(b) Polycarbonate bulkhead with black base, tool-less gear tray fixation with honeycomb prismatic diffuser as Thorn Leopard (Type G)	Nr	6		
5.14-Z781.1	(c) Photocell for Type - G circuit	Nr	1		
	Distribution Board & Motor Control Panel				
5.14-Z781.5	Wall-mounted purpose made front access distribution board and motor control panel manufactured in plastic, complete with the following: - (a) Digital multimeter capable of measuring 3-phase voltage and current and other power system parameters (viz. KW, KVA, KWHr, KVArs, Frequency, P.F., and harmonics) (b) 1 No. 50A TP MCCB incomer (c) 5 No. 63A TPN insulated copper bus bars (d) 4 No. 20A TPN MCB (e) 2 No. 6A TPN MCB (f) 1 No. 32A SPN MCB (g) 1 No. 10A SPN MCB (h) 1 No. 20A SPN MCB (i) Sufficient spare capacity (j) 3 No. 2.5 kW DOL Starter with O/L relay and controls complete with the following: - - RUN/STOP/TRIP Indicating Lamps - Manual ON/OFF operation - Reset button - Running Hour Meters - Over-load protection - UV / OV & Phase Sequence Protection.				
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	- Remote Push Button Station for Start / Stop Operation - Any other protection & Indications as required. (k) 2 No. 0.75 kW DOL Starter with O/L relay and controls complete with the following: - - RUN/STOP/TRIP Indicating Lamps - Manual ON/OFF operation - Reset button - Running Hour Meters - Over-load protection - UV / OV & Phase Sequence Protection. - Remote Push Button Station for Start / Stop Operation - Any other protection & Indications as required.	Item	L.S		
5.14-Z779	Labeling of all the final sub-circuits in item No. 5.14-Z781.5 above.	Item	L.S		
	Push Button Station				
5.14-Z781.6	Supply and install remote Start/Stop Push Button station to IP 54, complete with 1.2 mtr Stanchion at each mixer motor location	Nr	3		
5.14-Z714.9	Supply and install 4C 1.5mm^2 PVC cable from distribution board to Push Button Station complete with conduit, termination, lugs, etc.	m	40		
5.14-Z781.6	Supply and install remote Start/Stop Push Button station of IP 54 class Protection at each ventilation fan location	Nr	2		
5.14-Z714.9	Supply and install 4C 1.5mm^2 PVC cable from distribution board to Push Button Station complete with conduit, termination, lugs, etc.	m	50		
	Small Power				
5.14-Z784	13A Twin metal clad switched socket outlet as MK or approved equivalent complete with wiring in 3 x 2.5 sq.mm PVC insulated single core copper cable drawn in GI steel conduit surface mounted in building fabrics.	Nr	5		
	CHEMICAL STORAGE, MIXING AND DOSING BUILDING				
	Supply, install, test, commission and set to work the following. All lighting fittings to be complete with lamp control gear etc. as applicable.				
	Lighting				
5.14-Z799.1	Lighting point 1-way switched, wired in 3x1.5 sq.mm PVC insulated single core copper cable drawn in 20mm dia.GI conduit surface mounted in building fabric	Nr	8		
5.14-Z799.2	Ditto but lighting point 2-way switched	Nr	4		
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	6A metal clad switch plates as MK Logic Plus, Clipsal E-Series or equivalent and approved: -				
5.14-Z782.1	(a) 1-gang 1-way	Nr	1		
5.14-Z782.2	(b) 2-gang 1-way	Nr	1		
5.14-Z782.3	(c) 1-gang 1-way, weatherproof	Nr	3		
	Supply, fix into position and test the following light fittings.				
5.14-Z783.3	a) 2x 58watts IP65 rated dust and moisture resistant fluorescent fitting with injection molded GRP canopy, acrylic diffuser and stainless steel toggles, fitted with warm start high frequency ballast as Thorn Corrosion-proof 2 (Type F)	Nr	6		
5.14-Z783.4	(b) Ditto but with emergency version (Type FE)	Nr	1		
5.14-Z783.2	(c) Polycarbonate bulkhead with black base, tool-less gear tray fixation with honeycomb prismatic diffuser as Thorn Leopard (Type G)	Nr	4		
5.14-Z781.1	(d) Photocell for Type - G circuit	Nr	1		
	Distribution Board & MCC				
5.14-Z781.6	Wall-mounted purpose made front access distribution board and motor control center manufactured in plastic, complete with the following: -				
	(a) Digital multimeter capable of measuring 3-phase voltage and current and other power system parameters (viz. KW, KVA, KWHr, KVArs, Frequency, P.F., and harmonics) (b) 1 No. 50A TP MCCB incomer (c) 5 No. 63A TPN insulated copper bus bars (d) 4 No. 20A TPN MCB (e) 2 No. 6A TPN MCB (f) 1 No. 32A SPN MCB (g) 2 No. 10A SPN MCB (h) Sufficient spare capacity (i) 3 No. 2.5 kW DOL Starter with O/L relay and controls complete with the following: - - RUN/STOP/TRIP Indicating Lamps - Manual ON/OFF operation - After Trip Reset button - Running Hour Meters - Over-load protection - UV / OV & Phase Sequence Protection. - Control Relays - Remote Push Button Station for Start / Stop Operation - Any other protection & Indications as required. (j) 2 No. 0.75 kW DOL Starter with O/L relay and controls complete with the following: - - RUN/STOP/TRIP Indicating Lamps - Manual ON/OFF operation - After Trip Reset button - Running Hour Meters - Over-load protection				
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	- UV / OV & Phase Sequence Protection. - Control Relays - Remote Push Button Station for Start / Stop Operation - Any other protection & Indications as required.	Item	L.S		
5.14-Z779	Labeling of all the final sub-circuits in item No. 6.2.1 above.	Item	L.S		
	Push Button Station				
5.14-Z781.6	Supply and install remote Start/Stop Push Button station to IP 54, complete with 1.2 mtr Stanchion at each mixer motor location	Nr	3		
5.14-Z714.9	Supply and install 4C 1.5mm^2 PVC cable from distribution board to Push Button Station complete with conduit, termination, lugs, etc.	m	40		
5.14-Z781.6	Supply and install remote Start/Stop Push Button station of IP 54 class Protection at each ventilation fan location	Nr	2		
5.14-Z714.9	Supply and install 4C 1.5mm^2 PVC cable from distribution board to Push Button Station complete with conduit, termination, lugs, etc.	m	30		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					

	Small Power				
5.14-Z784	13A Twin metal clad switched socket outlet as MK or approved equivalent complete with wiring in 3 x 2.5 sq.mm PVC insulated single core copper cable drawn in GI steel conduit surface mounted in building fabrics.	Nr	5		
	GUARD HOUSE				
	Supply, install, test, commission and set to work the following. All lighting fittings to be complete with lamp control gear etc. as applicable.				
	Lighting				
5.14-Z799.1	Lighting point 1-way switched, wired in 3x1.5 sq.mm PVC insulated single core copper cable drawn in 20mm dia.GI conduit surface mounted in building fabric	Nr	4		
5.14-Z799.2	Ditto but lighting point 2-way switched	Nr	1		
	6 A white molded switch plates as MK Logic Plus, Clipsal E-Series or equivalent and approved: -				
5.14-Z782.1	(a) 1-gang 1-way	Nr	1		
5.14-Z782.2	(b) 2-gang 1-way	Nr	1		
5.14-Z782.3	(c) 1-gang 1-way, weatherproof	Nr	1		
	Supply, fix into position and test the following light fittings.				
5.14-Z783.3	(a) 2x 58watts IP65 rated dust and moisture resistant fluorescent fitting with injection molded GRP canopy, acrylic diffuser and stainless steel toggles, fitted with warm start high frequency ballast as Thorn Corrosion-proof 2 (Type F)	Nr	1		
5.14-Z783.2	(b) Polycarbonate bulkhead with black base, tool-less gear tray fixation with honeycomb prismatic diffuser as Thorn Leopard (Type G)	Nr	3		
5.14-Z783.5	(c) 18watts 600mm fluorescent fitting with opal diffuser fitted with warm start high frequency ballast as Thorn (Type A)	Nr	1		
5.14-Z781.1	(d) Photocell for Type - G circuit	Nr	1		
	Small Power				
5.14-Z781.2	4 Ways 100A SP MCBs flush mounted Consumer Unit complete with integral isolator and front lockable cover as Terasaki or equal and approved.	Nr	1		
5.14-Z769.1	Labelling for the above board	Item	L.S		
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	MCBs for the items above:				
5.14-Z781.3	a) 10A SP.	Nr	2		
5.14-Z781.4	b) 30A SP.	Nr	2		
5.14-Z784	13A Twin metal clad switched socket outlet as MK or approved equivalent complete with wiring in 3 x 2.5 sq.mm PVC insulated single core copper cable drawn in GI steel conduit surface mounted in building fabrics.	Nr	3		
	STAFF HOUSES				
	Supply, install, test, commission and set to work the following. All lighting fittings to be complete with lamp control gear etc. as applicable.				
	Staff House Building (2 no. one bedroom houses)				
	Lighting				
5.14-Z799.1	Lighting points wired in 3x 1.5 sq.mm PVC insulated single core copper cable drawn in 20mm dia. PVC Heavy gauge conduit concealed in building fabrics for one way switching.	Nr	40		
5.14-Z799.2	Ditto, but for two ways switching.	Nr	4		
	6A metal clad switch plates as MK Logic Plus, Clipsal E-Series or equivalent and approved: -				
5.14-Z782.1	(a) 1-gang 1-way	Nr	4		
5.14-Z782.2	(b) 2-gang 1-way	Nr	4		
5.14-Z782.3	(c) 1-gang 1-way, weatherproof	Nr	4		
	Supply, fix into position and test the following light fittings.				
5.14-Z783.6	(a) 28W 2D standard circular compact fluorescent surface mounted luminaire with polycarbonate opal diffuser and white trim body as Thorn Club or equal and approved (Type A).	Nr	24		
5.14-Z783.7	(b) 1x36W 1200mm HPF surface mounted batten fluorescent fittings as Thorn Popular Pack PP136 or equal and approved, as type 4.	Nr	4		
5.14-Z783.8	(c) 100watts ceiling pendant, as MK 1189 WHI or equal and approved (Type P)	Nr	12		
5.14-Z783.9	(d) Polycarbonate bulkhead with black base, tool-less gear tray fixation with honeycomb prismatic diffuser as Thorn Leopard (Type M)	Nr	12		
5.14-Z781.2	(e) Photocell for Type M circuit	Nr	4		
	Small Power				
	Ring mains circuit power points wired in 3x 2.5 sq.mm PVC insulated single core copper cable drawn in PVC Heavy gauge conduit concealed in building fabrics.	Nr	48		
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5.14-Z772	Cooker circuit comprising wiring in 3 x 4.0mm sq. single core PVC insulated copper cables drawn in 25 mm diameter heavy gauge PVC conduits concealed in floor slabs and walls and complete with all the necessary accessories.	Nr	4		
5.14-Z789.1	45 Amp Cooker control unit complete with 13A socket outlet, neon lamps and clamped connector unit as MEM or equal and approved.	Nr	4		
5.14-Z789.2	10A 240V 4 Pole AC1 contractor as Telemecanique for the control of external lights	Nr	4		
5.14-Z789.3	10A over-ride switch across the contactor above, complete with all accessories	Nr	4		
5.14-Z789.4	200 x 200 mm x 100 mm galvanized steel adaptable box	Nr	4		
	500V white molded socket plates as Clipsal range or equal and approved as described:				
5.14-Z789.5	a) 13A twin standard switched.	Nr	48		
5.14-Z789.6	b) 13A single standard switched	Nr	8		
	Power Distribution and Sub-Mains				
5.14-Z789.7	Purpose made metering panel manufactured in 14 SWG galvanized mild steel sheet and finished in cream (or appropriate colour) powder coating complete with Cut-Out, 63A MCCB and Perspex viewing window.	Nr	4		
5.14-Z789.8	6 Ways 100A SP MCBs flush mounted Consumer Unit 'CU-S1' complete with integral isolator and front lockable cover as Terasaki or equal and approved.	Nr	4		
5.14-Z769.2	Earthing comprising 1500mm, 12mm diameter earth electrode, 6metres of 6.0mm sq. earth lead drawn in 20mm diameter conduit concealed in wall, 300x300x300mm earth pit as Furse or equal and approved, complete with all accessories.	Item	L.S		
5.14-Z769.3	Labelling for the above board	Item	L.S		
	MCBs for the items above:				
5.14-Z781.3	a) 10A SP.	Nr	4		
5.14-Z781.4	b) 30A SP.	Nr	12		
5.14-Z781.7	c) 45A SP.	Nr	8		
5.14-Z781.8	250 x 200 mm x 150 mm cable loop-in box complete with all accessories.	Nr	4		
	EXTERNAL LIGHTING				
5.14-N164	Supply and install 5.0 m columns for post top lantern including suitable foundation	Nr	10		
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5.14-Z781.9	120W Area flood light as Lipper	Nr	20		
5.14-Z714.10	Supply, install and connect 2.5 mm² x 3 core PVC/SWA/PVC cables in cable trenches and ducts	m	100		
5.14-Z762.4	Supply and install cable glands	Nr	3		
5.14-Z714.11	Trenching, laying, tiling and backfilling for underground cables - Avg. depth 600 mm	m	300		
5.14-Z781.9	Supply and install Lucy connectors complete with 5 Amp. H.R.C. fused cut-outs in the column windows.	Nr	20		
5.14-Z714.12	2.5mm² twin + earth cable between the Lucy cut-out in each of the poles and the lighting fixture.	m	75		
5.14-Z781.10	Supply and install 16 mm dia. x 1500 mm long earth electrode for alternate columns complete with 6 mm2 copper earth wire	Nr	15		
5.14-Z781.11	Supply and install cable markers	Nr	40		
5.14-Z781.12	Supply and install labels on columns / Danger warning notices as may be necessary	Item	L.S		
5.14-Z779.1	Engrave security lighting lanterns as required by the Engineer	Nr	25		
	OPERATOR'S OFFICE, LABORATORY & STORE				
	Supply, install, test, commission and set to work the following. All lighting fittings to be complete with lamp control gear etc. as applicable.				
	Lighting				
5.14-Z799.1	Lighting point 1-way switched, wired in 3x1.5 sq.mm PVC insulated single core copper cable drawn in 20mm dia.GI conduit surface mounted in building fabric	Nr	13		
5.14-Z799.2	Ditto but lighting point 2-way switched	Nr	6		
	5A white molded switch plates as MK Logic Plus, Clipsal E-Series or equivalent and approved: -				
5.14-Z782.1	(a) 1-gang 1-way	Nr	6		
5.14-Z782.2	(b) 2-gang 1-way	Nr	2		
5.14-Z782.3	(c) 1-gang 1-way, weatherproof	Nr	2		
5.14-Z782.4	(e) 2-gang 2-way	Nr	4		
	Supply, fix into position and test the following light fittings.				
5.14-Z783.10	(a) 2 x 58W 1500mm HPF Fluorescent batten fitting with mirrow Brite aluminum louvers as THORN Cat. No. PPS 258 + PP/PT L24Cat2 MB or approved equivalent. (Type A)	Nr	4		
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5.14-Z783.11	(b) 1 x 58W 1500mm HPF Fluorescent batten fitting as THORN Cat. No. PPS 158 or approved equivalent. (Type B)	Nr	4		
5.14-Z783.12	(c) 28W 2D shallow opal surface mounted light fitting and trim in chrome as Thorn Superclub complete with lamp Type C)	Nr	5		
5.14-Z783.2	(d) Polycarbonate bulkhead with black base, tool-less gear tray fixation with honeycomb prismatic diffuser as Thorn Leopard (Type G)	Nr	6		-
5.14-Z781.1	(e) Photocell for Type - G circuit	Nr	1		
	Power Supply				
5.14-Z781.13	6Ways 100A TP Distribution Board complete with integral isolator and front lockable cover as Terasaki or equal and approved.	Nr	1		
	MCBs for the items above:				
5.14-Z781.3	a) 10A SP.	Nr	3		
5.14-Z781.4	b) 30A SP.	Nr	3		
5.14-Z779	Labeling and earthing of all the final sub-circuits in item No. 5.14-Z781.13 above.	Item	L.S		-
5.14-Z784.1	Outlet for 15A round pin socket outlet complete with concealed conduit, box wiring in 3 x 4 mm² SC-PVC-CU cables and all accessories including 15A round pin socket outlet plate with neon light as MK Logic or Clipsal E-Series	Nr	1		
5.14-Z772.1	Outlet for cooker control unit comprising wiring in 3x6.0mm² SC-PVC CU cables, twin steel box Dia. 25mm HG PVC conduit link, and all accessories including 45A DP cooker control unit with neon lamp, and 13A integral socket with neon light as MK Logic, Clipsal E-Series or approved equivalent.	Nr	1		
5.14-Z781.4	45A DP cooker connector unit with wiring in 3 x 6.0mm² SC-PVC-CU cables, and Dia. 25mm HG conduit link to the above.	Nr	1		
5.14-Z781.14	Twin 13A white molded standard socket outlet for normal power wired in 6 x 2.5 mm² SC-PVC-CU cables inside the trunking. The socket outlets to be MK, Clipsal E-Series or approved equivalent.	Nr	8		
5.14-Z721.1	Dia 32mm HG PVC concealed conduits	m	80		
	STREET LIGHTING & OUTDOOR LIGHTING				
	Supply and install 5.0 m columns for post top lantern Gamma Six - 80W HP Mercury, clear bowl, large canopy, including suitable foundation				
5.14-N164	Type - J	Nr	10		
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5.14-Z714.10	Supply, install and connect 2.5 mm^2 x 3 core PVC/ SWA/PVC cables in cable trenches and ducts	m	600		
5.14-Z714.13	Terminate 3C X 2.5 sq.mm Cable for lighting columns complete with Conduits, glands, lugs etc.	Nr	75		
5.14-Z714.11	Trenching, laying, tiling and backfilling for underground cables - Avg. depth 600 mm	m	200		
5.14-Z781.9	Supply and install Lucy connectors complete with 5 Amp. H.R.C. fused cut-outs in the column windows.	Nr	24		-
5.14-Z714.14	Supply, install and connect 1.5 mm2 x 3 cores with earth PVC/PVC cable from fused cut-outs to lanterns.	Nr	24		
5.14-Z781.10	Supply and install 16 mm dia. x 1500 mm long earth electrode for columns	Nr	5		
5.14-Z714.15	Supply, install and connect 6 mm^2 copper earth wire at columns from earth electrodes	Nr	5		
5.14-Z781.11	Supply and install cable markers	m	400		
5.14-Z781.12	Supply and install labels on columns / Danger warning notices as may be necessary.	Item	L.S		
5.14-Z779.1	Engrave security lighting lanterns as required by the Engineer	Nr	46		
5.14-A260	Test and Commission - Small Power & Lighting System.	Item	L.S		
	OUTDOOR LIGHTING - FILTER AREA				
	Supply and install Wall Brackets for post top lantern Gamma Six - 80W HP Mercury, clear bowl, large canopy, including suitable foundation.				
5.14-N164.1	Type - M	Nr	4		
5.14-N164.2	Type – G	Nr	12		
5.14-N164.3	Type – F	Nr	4		
5.14-Z714.16	Supply and install cables including GI conduits and accessories to light fittings including connection to the Outdoor Lighting circuit	item	L.S		
5.14-A260	Test and Commission - Lighting system.	Item	L.S		
	EARTHING SYSTEM				
	Supply & Install Earthing of LV switchboards and others	Item	L.S		
	LIGHTING ARRESTORS AND EARTHING / GROUNDING INSTALLATION				
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	Allow a Provisional Sum of Ksh 450,000 for each of the following items for supply and installation of lightning protection and earthing on the following structures comprising of multiple air terminals, air base terminals, tape saddle clips, 3 x 25 mm copper tape, testing clamps, tape to earth rod clamps, earthing rods and inspection chamber.				
5.14-A420.4	Elevated Backwash Tank	Item	P. S	70,000	70,000
5.14-A420.5	Operator's Office	Item	P. S	70,000	70,000
5.14-A420.6	Filter Gallery Building	Item	P. S	60,000	60,000
5.14-A420.7	Chemical storage, mixing and dosing Building	Item	P. S	90,000	90,000
5.14-A420.8	Chlorine storage, mixing and dosing Building	Item	P. S	90,000	90,000
5.14-A420.9	Staff buildings	Item	P. S	70,000	70,000
	VOICE AND DATA INSTALLATION				
	Allow a Provisional Sum of Ksh 250,000 for each of the following items for supply and installation of complete LNA Network.				
5.14-A420.10	Operator's Office	Item	P. S	50,000	50,000
5.14-A420.11	Chemical storage, mixing and dosing Building	Item	P. S	50,000	50,000
5.14-A420.12	Chlorine storage, mixing and dosing Building	Item	P. S	50,000	50,000
5.14-A420.13	Staff buildings	Item	P. S	50,000	50,000
5.14-A420.14	Allow for optic fiber cable back bone connectivity between buildings	Item	P. S	50,000	50,000
	FIRE DETECTION AND ALARM SYSTEM				
	Allow a Provisional Sum of Ksh 250,000 for each of the following items for supply and installation of fire detection and alarm system comprising of fire alarm panel, heat sensors, smoke sensors, break glass, sounders, interfacing units, FP200 cabling, programming, testing and commissioning.				
5.14-A420.15	Operator's Office	Item	P. S	60,000	60,000
5.14-A420.16	Chemical storage, mixing and dosing Building	Item	P. S	60,000	60,000
5.14-A420.17	Chlorine storage, mixing and dosing Building	Item	P. S	60,000	60,000
5.14-A420.18	Pump House Building	Item	P. S	70,000	70,000
5.14-A420.19	Contractor's profit and overheads of items 5.14-A420.4 to 5.14-A420.18	%	950,000		
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CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

BILL No. 5.14

ELECTRICAL WORKS

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CONSTRUCTION OF MARALAL WATER SUPPLY
BILL No. 5.15

STAFF HOUSE (ONE BEDROOM)

Item No.	Description	UNIT	Quantity	Rate (Ksh.)	
5.15	**SUB-STRUCTURES (PROVISIONAL)**				
	Excavations and Earthworks				
	The rate shall include for all strutting, shuttering, stabilizing the excavation faces and keeping the excavation free of water by pumping, bailing or other means				
	Bulk excavations and top soil stripping for all structures are measured under Bill No. 5.13 - Site and Ancillary Works.				
	Excavate for foundations, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer				
	Excavate 0.0 - 5m Starting from Stripped Level to Receive				
5.15-E324	Excavate for foundation trench not exceeding 1.50 meters deep.	m^3	50		
5.15-E335.1	Excavating in rock Class "A"	m^3	2		
5.15-E335.2	Excavating in rock Class "B"	m^3	2		
5.15-E335.3	Excavating in rock Class "C"	m^3	10		
5.15-E614	Return, fill-in and rum selected excavated materials around foundations	m^3	26		
5.15-E532	Remove and cut away surplus excavated materials.	m^3	18.6		
	Approved Selected Filling				
5.15-E647	Provide and deposit approved imported hardcore in maximum 300mm thick layers in making up levels including achieving satisfactory compaction	m^3	20		
5.15-E645	50mm (Average) thick quarry dust blinding to surfaces of hardcore	m^2	60		
	Ant termite treatment				
5.15-E790	Termidor 25 EC or other equal approved anti-termite chemical treatment: applied by an approved professional pest control specialist:10-year warranty: strictly applied in accordance with the manufacturer's instructions	m^2	60		
	Damp-Proof Membrane				
5.15-W239	500mm Gauge polythene damp- proof membrane laid on blinded hardcore with 100mm folded side and end laps (measured net-allow for laps)	m^2	60		
	Concrete Work:				
	Provision of concrete				
5.15-F122	Designed concrete C 12/15	m^3	1.5		
5.15-F142	Designed concrete C 20/25	m^3	16		
	Placing of concrete				
5.15-F611	50mm thick mass concrete class 15 To bottoms of foundations	m^2	1.5		
5.15-F72*.1	Concrete Class 25 for Foundations in trenches	m^3	6		
5.15-F72*.2	150mm thick bed	m^3	10		
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	Reinforcement				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²: cut, bend and fix as directed: tenderers to allow in their rate, cost for cutting, bending, hoisting and fixing including all necessary binding wires, spacer blocks and stools				
5.15-G523	Diameter: 10mm	Kg	180		
	Fabric Reinforcement No. A142 Mesh Size 200 x 200mm Weighing 2.22 kgs Per m2, Including Bends, Tying Wire and Distance Blocks to B.S 4483				
5.15-G562	Reference A142 mesh 200x200 mm, weight 2.22 kgs per square meter (measured net-no allowance made for laps including bends, tying wire and distance blocks	m^2	60		
	Sawn formwork to Insitu concrete as described: -				
5.15-G142	To sides; vertical or battering of foundations	m^2	30		
5.15-G142	Edge of ground floor slab 150mm wide	m^2	10		
	Walling				
	Natural Stone Block Walling, Medium Chisel Dressed, reinforced with 20 swg Hoop Iron at every third course, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.15-U121	200 mm Walling	m^2	64		
	Damp proof Course				
	Bituminous Felt Damp-Proof Course as Described: -				
5.15-W239	200mm Wide under walls	LM	48		
	SUPERSTRUCTURE				
	Guaranteed Strength Reinforced Concrete Class 20/25mm Maximum Aggregate as Described in: -				
5.15-F142	Beams	m^3	4		
	Reinforcement				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²: cut, bend and fix as directed: tenderers to allow in their rate, cost for cutting, bending, hoisting and fixing including all necessary binding wires, spacer blocks and stools				
5.15-G522	Diameter: 8mm	Kg	210		
5.15-G524	Diameter: 12mm	Kg	210		
	Sawn formwork to Insitu concrete as described: -				
5.15-G142	To side and soffits of beams.	m^2	40		
	NATURAL STONE WALLING				
	Selected Machine Dressed Natural Stone Block Walling, reinforced with 20 swg Hoop Iron at every alternate course, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.15-U121	200mm thick approved local; chisel dressed both sides; bedding, jointing and pointing in cement sand (1:3) mortar	m^2	100		
5.15-U178	Fair raking cutting 200mm walls external	m^2	100		

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	ROOF CONSTRUCTION AND RAIN WATER DISPOSAL				
	Gauge 28 pre-painted IT5 approved roofing sheets, colour to approval of the Engineer				
5.15-W321	Roof covering;150mm laps on one end and one and a half corrugation side lap; and nailing to 75X50mm celcured sawn cypress purlins	m^2	90		
	Accessories, fixing as necessary to roof sheets				
5.15-W327	Do; hip cap	LM	39		
	CARPENTRY				
	Structural timbers: sawn cypress: celcure treated				
5.15-O217	75X50mm ceiling joist	LM	91		
5.15-O217	1Ō0x50mm rafters	LM	70		
5.15-O217	75x50mm struts and ties	LM	30		
5.15-O217	100x50mm king post, top and bottom chords	LM	70		
	The following in sawn celcured cypress				
5.15-O217	100 x50mm wall plate rag-bolted at 1200mm centers with 12mm diameter bolts (m/s) or equivalent	LM	50		
5.15-O217	100x50mm hip rafters	LM	80		
5.15-O217	75x50mm purlins	LM	98		
	The following in Wrot cypress				
5.15-O217	200x25mm thick fascia	LM	40		
	Rain Water Disposal				
5.15-X331	Plastic gutters;180mm diameter half round	L.M	40		
5.15-X332	Plastic gutters; support brackets spaced at 500mm c/c	Nr.	81		
5.15-X333	Plastic downpipes;75mm diameter	L.M	18		
	Painting and Decorations				
	Prepare and apply one zinc lumbate primer and three coats of `CROWN SOLO` or other equal andapproved super gloss oil paint to: -				
5.15-V539	Fascia's; 200mm girth; external	LM	40		
	DOORS, FRAMES, ETC				
	Doors				
	Wrot Prime Grade Cypress				
	50mm Thick door with ex. 100 x 50mm thick stiles and top rails, ex. 150 x 50mm middle and bottom rails, and infilled with panels made out of ex. 100 x 50mm thick tongued and grooved battens, including 3 No. 100 mm Steel heavy duty washered butt hinges, three-lever mortice lock as "Union Ref: 2237" with set of brass lever handles and furniture, rubber door stop and three coats first quality gloss paint: -				
5.15-Z313.1	Single door size (D4)	Nr	1		
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	50mm Thick Semi-Solid Core Flush Door with Hardwood Lipping all Round, including 3 No. 100 mm Steel Heavy Duty Washered Butt Hinges, Three-Lever Mortice Lock as "Union Ref: 2237" With Set of Brass Lever Handles and Furniture, Rubber Door Stop and Three Coats First Quality Gloss Paint: -				
5.15-Z313.2	Single door size (D5)	Nr	2		
	Door Frames				
	Wrot Prime Grade Cypress				
	Ex. 125 x 50mm Thick Wrot Prime Grade Cypress door frame with six Labours with and including 250mm girth x 25mm x 1.6mm galvanized mild steel cramps fixed at maximum 600mm centers for each jamb including all necessary Architraves and Quadrant Beads and Three Coats First Quality Gloss Paint: -				
5.15-Z314.1	Frame to fit door opening high (D5)	Nr	2		
5.15-Z314.2	Frame to fit door opening including a transome (D4)	Nr	1		
	Fanlights				
	6mm Thick Georgian Wired Glass Panel with a 25mm gap for PV and with 60 x 20mm Wrot Prime Grade Cypress Glazing Beads: -				
5.15-Z395	Fanlight panel size 830mm wide x 230mm high	Nr	2		
	METAL WORK-PURPOSE-MADE UNITS				
	Doors				
	Solid steel doors comprising 50 x 50mm Square Hollow Section surround main frame : 4mm thick mild steel sheets on both sides : Door ironmongery consisting of 180 degrees washered heavy duty purpose made hinges, deadlock with oval profile cylinder and escutcheon, stainless steel lever door handles with rose, : hanging door to and including 100 x 50 x 3mm Profiled steel door frame fixed to concrete, concrete block wall or stonework pointed externally in mastic : one shop coat red oxide primer: Prepare touch up primer and apply one undercoat and two coats gloss enamel paint on general surfaces of louvre doors including returns in louvres: all in accordance with Engineer's approval and specifications				
5.15-Z323	Solid steel door overall size 1410 x 2400mm high	Nr	2		
	Iron monger				
	Supply and fix the following to UNION catalogue or other equal and approved				
5.15-Z343.1	To soft, hardwood or the like fixing with screws	Nr	160		
5.15-Z343.2	Two levers mortices lock complete with set lever aluminum handle furniture	Nr	3		
5.15-Z341	100 mm steel butt hinges	Nr	9		
	To concrete or blockwork; fixing with bolts; plugging				
5.15-Z349	Rubber door stop complete with 38 mm rawl bolt	Nr	3		
	Paintings and Decorations				
	Prepare and apply one coat etching primer, one undercoat and two coats gloss oil paint to Crown Solo or other equal and approved to:				
	On metal: -				

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5.15-V313	General surfaces of glazed casement metal doors; over 300 mm girth internal	m^2	5		
	Aluminium primer or other equal andapproved wood pri mer before fixing:				
5.15-V313	General surfaces of glazed casement metal doors; over 300 mm girth internal	m^2	5		
5.15-V316	Backs of frame, board, etc. over 100 mm but not exceeding 200 mm girth	LM	20		
	Knot prime and stop; prepare and apply one undercoat and two coats of gloss oil paint				
5.15-V323	General surfaces of timber doors over 300 m girth; external	m^2	6		
5.15-V326	Frames; over 150 mm but not exceeding 300 mm girth internal	LM	20		
	WINDOWS				
	Precast Concrete Cills				
5.15-H810	200mm Thick x 275mm wide precast concrete cill bedded, jointed and pointed in cement mortar on top of 200mm wall	LM	12		
	METAL WORK				
	Supply and fix the following Standard Section Steel Casement Windows, including 4mm Thick Clear Sheet Glass glazed to Steel Casements with Putty, Complete with Opening Accessories, Including Building in Lugs to Jambs and Head and Water-Proofing and Filling Around Opening with Approved Compound				
5.15-Z321.1	Window size 1797x1197 mm high(W1)	Nr	4		
5.15-Z321.2	Window size 1197 x 1197mm high (W3a)	Nr	1		
5.15-Z321.3	Window size 597 x 597mm high (W8)	Nr	2		
	Burglar Proofing to Windows				
	Provide and fix burglar proofing made from 12mm x 12mm M.S. square bars at 150mm vertically and 200mm centers horizontally and fixed internally to wall with 12mm M.S. Fish tail lugs at 600mm centers painted with one coat primer and 3 coats gloss paint, to the following windows:				
5.15-M479.1	To windows size 1797x1197 mm high(W1)	Nr	4		
5.15-M479.2	To windows size 1197 x 1197mm (W3a)	Nr	1		
	Painting and Decorations				
	On Metal Work				
	Prepare and apply three coats oil paint full gloss to Crown solo or other equal and approved to: -				
5.15-V313	General window surfaces; over 300mm girth internal	m^2	2		
5.15-V313	General window surfaces; over 300mm girth External	m^2	2		
5.15-V313	Surfaces of metal over 300mm girth (burglar proofing grills)	m^2	2		
	FINISHES				
	WALL FINISHES				
	Insitu finishes				
	Render;15mm thick, 2 No coatwork,12mm first coat of ce ment sand (1:3); 3mm second coat of cement and lime putty (1:9); steel trowelled to concrete or blockwork base generally to:				
5.15-Z443	Beams and external	m^2	55		
5.15-Z443	Walls; internal	m^2	190		
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5.15-Z445	20mm skirting 150mm high with rounded top edge and cove to junction with paving	LM	35		
	Tile, Slab or Block FinishingsApproved ceramic tiles to B.S.1281; Local white glazed floor tiles to regular or approved other pattern; bedding and jointing in cement sand (1:4 mortar, grouting with white cement				
5.15-Z421	6mm thick; butt joints straight both ways; to cement sand base to floors with metal edging	m^2	60		
	Wall Tiling				
	Wall Tiles to B.S. 4490 bedded in cement and sand (1:3) screeded backing				
5.15-Z423	Tiles 150 x 150 x 6mm thick	m^2	50		
	Sundries				
5.15-Z443	PVC tiling edge to external corners of tiles (Provisional)	m	50		
	CEILING				
	12mm thick approved chipboard to BS 2604, Part 2, in sheets size 2400 x 1200mm fixed to and including 50 x 50mm sawn cypress Grade 2 battens at 600mm centers in both directions complete with gauge jointing material				
5.15-Z453	Horizontal ceiling fixed to underside of trusses	m^2	60		
5.15-Z159	12mm Cornice 50mm high, plugged	m	55		
5.15-Z159	Extra over ceiling lining for forming removable access trap door size 600 x 600mm with 100 x 38 mm sawn treated cypress trimming joists between tie beams,120 x 20mm (finished) Wrot cypress frame all round and 20mm blockboard removable panel set loose on top of framing	Nr	3		
	Prepare and Apply Three Coats Washable Distemper as Described to: -				
5.11-V564	Horizontal soffits of suspended chipboard or plasterboard ceilings	m^2	60		
	BUILDERS WORK IN CONNECTION WITH ELECTRICAL INSTALLATIONS				
5.15-Z739	Allow for cutting and leaving all necessary holes, notches, mortices, sinkings and chases both in the structure and its finishes and for all making good in connection with concealed conduits or cables	Item	L.S		
	PLUMBING AND DRAINAGE				
	Sanitary Fittings				
	Supply and fix the following including all jointing materials and joints to supply, waste and overflow pipes.				
5.15-Z530.1	White vitreous china high level washdown W.C. suite complete as "TWYFORDS Classic 10003" comprising closet with "S"-trap, No. 12030 cistern 9 liters capacity, No. 52120 valveless fittings with plastic syphon and flush bend, cistern supports, No. 50219 inlet connection and No. 50302 plastic seat and cover; pan plugged and screwed to floor and cistern to wall, including water supply to fitting and connecting to drainage system	Nr	1		
5.15-Z530.2	White vitreous china washbasin completes as "TWYFORDS Classic 14003" with one No.54100 Aztec tap15mm, No. 54351 chain waste, No. 56005 fixing brackets including all necessary fixing, including water supply to fitting and connecting to drainage system.	Nr	1		
5.15-Z530.5	Toilet roll holder	Nr	1		
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5.15-Z530.6	Chrome plated towel rail size 25mm diameter x 900mm long complete with end brackets.	Nr	1		
5.15-Z530.7	600mm x 600mm wall mounted mirrors	Nr	1		
5.15-Z781.2	Shower fitting with an instant heating element complete with the stop corks as 'Cobra'	Nr	1		
5.15-Z530.8	Double bowl single drainer inset kitchen sink made out of 18/8 stainless steel, size 1000 x 500mm with 420 x 355 x 150mm deep bowl. The kitchen sink shall be competed with bi-flow mixer tap with an overarm swivel outlet as 'Cobra VIC-171/041' 11/2" chrome plated sink grid waste, 11/4" chrome plated bottle trap waste	Nr	1		
	Sanitary Plumbing				
5.15-Z512.1	32mm Basin bottle "P" trap and waste outlet complete with plug and chain	Nr	1		
5.15-Z512.2	38mm Sink tubular "P" trap and waste outlet	Nr	1		
5.15-Z512.3	Gulley piece	Nr	2		
5.15-K231	Gulley trap chamber internal size 203x203x150mm high with 75mm thick sides and rebated top edge for and including 210 x 210 x 63mm thick precast concrete cover including bedding UPVC gulley (m.s.) in concrete Class Q, dishing base of gulley, all necessary formwork, excavation and disposal	Nr	2		
	Testing				
5.15-A260	Allow for testing the whole of the drainage services to the satisfaction of the Engineer	Item	L.S		
	Cold Water Tanks				
5.15-Z524	1000 liters "ROTO" or approved equivalent cold-water tanks complete with cover and inlet and outlet connections, and ball valves including hoisting to roof level not exceeding 5.0m high.	Nr	2		
5.15-Z519	Allow for provisional amount for internal plumbing and sanitary drainage	Item	L.S		
	KITCHEN JOINERY				
	Low Level Kitchen Cabinets				
5.15-Z162	Supply & fix low level kitchen cabinets overall size 5500 x 600 x 900mm high comprising 20mm thick laminated MDF in 1 No. Shelf; 10 No. cabinet doors average size 550 x 800mm high; complete with ironmongery for doors; Worktops and other concrete works (m/s); All to Engineer's detail and approval	Nr	1		
	25mm thick blockboard base to specialist detail; to				
5.15-Z163.1	Soffits of work-top	m^2	5		
5.15-Z163.2	Worktop	m^2	5		
5.15-Z163.3	Extra over for making hole size 1000 x 500mm for double bowl sink	Nr	1		
	High Level Kitchen Cabinets				
5.15-Z162	High level kitchen cabinets overall size 3250 x 300 x 700mm high comprising 20mm thick laminated MDF in 1 No. Shelf; 5 No. cabinet doors average size 550 x 600mm high; complete with ironmongery for doors; All to Architect's detail and approval	Nr	1		
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CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

CONTRACT No…..

BILL No. 5.15

STAFF HOUSE_ (ONE BEDROOM)

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BILL No. 5.16
GUARD HOUSE

Item No.	Description	UNIT	Quantity	Rate (Ksh.)	Amount (Ksh.)
5.16	**SUBSTRUCTURES (PROVISIONAL)**				
	Excavations and Earthworks				
	The rate shall include for all strutting, shuttering, stabilizing the excavation faces and keeping the excavation free of water by pumping, bailing or other means				
	Bulk excavations and top soil stripping for all structures are measured under Bill No. 5.13 - Site and Ancillary Works.				
	Excavate for foundations, part backfill after construction and remainder, cart away to tips or use as fill on site, all as directed by the Engineer				
	Excavate 0.0 - 1.5m Starting from Stripped Level to Receive: -				
5.16-E324	Excavate for foundation trench not exceeding 1.50 meters deep.	m^3	8		
5.16-E335.1	Excavating in rock Class "A"	m^3	1		
5.16-E335.2	Excavating in rock Class "B"	m^3	1		
5.16-E335.3	Excavating in rock Class "C"	m^3	1		
5.16-E614	Return, fill-in and rum selected excavated materials around foundations	m^3	7		
5.16-E532	Remove and cut away surplus excavated materials.	m^3	4		
	Approved Selected Filling				
5.16-E647	Provide and deposit approved imported hardcore in maximum 300mm thick layers in making up levels including achieving satisfactory compaction	m^3	2		
5.16-E645	50mm (Average) thick quarry dust blinding to surfaces of hardcore	m^2	7		
	Anti-termite treatment				
5.16-E790	Termidor 25 EC or other equal approved anti-termite chemical treatment: applied by an approved professional pest control specialist:10-year warranty: strictly applied in accordance with the manufacturer's instructions	m^2	7		
	Damp-Proof Membrane				
5.16-W239	500mm Gauge polythene damp- proof membrane laid on blinded hardcore with 100mm folded side and end laps (measured net-allow for laps)	m^2	7		
	Concrete Work:				
	Provision of concrete				
5.16-F122	Designed Concrete C12/15	m^3	0.45		
5.16-F142	Designed Concrete C 20/25	m^3	3.5		
	placing for concrete				
5.16-F611	50mm thick mass concrete class 15 To bottoms of foundations	m^3	0.45		
5.16-F72*.1	Reinforced Concrete Class 25 for Foundations in trenches	m^3	2		
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5.16-F72*.2	**150mm thick bed**	m^3	1.5		
	Reinforcement				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²: cut, bend and fix as directed: tenderers to allow in their rate, cost for cutting, bending, hoisting and fixing including all necessary binding wires, spacer blocks and stools				
5.16-G523	Diameter: 10mm	Kg	60		
	Fabric Reinforcement No. A142 Mesh Size 200 x 200mm Weighing 2.22 kgs Per m2, Including Bends, Tying Wire and Distance Blocks to B.S 4483				
5.16-G562	Reference A142 mesh 200x200 mm, weight 2.22 kgs per square meter (measured net-no allowance made for laps including bends, tying wire and distance blocks	m^2	7		
	Sawn formwork to Insitu concrete as described: -				
5.16-G142	To sides; vertical or battering of foundations	m^2	6		
5.16-G142	Edge of ground floor slab 150mm wide	m^2	2		
	Walling				
	Natural Stone Block Walling, Medium Chisel Dressed, reinforced with 20 swg Hoop Iron at every third course, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.16-U121	200 mm Walling	m^2	18		
	Damp proof Course				
	Bituminous Felt Damp-Proof Course as Described: -				
5.16-W239	200mm Wide under walls	LM	14		
	SUPERSTRUCTURE				
	Guaranteed Strength Reinforced Concrete Class 20/25mm Maximum Aggregate as Described in: -				
5.16-F142	Beams	m^3	1.5		
	Reinforcement				
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²: cut, bend and fix as directed: tenderers to allow in their rate, cost for cutting, bending, hoisting and fixing including all necessary binding wires, spacer blocks and stools				
5.16-G522	Diameter: 8mm	Kg	40		
5.16-G524	Diameter: 12mm	Kg	48		
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	Sawn formwork to Insitu concrete as described: -				
5.16-G142	To side and soffits of beams.	m^2	15		
	NATURAL STONE WALLING				
	Selected Machine Dressed Natural Stone Block Walling, reinforced with 20 swg Hoop Iron at every alternate course, and Bedded, Jointed and Pointed in Cement Mortar (1:3): -				
5.16-U121	200mm thick approved local; chisel dressed both sides; bedding, jointing and pointing in cement sand (1:3) mortar	m^2	30		
5.16-U178	Fair raking cutting 200mm walls external	m^2	30		
	ROOF CONSTRUCTION AND RAIN WATER DISPOSAL				
	Gauge 28 pre-painted IT5 approved roofing sheets, colour to approval of the Engineer				
5.16-W321	Roof covering;150mm laps on one end and one and a half corrugation side lap; and nailing to 75X50mm celcured sawn cypress purlins	m^2	20		
	Accessories, fixing as necessary to roof sheets				
5.16-W327	hip cap	LM	14		
	CARPENTRY				
	Structural timbers: sawn cypress: celcure treated				
5.16-O217	75X50mm ceiling joist	LM	20		
5.16-O217	100x50mm rafters	LM	28		
5.16-O217	75x50mm struts and ties	LM	5		
5.16-O217	100x50mm king post, top and bottom chords	LM	18		
	The following in sawn celcured cypress				
5.16-O217	100 x50mm wall plate rag-bolted at 1200mm centers with 12mm diameter bolts (m/s) or equivalent	LM	14		
5.16-O217	100x50mm hip rafters	LM	16		
5.16-O217	75x50mm purlins	LM	50		
	The following in Wrot cypress				
5.16-O217	200x25mm thick fascia	LM	17		
	Rain Water Disposal				
5.16-X331	Plastic gutters;180mm diameter half round	L.M	17		
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5.16-X332	Plastic gutters; support brackets spaced at 500mm c/c	Nr.	37		
5.16-X333	Plastic downpipes;75mm diameter	L.M	6		
	Painting and Decorations				
	Prepare and apply one zinc plumbate primer and three coats of `CROWN SOLO` or other equal and approved super gloss oil paint to: -				
5.16-V539	Fascia's; 200mm girth; external	LM	17		
	DOORS, FRAMES, ETC				
	Doors				
	Wrot Prime Grade Cypress				
	50mm Thick door with ex. 100 x 50mm thick stiles and top rails, ex. 150 x 50mm middle and bottom rails, and infilled with panels made out of ex. 100 x 50mm thick tongued and grooved battens, including 3 No. 100 mm Steel heavy duty washered butt hinges, three-lever mortice lock as "Union Ref: 2237" with set of brass lever handles and furniture, rubber door stop and three coats first quality gloss paint: -				
5.16-Z313	Single door size (D4)	Nr	2		
	Door Frames				
	Wrot Prime Grade Cypress				
	Ex. 125 x 50mm Thick Wrot Prime Grade Cypress door frame with six Labours with and including 250mm girth x 25mm x 1.6mm galvanized mild steel cramps fixed at maximum 600mm centers for each jamb including all necessary Architraves and Quadrant Beads and Three Coats First Quality Gloss Paint: -				
5.16-Z314	Frame to fit door opening including a transome (D4)	Nr	1		
	Fanlights				
	6mm Thick Georgian Wired Glass Panel with a 25mm gap for PV and with 60 x 20mm Wrot Prime Grade Cypress Glazing Beads: -				
5.16-Z395	Fanlight panel size 830mm wide x 230mm high	Nr	1		
	METAL WORK-PURPOSE-MADE UNITS				
	Iron monger				
	Supply and fix the following to UNION catalogue or other equal and approved				
5.16-Z343.1	To soft, hardwood or the like fixing with screws	Nr	50		
5.16-Z343.2	Two levers mortices lock complete with set lever aluminum handle furniture	Nr	3		
5.16-Z341	100 mm steel butt hinges	Nr	6		
	To concrete or blockwork; fixing with bolts; plugging				
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5.16-Z349	Rubber door stop complete with 38 mm rawl bolt	Nr	2		
	Paintings and Decorations				
	Aluminum primer or other equal and approved wood primer before fixing: -				
5.16-V316	Backs of frame, board, etc. over 100 mm but not exceeding 200 mm girth	LM	10		
	Knot prime and stop; prepare and apply one undercoat and two coats of gloss oil paint				
5.16-V323	General surfaces of timber doors over 300 m girth; external	m^2	5		
5.16-V326	Frames; over 150 mm but not exceeding 300 mm girth internal	LM	10		
	WINDOWS				
	Precast Concrete Cills				
5.16-H810	200mm Thick x 275mm wide precast concrete cill bedded, jointed and pointed in cement mortar on top of 200mm wall	LM	4		
	METAL WORK				
	Supply and fix the following Standard Section Steel Casement Windows, including 4mm Thick Clear Sheet Glass glazed to Steel Casements with Putty, Complete with Opening Accessories, Including Building in Lugs to Jambs and Head and Water-Proofing and Filling Around Opening with Approved Compound	-			
5.16-Z321.1	Window size 1197x1197 mm high(W3)	Nr	2		
5.16-Z321.2	Window size 1197 x 597mm high (W4)	Nr	1		
5.16-Z321.3	Window size 597 x 597mm high (W8)	Nr	1		
	Burglar Proofing to Windows				
	Provide and fix burglar proofing made from 12mm x 12mm M.S. square bars at 150mm vertically and 200mm centers horizontally and fixed internally to wall with 12mm M.S. Fish tail lugs at 600mm centers painted with one coat primer and 3 coats gloss paint, to the following windows:				
5.16-M479.1	To windows size 1797x1197 mm high(W3)	Nr	2		
5.16-M479.2	To windows size 1197 x 1197mm (W4)	Nr	1		
	Painting and Decorations				
	On Metal Work				
	Prepare and apply three coats oil paint full gloss to Crown solo or other equal and approved to: -				
5.16-V313	General window surfaces; over 300mm girth internal	m^2	1		
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5.16-V313	General window surfaces; over 300mm girth External	m^2	1		
5.16-V313	Surfaces of metal over 300mm girth (burglar proofing grills)	m^2	1		
	FINISHES				
	WALL FINISHES				
	Insitu finishes				
	Render;15mm thick, 2 No coatwork,12mm first co at of cement sand (1:3); 3mm second coat of cement and lime putty (1:9); steel trowelled to concrete or blockwork base generally to:				
5.16-Z443	Beams and external	m^2	10		
5.16-Z443	Walls; internal	m^2	40		
5.16-Z445	20mm skirting 150mm high with rounded top edge and cove to junction with paving	LM	12		
	Tile, Slab or Block FinishingsApproved ceramic tiles to B.S .1281; Local white glazed floor tiles to regular or approved other pattern; bedding and jointing in cement sand (1:4) mortar, grouting with white cement				
5.16-Z421	6mm thick; butt joints straight both ways; to cement sand base to floors with metal edging	m^2	10		
	Wall Tiling				
	Wall Tiles to B.S. 4490 bedded in cement and sand (1:3) screeded backing				
	-				
5.16-Z423	Tiles 150 x 150 x 6mm thick	m^2	15		
	Sundries				
5.16-Z443	PVC tiling edge to external corners of tiles (Provisional)	m	13		
	CEILING				
	12mm thick approved chipboard to BS 2604, Part 2, in sheets size 2400 x 1200mm fixed to and including 50 x 50mm sawn cypress Grade 2 battens at 600mm centers in both directions complete with gauge jointing material				
5.16-Z453	Horizontal ceiling fixed to underside of trusses	m^2	10		
5.16-Z159	12mm Cornice 50mm high, plugged	m	15		
5.16-Z159	Extra over ceiling lining for forming removable access trap door size 600 x 600mm with 100 x 38 mm sawn treated cypress trimming joists between tie beams,120 x 20mm (finished) Wrot cypress frame all round and 20mm blockboard removable panel set loose on top of framing	Nr	1		
	Prepare and Apply Three Coats Washable Distemper as Described to: -				
5.11-V564	Horizontal soffits of suspended chipboard or plasterboard ceilings	m^2	10		
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	BUILDERS WORK IN CONNECTION WITH ELECTRICAL INSTALLATIONS				
5.16-Z739	Allow for cutting and leaving all necessary holes, notches, mortices, sinkings and chases both in the structure and its finishes and for all making good in connection with concealed conduits or cables	Item	L.S		
	PLUMBING AND DRAINAGE				
	Sanitary Fittings				
	Supply and fix the following including all jointing materials and joints to supply, waste and overflow pipes.				
5.16-Z530.1	White vitreous china high level washdown W.C. suite complete as "TWYFORDS Classic 10003" comprising closet with "S"-trap, No. 12030 cistern 9 liters capacity, No. 52120 valveless fittings with plastic syphon and flush bend, cistern supports, No. 50219 inlet connection and No. 50302 plastic seat and cover; pan plugged and screwed to floor and cistern to wall, including water supply to fitting and connecting to drainage system	Nr	1		
5.16-Z530.2	White vitreous china washbasin completes as "TWYFORDS Classic 14003" with one No.54100 Aztec tap15mm, No. 54351 chain waste, No. 56005 fixing brackets including all necessary fixing, including water supply to fitting and connecting to drainage system.	Nr	1		
5.16-Z530.5	Toilet roll holder	Nr	1		
	Sanitary Plumbing				
5.16-Z512.1	32mm Basin bottle "P" trap and waste outlet complete with plug and chain	Nr	1		
5.16-Z512.2	38mm Sink tubular "P" trap and waste outlet	Nr	1		
5.16-Z512.3	Gulley piece	Nr	1		
5.16-K231	Gulley trap chamber internal size 203x203x150mm high with 75mm thick sides and rebated top edge for and including 210 x 210 x 63mm thick precast concrete cover including bedding UPVC gulley (m.s.) in concrete Class Q, dishing base of gulley, all necessary formwork, excavation and disposal	Nr	1		
	Testing				
5.16-A260	Allow for testing the whole of the drainage services to the satisfaction of the Engineer	Item	L.S		
	Cold Water Tanks				
5.16-Z524	1000 liters "ROTO" or approved equivalent cold-water tanks complete with cover and inlet and outlet connections, and ball valves including hoisting to roof level not exceeding 5.0m high.	Nr	1		
5.16-Z519	Allow for provisional amount for internal plumbing and sanitary drainage	Item	L.S		
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BILL No. 5.16

GUARD HOUSE

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BILL No. 5.17

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE (Ksh)	AMOUNT (Ksh.)
	RECYCLED WATER PUMP HOUSE				
5.17	Excavation and Earth Works				
	Note**:** Items for work in this class shall include: - - Excavation, preparation of surfaces, disposal of excavated material, shoring sides of excavation, backfilling and removal of redundant services. - Concrete, reinforcement, formwork, joints and finishes.				
	- Tips for disposal of excavated material or debris to be identified by the Contractor in liaison with the Local Authority.				
5.17-E324	**Excavate for concrete recycled Water Pumping Station, part backfill after construction and remainder cart away to approved tips. Depth:1-2m**	m^3	40		
	Extra Over Excavation in Any Position for: -				
5.17-E335	Excavating in rock Class "A"	m^3	20		
5.17-E335	Excavating in rock Class "B"	m^3	15		
5.17-E335	Excavating in rock Class "C"	m^3	25		
	Concrete Work:				
	Provision of concrete				
5.17-F122	Designed concrete 12/15	m^3	4		
5.17-F142	Designed concrete 20/25	m^3	70		
	Placing of concrete				
5.17-F611	Mass Concrete Class 12/15 in Pump House	m^3	4		
5.17-F72*	Reinforced Concrete Class 20/25 in Pump House	m^3	70		
	Deformed high yield ribbed bars reinforcement to BS 4449:1997 with yield strength of 460N/mm²				
5.17-G523	**Diameter: 10mm**	Kg	2500		
5.17-G524	Diameter: 12mm	Kg	3500		
5.17-G342	Vertical Formwork for concrete works (Class F1)	m^2	150		
5.17-G343	Vertical Formwork for concrete works (Class F3)	m^2	130		
	METAL WORK AND MISCELLANOUS WORKS				
5.17-N130	Supply and install galvanized mild steel internal ladders with stringers returned to form handrails.	Nr	2		
5.17-G832	Supply and Install Cast Iron Step Irons on walls of Intake Chamber	Nr	40		
5.17-N130	Supply and install galvanized mild steel floor open mesh grating welded to 75 x 50mm RHS steel bars. Include for provision and fixing of fishtail lugs in concrete walls.	Nr	1		
5.17-G371	Boxing out 350mm x 350mm holes in concrete walls and making good after installation of pipework.	Nr	1		
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5.17-N170	Supply and install 800mm x 800mm rectangular stop log in intake structure as specified. Include rising operating spindle.	Nr	1		
5.17-N170	Lockable mild steel sheet metal covers for access manholes as per detail on the drawing.	Nr	4		
5.17-K231	Allow for 50 mm x 50 mm rebate in walls of chamber for sheet metal covers.	m	20		
5.17-N149.1	Supply and install handrails consisting of 900 mm high level balustrades of 40 mm diameter tubing Class B throughout, consisting of handrail and parallel middle rail 450 mm below the hand rail with balusters at maximum 1500 mm centers. Include for painting with one coat primer and 2 coats zinc metal paint.	m	30		
5.17-K236	Provide all materials and construct valve chamber internal dimensions 1000mm x 1000mm. Include for supply and fixing of concrete cover, step irons, as detailed in drawings. Rate to include for excavation, preparation of surfaces, disposal of excavated material, shoring sides of excavation, backfilling and removal of redundant services.	nr	1		
5.17-N299	Provide and fix galvanized mild steel coarse screen and frame at the inlet chamber - 4,000mm x 1,200mm (Maximum screen size 50mm). Supply and fix coarse screen, size 4000x1200mm, fabricated using G.M.S. bars, dia 20 mm, spacing 50 mm.	nr	1		
5.17-K231	Form rebate in wall and base of inlet chamber for frame of coarse screen	m	1		
5.17-N299	Supply and fix fine screen, size 900mm x 900mm, fabricated using G.M.S. bars, dia 15 mm, spacing 15 mm. Include for provision and fixing of frame with fish tailed lugs into concrete walls.	nr	1		
	PUMP LIFTING GANTRY				
5.17-Z323	**Provide all materials and construct a travelling pump lifting gantry over the Pump House as shown in the drawing Gantry to be supplied complete with chain block and hook.**	Item	L.S		
	PIPEWORK, FITTINGS AND VALVES				
	Supply, Transport to Site and Store in Secure Place, Including Jointing Material, Bolts, Gaskets, Packing, Jointing Glues, etc. as Applicable				
	Recycled Water Pumps - Delivery Main (Approved epoxy coated steel pipe PN 16)				
5.17-J331	100mm x 80mm dia. all flanged concentric taper (Mark 1)	Nr	2		
5.17-J391	DN 100 single flanged pipe 3500mm long (cut to suit) (Mark 2)	Nr	2		
5.17-J351	100mm dia. flange adaptor (Mark 3)	Nr	4		
5.17-J311	DN 100 Double flanged 90 degrees bend (Mark 4)	Nr	2		
5.17-J381	DN 100 single flanged pipe 1000mm long with Central puddle flange (cut to suit) (Mark 5)	Nr	2		
5.17-J831	DN 100 double flanged non return valve (Mark 6)	Nr	2		
5.17-J811	DN 100 double flanged gate valve (Mark 7)	Nr	2		
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5.17-J311	100mm x 150mm dia. all flanged concentric taper (Mark 8)	Nr	2		
5.17-J311	DN 150 Double flanged 90 degrees bend (Mark 9)	Nr	3		
5.17-J341	DN 150 Double Flanged Pipe piece, length n.e. 500m (Mark 10)	Nr	2		
5.17-J311	DN 150 All flanged Radial Tee (Mark 11)	Nr	1		
5.17-J351	DN 150 Flange adapter (Mark 12)	Nr	2		
5.17-J382	DN 300 single flanged pipe 500mm long with Central puddle flange l=250(Mark 13)	Nr	1		
5.17-J352	DN 300 Flange adapter (Mark 14)	Nr	1		
5.17-J381	DN 50 Plain Ended pipe cut to suit L= 2m (Mark 15)	Nr	2		
5.17-J351	DN 50 Flange adapter (Mark 16)	Nr	2		
5.17-J811	DN 50 Double Flanged Gate Valve (Mark 17)	Nr	2		
5.17-J381	DN 50 Plain Ended pipe L=4000 Cut to suit (Mark 18)	Nr	1		
5.17-J381	DN 150 Single flanged pipe L=90000 Cut to suit (Mark 19)	Nr	1		
5.17-J381	DN 150 Double flanged pipe L=1000 with Central puddle flange l=500(Mark 20)	Nr	1		
5.17-J311	DN 150 Single Flanged 90-degree bend (Mark 21)	Nr	1		
5.17-J311	DN 150 Double flange 45-degree bend (Mark 22)	Nr	1		
	PUMPS				
	Recycled water Pumps				
5.17-Z523	Supply, transport to site, install, test and commission AmaPorter F 61_, n = 2900 rpm, 615 (DIA158), ISO 990 CLASS 2A/3A, 4.5Kw or approved equivalent complete with motor, base plate, fixing bolts, grouting, etc., for the following characteristics: Flow 14 liters per second, dynamic head 19m with an efficiency of 60%	Nr	2		
5.17-Z781	Electrical connections from isolators to pump control panels and from control panels to electric motors, including all necessary earthing, cabling and conduiting.	Sum	4		
5.17-Z631	Electrode for stopping above pumps should the level in the tank be too low	Nr.	4		
5.17-Z512	300 mm line strainer	Nr.	2		
5.17-Z539	Suction Vortex plates	Nr.	2		
5.17-Z512	300mm pressure relief valves	Nr.	2		
5.17-Z512	400mm x 300mm waste cones for pressure relief valve	Nr.	2		
	MISCELLANEOUS				
5.17-Z481	Provide and fix shop-primed gantry girder made out of 356 x 174 x 45 kilograms per meter universal beam. Include for 1,000kg capacity chain block mounted on a roller bracket on the gantry and include for the fixing of the gantry and chain block on to concrete beams with 16mm bolts, all as per details on Drg No.MWS/TW/RWPH/01	Nr	1		
	Provide and Install:				
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					-

5.17-Z436	3mm thick 300mm wide chequered plate cover over 200mm wide cable ducts.	m	9		
5.17-Z436	3mm thick 250mm wide chequered plate cover over 150mm wide cable ducts	m	3		
	-				
5.17-Z436	Mild steel grating cover 240mm wide, made of 16mm round M.S. bars welded to 38mm x 38mm x 6mm MS angles, as per details on Drg. MWS/SD/23-26	m	5		
5.17-Z481	Mild steel cover over drainage sump, size 490mm x 490mm, made of 16mm round M.S. bars welded to M.S. angels as per details on Drg. No. MWS/SD/23-26	Nr	1		
5.17-V389	Allow for painting of all exposed pipework in the pump house with 3 coats of approved oil gloss paint. Colour codes to be advised by the Engineer.	Item	L.S		
PAGE TOTAL CARRIED TO BILL COLLECTION PAGE					-

CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

CONTRACT No…..

BILL No. 5.17

RECYCLED WATER PUMP HOUSE

		Amount (Ksh.)
	Page Total, Page 1 of 4	
	Page Total, Page 2 of 4	
	Page Total, Page 3 of 4	
	Page Total, Page 4 of 4	
	Bill Total	

CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

CONTRACT No…..

BILL No. 05 SUMMARY

WATER TREATMENT PLANT	**Amount (Ksh.)**
Bill No. 5.1 - Chemical Storage, Mixing and Dosing Building	
Bill No. 5.2 - Stilling Well, Chemical Dosing Channel and Flocculation Basin	
Bill No. 5.3 - Sedimentation Tanks	
Bill No. 5.4 - Filters, Filter Gallery and Filter Control Room	
Bill No. 5.5 - Chlorine Storage, Mixing and Dosing Building	
Bill No. 5.6 - Treated Water Tank (500m^3)	
Bill No. 5.7 - Backwash Water Pump	
Bill No. 5.8 - Backwash Water, Sludge Lagoon and Recirculation Chamber	
Bill No. 5.9 - Sludge Drying Beds	
Bill No. 5.10 - Elevated Backwash Water Tank (108m^3)	
Bill No. 5.11 - Operator's Office, Laboratory and Store	
Bill No. 5.12 - Works Pipelines and Chambers	
Bill No. 5.13 - Site and Ancillary Works	
Bill No. 5.14 - Electrical Works	
Bill No. 5.15 - One Bedroom Staff House	
Bill No. 5.16 - Guard House	
Bill No. 5.17 - Recycled Water Pump House	
Section 5 Total	

BILL No. 6.0

SCHEDULE OF DAYWORKS

ITEM No.	DESCRIPTION	UNIT	QUANTITY	RATE Ksh.	AMOUNT Ksh.
	NOTE: THE WHOLE OF THIS BILL IS PROVISIONAL				
	Notes:				
i)	The whole of this Section is Provisional				
ii)	The rates inserted in this Schedule are to cover all establishment charges, insurances, holidays with pay, use and sharpening of all tools, supply of water, scaffolding, plant, hoisting gear etc., travelling and all other charges, overheads and profit				
iii)	The rates for materials are to cover delivery to the usual points at which materials are received on the site and for distribution to the individual sites, storage, handling, overheads and profit				
iv)	The rates for plant shall be rates for working time only and maintenance, fuel, oil and operator's time shall be included in the hourly rates				
v)	The time of gangers working with their gangs is to be paid for under the appropriate items, but the time of foremen and walking gangers is to be covered by Superintendence of the Contract generally				
vi)	The Contractor will not be paid for any work as day and hour unless he shall have obtained a written order from the Engineer before the commencement of the said work. All claims made by the Contractor for day and hour work must be supported by certified copies and the written order from the Engineer				
vii)	The rates will be used in assessing the cost of any extra work ordered by the Engineer for execution on daywork basis. In case any rate is found to be grossly in excess of prevailing market rates the Engineer shall use the market rate for this purpose				
viii)	The quantities indicated in this schedule are for the purpose of obtaining competitive rates. The work to be done may not be restricted to these quantities. The Contractor shall be required to work on the rates quoted irrespective of the quantities being greater or less than those quoted in this schedule				
ix)	If any of the following items is not priced, then other priced items will be deemed to cover for the costs for executing the item which is not priced				
PAGE TOTAL CARRIED TO BILL COLLECTION SHEET					**-**

1	**LABOUR**				
	The rates inserted herein should include for all costs such as insurance, travelling time, overtime, accommodation, use and maintenance of small tools of trade, supervision, overheads and profit. Only time engaged upon work will be paid for.				
A411.1	Unskilled Labourer	Hrs.	75		
A411.2	Timberman	Hrs.	25		
A411.3	Stone Mason	Hrs.	75		
A411.4	Carpenter	Hrs.	75		
A411.5	Concreter	Hrs.	100		
A411.6	Blaster (Certified)	Hrs.	10		
A411.7	Pipelayer	Hrs.	75		
A411.8	Painter	Hrs.	30		
A411.9	Surveyor	Hrs.	50		
A411.10	Foreman	Hrs.	75		
A411.11	Watchman (including use of firewood, lights, day, night, Sunday and Public Holiday watching)	Hrs.	75		
A411.12	Plant operator	Hrs	75		
PAGE TOTAL CARRIED TO BILL COLLECTION SHEET					-

	PLANT				
	The rates inserted herein should include for all operational and maintenance costs, fuel, oil, grease, operators, turnboys, supervision, overhead and profits. Only the time actually employed on works will be paid for and the rates should include for idle, travelling and overtime.				
A415.1	Compressor complete (3.0 m^3/minute)	Hrs.	25		
A415.2	Compressor complete (6.0 m^3/minute)	Hrs.	25		
A415.3	Pneumatic Pick	Hrs.	15		
	-				
A415.4	D4 Tractor	Hrs.	15		
	-				
A415.5	D8 Tractor	Hrs.	15		
	-				
A415.6	Concrete Vibrator (Petrol or Diesel)	Hrs.	15		
	-				
A415.7	Concrete Mixer 14/10 (including batch weighing gear and drag feed shovel)	Hrs.	50		
A415.8	-Ditto- but 7/5	Hrs.	15		
A415.9	Dumper 0.38 m^3	Hrs.	15		
A415.10	Dumper 0.76 m^3	Hrs.	20		
A415.11	5 Tone Lorry (Tipper)	Hrs.	20		
A415.12	7 Tone Lorry (Tipper)	Hrs.	25		
A415.13	Portable water pump 50mm diameter (inclusive of hoses, couplings, etc.)	Hrs.	20		
	-				
A415.14	Oxy-Acetylene cutting and welding set including oxygen and acetylene	Hrs.	20		
	-				
A415.15	Electric welding set including electrodes	Hrs.	20		
A415.16	Tunneling equipment, bore not exceeding 600mm	Hrs.	20		
PAGE TOTAL CARRIED TO BILL COLLECTION SHEET					-

	MATERIALS				
	All materials are to comply with the specifications. The rates inserted herein are to include for delivery to site, storage, handling, overheads and profits.				
A413.1	Ordinary Portland Cement	Tone	3		
A413.2	Mild Steel (any size from 6mm to 25mm dia.)	Kg	200		
A413.3	High Tensile Steel (any size from 8mm to 25mm dia.)	Kg	200		
A413.4	Fine Aggregate for Concrete	m^3	50		
A413.5	Coarse Aggregate for Concrete	m^3	20		
A413.6	Use of Shuttering Timber	m^3	5		
A413.7	Use of Timbering for Trenches	m^3	5		
A413.8	Murram	m^3	100		
A413.9	225mm dia. Concrete Ogee Pipe	m	10		
A413.10	300mm dia. Concrete Ogee Pipe	m	10		
A413.11	Concrete Class 12/15	m^3	10		
A413.12	Concrete Class 16/20	m^3	10		
A413.13	Concrete Class 20/25	m^3	10		
A413.14	Heavy-Duty Cast-Iron Manhole Covers	Nr	5		
A413.15	600mm HDPE PN 16 pipe as sleeve material for tunneling works	m	7		
A413.16	300mm dia. "Helix" Water Meter complete with all gasket bolts etc. Rate to include for all associated fittings	nr	1		
A413.17	200mm dia. "Helix" Water Meter complete with all gasket bolts etc. Rate to include for all associated fittings	nr	2		
A413.18	DN500 HDPE DWC Pipe SN 8	m	12		
A413.19	DN600 HDPE DWC Pipe SN 8	m	12		
A413.20	DN600 Galvanized Steel Pipe PN16	m	12		
PAGE TOTAL CARRIED TO BILL COLLECTION SHEET					-

BILL No. 6.0

SCHEDULE OF DAYWORKS

	Amount (Ksh.)
Page Total, Page 1 of 4 Page Total, Page 2 of 4 Page Total, Page 3 of 4 Page Total, Page 4 of 4	Notes
Bill Total	

CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

CONTRACT No…..

BILL No. 06 SUMMARY

	Amount (Ksh.)
Bill No. 6.0 - Schedule of Day Works	
Section 6	

ANNEX 1- ENVIRONMENTAL & SOCIAL MITIGATION AND MANAGEMENT PLAN (ESMMP)

SCHEDULE A- CONTRACTOR'S RESPONSIBILITIES

Environmental/ Social Impact	Mitigation Action Plan	Responsibility	Phase	Price (kes)
Loss of flora and fauna	▪ Site clearance should be limited to the minimum area required for the execution of the works. ▪ The contractor to obtain permits for cutting down of trees within and around the site. ▪ Top soil should be stockpiled separately from the subsoil. After completion of works, the subsoil should be backfilled first then top soil should be restored on top to facilitate natural regeneration of those areas, particularly at the borrow sites/ Rehabilitation and restoration of quarries and borrow pits	Contractor Project Resident Engineer/ Supervisor KFS KWS	Construction Phase	
Flooding, Siltation and failure of the pressure filters	▪ Planting of trees in the upstream to control any sources of erosion and siltation to the Dam by human activities ▪ Undertake monitoring of the upstream to control siltation and erosion ▪ Take necessary engineering measures to sustain the pressure projected ▪ Mitigate any impacts related to climate change from an engineering perspective.	Contractor Project Resident Engineer/ Supervisor KFS KWS	Pre-construction Phase Construction Phase	
Quarries and borrow pits	▪ Contractor to obtain a separate ESIA license for quarries, his campsites, and borrow pits ▪ Comply with the NEMA Integrated National Land Use Guidelines (*Guidelines for Mining and Quarrying)*, 2011	Contractor Project Resident Engineer/ Supervisor KFS/ KWS	Construction Phase	

Air pollution, Noise and Dust	▪ Comply with NEMA Air and Noise pollution control regulations ▪ Vehicles and other equipment emissions would be kept to a minimum by servicing and maintaining the equipment to manufacturer's specification. ▪ Use protective clothing like helmets and dust masks by construction crew and any other required Personal Protective Equipment (PPEs) ▪ Avoid night time construction when noise is loudest. ▪ Avoid night-time construction using heavy machinery ▪ Construction sites and transportation routes will be water-sprayed on dry and windy days up to three times a day, especially if these sites are near sensitive receptors, such as ecological sites, local villages, or institutions, especially during transportation of materials to the project site.	Contractor Project Resident Engineer/ Supervisor	Construction Phase	
Generation of solid and liquid waste	▪ Compliance to NEMA Waste Management Regulations 2006 ▪ Provide adequate waste disposal facilities. Ensure collection of all solid waste from generation points, safe transportation to a central point where they are sorted out and safely disposed according to type to protect the environmental resources. ▪ Put in place adequate and efficient sanitary facilities for handling liquid waste especially waste water to protect the river from pollution.	Contractor Project Resident Engineer/ Supervisor	Construction Phase	

	▪ Wastewater from residential quarters and offices to be directed to constructed septic tanks for safe handling. ▪ Pit latrines can be used in areas where the other services are not available or feasible			
Pollution of water resources	▪ Ensure proper measures are in place for collection and disposal of spilled oils and lubricants. ▪ Rehabilitation and restoration/ Decommissioning Plans for quarries and borrow pits	Contractor Project Resident Engineer/ Supervisor	Construction Phase Decommissioning phase	
Health and safety	▪ Full compliance with Occupational Safety and Health Act , 2007 comply with operating occupational health and safety law requirements ▪ Provision of Personal Protective Equipment (ear muffs, gloves, dust masks and helmets) for the construction crew ▪ Employ a full-time qualified (graduate level) Environment, Health and Safety officer on site. ▪ Provide First aid kit and appropriate procedures and safety measures ▪ Ensure that all construction machines and equipment are in good working conditions to prevent occupational hazards. ▪ Provide information, education and communication about safe uses of drinking water. ▪ Isolate construction sites from the general public through hoarding and other suitable methods	Contractor Project Resident Engineer/ Supervisor	Construction Phase	

	▪ Provide workers training on safety procedures and emergency response such as fire, oil and chemical spills, pipe bursts and other serious water loss risks. ▪ Develop and implement an HIV/ AIDs sensitization and awareness creation program. Sensitize workers and the surrounding communities on awareness, prevention and management of HIV/AIDS through staff training, quarterly awareness campaigns ▪ Provide condom dispensers at appropriate locations coupled with awareness campaigns to workers and surrounding communities on HIV/AIDS throughout the construction period ▪ Provide enough toilets and other sanitary facilities within the camp ▪ Work to minimize or altogether eliminate mosquito breeding sites.			
Traffic Accidents and Management	▪ Develop and implement a Traffic Management Plan in the Park ▪ Provide temporary road signs or notices to indicate ongoing works ▪ Strictly follow KWS Park traffic rules ▪ All transport staff (especially drivers) to undergo induction and abide to the traffic rules within the park ▪ Provide appropriate signage to warn motorists and other road users of the construction activities, diversion routes to ward off traffic accidents.	Contractor Project Resident Engineer/ Supervisor KWS	Construction Phase	

	▪ Communicate any intended disruption of the services to enable the people to prepare, e.g. Power disruptions ▪ In the event that delivery trucks damage parts of the road, repair the spots in consultation with the local authorities.			
Gender balance and Mainstreaming	▪ Ensure equitable distribution of employment opportunities between men and women ▪ Provide toilets and bathrooms for both male and female workers on site	Contractor Project Resident Engineer/ Supervisor	Pre-Construction Phase Construction Phase	
Increased spread of Sexually Transmitted Diseases (STD) and HIV/AIDs	▪ Develop and implement an STDs, HIV/ AIDs program throughout the project period to protect the workers and local communities from infections from migrant workers ▪ Contractor to create partnership with the County HIV/AIDs control department	Contractor Project Resident Engineer/ Supervisor	Construction Phase	
	Total Price C/F to Bill of Quantities Bill No. 1 Item No. 1-A299.4			

SCHDULE B- EMPLOYER'S RESPONSIBILITIES

Environmental / Social Impact	Mitigation Action Plan	Responsibility	Phase
Low river flows during the dry season	▪ Set minimum abstraction rates for dry and wet months (based on hydrological studies) to avoid drying up of the Yamo River downstream especially during the dry seasons	NWWDA	Construction Phase
Flooding, Siltation and failure of the pressure filters	▪ Mitigate any impacts related to climate change from an engineering perspective.	NWWDA	Pre- Construction Phase Construction Phase
Quarries and borrow pits	▪ Comply to the NEMA Integrated National Land Use Guidelines (*Guidelines for Mining and Quarrying)*, 2011	NWWDA	Construction Phase
Gender balance	▪ Ensure equitable distribution of employment opportunities between men and women	NWWDA	Pre- Construction Phase Construction Phase
Increased spread of Sexually Transmitted Diseases (STD) and HIV/AIDs	▪ Develop an STDs, HIV/ AIDs program throughout the project period to protect the workers and local communities from infections from migrant workers	NWWDA	Pre- Construction Phase Construction Phase

SECTION VI – SPECIFICATIONS

1. The specification to be used for the Works is the General and Technical Specifications given in Volume II of the Bid Documents.

2. "Standards, brand names, catalogue 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."

FOR DETAILS SEE VOLUME II OF THE BID DOCUMENT

SECTION VII – DRAWINGS

SCHEDULE OF ENGINEERING DRAWINGS

THE ENGINEERING DRAWINGS ARE GIVEN IN VOLUME III OF THE BIDDING DOCUMENTS.

SUPPLEMENTARY INFORMATION

Tenderer to fill as appropriate

PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS

SECTION VIII - GENERAL CONDITIONS OF CONTRACT

1. GENERAL CONDITIONS

1. General Provisions

1.1 Definitions

In the Conditions of Contract ("these Conditions"), which include Particular Conditions, Parts A and B, and these General Conditions, the following words and expressions shall have the meanings stated. Words indicating persons or parties include corporations and other legal entities, except where the context requires otherwise.

1.1.1 The Contract

"Bills of Quantities", "Daywork Schedule" and "Schedule of Payment Currencies" mean the documents so named (if any) which are comprised in the Schedules.

"Contract Agreement" means the contract agreement referred to in Sub-Clause 1.6 [Contract Agreement].

"Contract" means the Contract Agreement, the Letter of Acceptance, the Letter of Tender, these Conditions, the Specification, the Drawings, the Schedules, and the further documents (if any) which are listed in the Contract Agreement or in the Letter of Acceptance.

"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 Procuring Entity in accordance with the Contract.

"Laws" means all national legislation, statutes, ordinances, and regulations and by-laws of any legally constituted public authority.

"Letter of Acceptance" means the letter of formal acceptance, signed by the contractor and the Procuring Entity, including any annexed memoranda comprising agreements between and signed by both Parties.

"Letter of Tender" means the document entitled letter of tender or letter of tender, which was completed by the Contractor and includes the signed offer to the Procuring Entity for the Works.

"SCC**" means the Special Conditions of Contract completed by the Procuring Entity which modify the General Conditions of Contract.**

"Schedules" means the document(s) entitled schedules, completed by the Contractor and submitted with the Letter of Tender, as included in the Contract. Such document may include the Bills of Quantities, data, lists, and schedules of rates and/or prices.

"Specification" means the document entitled specification, as included in the Contract, and any additions and modifications to the specification in accordance with the Contract. Such document specifies the Works.

"Tender" means the Letter of Tender and all other documents which the Contractor submitted with the Letter of Tender, as included in the Contract.

1.1.2 Parties and Persons

"Contractor's Personnel" means the Contractor's Representative and all personnel whom the Contractor utilizes on Site, who may include the staff, labor and other employees of the Contractor and of each Subcontractor; and any other personnel assisting the Contractor in the execution of the Works.

"Contractor's Representative" means the person named by the Contract or in the Contractor appointed from time to time by the Contractor under Sub-Clause 4.3 [Contractor's Representative], who acts on behalf of the Contractor.

"Contractor" means the person(s) named as contractor in the Letter of Tender accepted by the Procuring Entity and the legal successors in title to this person(s).

"Engineer" means the person appointed by the Procuring Entity to act as the Engineer for the purposes of the Contract and named in the **SCC**, or other person appointed from time to time by the Procuring Entity and notified to the Contractor under Sub-Clause 3.4 [Replacement of the Engineer].
"Party" means the Procuring Entity or the Contractor, as the context requires.

"Procuring Entity" means the Entity named in the Special Conditions of Contract.

"Procuring Entity's Personnel" means the Engineer, the assistants referred to in Sub-Clause 3.2 [Delegation by the Engineer] and all other staff, labor and other employees of the Engineer and of the Procuring Entity; and any other personnel notified to the Contractor, by the Procuring Entity or the Engineer, as Procuring Entity's Personnel.

"Procuring Entity" means the person named as Procuring Entity in the **SCC** and the legal successors in title to this person.

"Subcontractor" means any person named in the Contract as a subcontractor, or any person appointed as a subcontractor, for a part of the Works; and the legal successors in title to each of these persons.

1.1.3 Dates, Tests, Periods and Completion

"Base Date" means a date 30 day prior to the submission of tenders.

"Commencement Date" means the date notified under Sub-Clause 8.1 [Commencement of Works].

"Completion Certificate" means the certificate issued under Sub-Clause 11.9 [Performance

Certificate]. **"Day"** means a calendar day and "year" means 365 days.

"Defects Notification Period" means the period for notifying defects in the Works or a Section (as the case may be) under Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects], which extends over 365 days except if otherwise stated in the **SCC** (with any extension under Sub-Clause 11.3 [Extension of Defects Notification Period]), calculated from the date on which the Works or Section is completed as certified under Sub-Clause 10.1[Taking Over of the Works and Sections].

"Taking-Over Certificate" means a certificate issued under Clause 10 [Procuring Entity's Taking Over].

"Tests after Completion" means the tests (if any) which are specified in the Contract and which are carried out in accordance with the Specification after the Works or a Section (as the case may be) are taken over by the Procuring Entity.

"Tests on Completion" means the tests which are specified in the Contract or agreed by both Parties or instructed as a Variation, and which are carried out under Clause 9 [Tests on Completion] before the Works or a Section (as the case may be) are taken over by the Procuring Entity.

"Time for Completion" means the time for completing the Works or a Section (as the case may be) under Sub- Clause 8.2 [Time for Completion], as stated in the **SCC** (with any extension under Sub-Clause 8.4 [Extension of Time for Completion]), calculated from the Commencement Date.

1.1.4 Money and Payments

"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.

"Contract Price" means the price defined in Sub-Clause 14.1 [The Contract Price] and includes adjustments in accordance with the Contract.

"Cost" means all expenditure reasonably incurred (or to be incurred) by the Contractor, whether on or off the Site, including overhead and similar charges, but does not include profit.

"Final Payment Certificate" means the payment certificate issued under Sub-Clause 14.13 [Issue of Final Payment Certificate].

"Final Statement" means the statement defined in Sub-Clause 14.11 [Application for Final Payment Certificate].

"Foreign Currency" means a currency in which part (oral) of the Contract Price is payable, but not the Local Currency.

"Interim Payment Certificate" means a payment certificate issued under Clause 14 [Contract Price and Payment], other than the Final Payment Certificate.

"Local Currency" means the currency of the Country.

"Payment Certificate" means a payment certificate issued under Clause 14 [Contract Price and Payment].

"Provisional Sum" means a sum (if any) which is specified in the Contract as a provisional sum, for the execution of any part of the Works or for the supply of Plant, Materials or services under Sub-Clause 13.5 [Provisional Sums].

"Retention Money" means the accumulated retention moneys which the Procuring Entity retains under Sub-Clause 14.3 [Application for Interim Payment Certificates] and pays under Sub-Clause 14.9 [Payment of Retention Money].

"Statement" means a statement submitted by the Contractor as part of an application, under Clause 14 [Contract Price and Payment], for a payment certificate.

1.1.5 Works and Goods

"Contractor's Equipment" means all apparatus, machinery, vehicles and other things required for the execution and completion of the Works and the remedying of any defects. However, Contractor's Equipment excludes Temporary Works, Procuring Entity's Equipment (if any), Plant, Materials and any other things intended to form or forming part of the Permanent Works.

"Goods" means Contractor's Equipment, Materials, Plant and Temporary Works, or any of them as appropriate.

"Materials" means things of all kinds (other than Plant) intended to form or forming part of the Permanent Works, including the supply-only materials (if any) to be supplied by the Contractor under the Contract.

"Permanent Works" means the permanent works to be executed by the Contractor under the Contract.

"Plant" means the apparatus, machinery and other equipment intended to form or forming part of the Permanent Works, including vehicles purchased for the Procuring Entity and relating to the construction or operation of the Works.

"Section" means a part of the Works specified in the **SCC** as a Section (if any).

"Temporary Works" means all temporary works of every kind (other than Contractor's Equipment) required on Site for the execution and completion of the Permanent Works and the remedying of any defects.

"Works" mean the Permanent Works and the Temporary Works, or either of them as appropriate.

1.1.6 Other Definitions

"Contractor's Documents" means the calculations, computer programs and other software, drawings, manuals, models and other documents of a technical nature (if any) supplied by the Contractor under the Contract.

"Country" means Kenya as the country in which the Site is located, where the Permanent Works are to be executed.

"Force Majeure" is defined in Clause 19 [Force Majeure].

"Laws" means all national (or state) legislation, statutes, ordinances and other laws, and regulations and by-laws of any legally constituted public authority.

"Notice of Dissatisfaction" means the notice given by either Party to the other under Sub-Clause 20.4 indicating its dissatisfaction and intention to commence arbitration.
"Performance Security" means the security (or securities, if any) under Sub-Clause 4.2 [Performance Security].

"Procuring Entity's Equipment" means the apparatus, machinery and vehicles (if any) made available by the Procuring Entity for the use of the Contractor in the execution of the Works, as stated in the Specification; but does not include Plant which has not been taken over by the Procuring Entity.

"Site" means the places where the Permanent Works are to be executed, including storage and working areas, and to which Plant and Materials are to be delivered, and any other places as may be specified in the Contract as forming part of the Site.

"Unforeseeable" means not reasonably foreseeable by an experienced contractor by the Base Date.

"Variation" means any change to the Works, which is instructed or approved as a variation under Clause 13 [Variations and Adjustments].

1.2 Interpretation

In the Contract, except where the context requires otherwise:

a) Words indicating one gender include all genders;
b) words indicating the singular also include the plural and words indicating the plural also include the singular;
c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing;
d) "written" or "inwriting" means hand-written, type-written, printed or electronically made, and resulting in a permanent record; and
e) the word "tender" is synonymous with "tender" and "tenderer" with "Tenderer" and the words "tender documents" with "tendering documents."

1.3 Communications

1.3.1 Wherever these Conditions provide for the giving or issuing of approvals, certificates, consents, determinations, notices, requests and discharges, these communications shall be:

a) In writing and delivered by hand (against receipt), sent by mail or courier, or transmitted using any of the agreed systems of electronic transmission as stated in the **SCC**; and
b) Delivered, sent or transmitted to the address for the recipient's communications as stated in the **SCC**. However:
    i) if the recipient gives notice of another address, communications shall thereafter be delivered accordingly; and
    ii) if the recipient has not stated otherwise when requesting an approval or consent, it may be sent to the address from which the request was issued.

1.3.2 Approvals, certificates, consents and determinations shall not be unreasonably withheld or delayed. When a certificate is issued to a Party, the certifier shall send a copy to the other Party. When a notice is issued to a Party, by the other Party or the Engineer, a copy shall be sent to the Engineer or the other Party, as the case may be.

1.4 Law and Language

1.4.1 The Contract shall be governed by the **laws of Kenya**.

1.4.2 The ruling language of the Contract shall be the **English Language.**

1.5 Priority of Documents

1.5.1 The documents forming the Contract are to be taken as mutually explanatory of one another. For the purposes of interpretation, the priority of the documents shall be in accordance with the following sequence:

a The Contract Agreement,
b) The Letter of Acceptance, the Particular Conditions–Part,
c) The Particular Conditions–Part B
d) The General Conditions of Contract
e) The Form of Tender,
f) The Specifications and Bills of Quantities
g) The Drawings, and
h) The Schedules and any other documents forming part of the Contract.

1.5.2 If an ambiguity or discrepancy is found in the documents, the Engineer shall issue any necessary clarification or instruction.

1.6 Contract Agreement

The Parties shall enter into a Contract Agreement within 14 days after the Contractor receives the Letter of Acceptance, unless the Particular Conditions establish otherwise. The Contract Agreement shall be based upon the form annexed to the Particular Conditions. The costs of stamp duties and similar charges (if any) imposed by law in connection with entry into the Contract Agreement shall be borne by the Procuring Entity.

1.7 Assignment

Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either Party:

a) May assign the whole or any part with the prior agreement of the other Party, at the sole discretion of such other Party, and
b) May, as security in favor of a Procuring Entity or financial institution, assign its right to any moneys due, or to become due, under the Contract.

1.8 Care and Supply of Documents

1.8.1 The Specification and Drawings shall be in the custody and care of the Procuring Entity. Unless otherwise stated in the Contract, two copies of the Contract and of each subsequent Drawing shall be supplied to the Contractor, who may make or request further copies at the cost of the Contractor.

1.8.2 Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until taken over by the Procuring Entity. Unless otherwise stated in the Contract, the Contractor shall supply to the Engineer

1.8.3 The Contractor shall keep, on the Site, a copy of the Contract, publications named in the Specification, the Contractor's Documents (if any), the Drawings and Variations and other communications given under the Contract. The Procuring Entity's Personnel shall have the right of access to all these documents at all reasonable times.

1.8.4 If a Party becomes aware of an error or defect in a document which was prepared for use in executing the Works, the Party shall promptly give notice to the other Party of such error or defect.

1.9 Delayed Drawings or Instructions

1.9.1 The Contractor shall give notice to the Engineer whenever the Works are likely to be delayed or disrupted if any necessary drawing or instruction is not issued to the Contractor within a particular time, which shall be reasonable. The notice shall include details of the necessary drawing or instruction, details of why and by when it should be issued, and the nature and amount of the delay or disruption likely to be suffered if it is late.

If the Contractor suffers delay and/or incurs Cost as a result of a failure of the Engineer to issue the notified drawing or instruction within a time which is reasonable and is specified in the notice with supporting details, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
b) payment of any such Cost-plus profit, which shall be included in the Contract Price.

1.9.2 After receiving this further notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

1.9.3 However, if and to the extent that the Engineer's failure was caused by any error or delay by the Contractor, including an error in, or delay in the submission of, any of the Contractor's Documents, the Contractor shall not be entitled to such extension of time, Cost or profit.

1.10 Procuring Entity's Use of Contractor's Documents

1.10.1 As between the Parties, the Contractor shall retain the copyright and other intellectual property rights in the Contractor's Documents and other design documents made by (or on behalf of) the Contractor. The Contractor shall be deemed (by signing the Contract) to give to the Procuring Entity a non-terminable transferable non-exclusive royalty-free license to copy, use and communicate the Contractor's Documents, including making and using modifications of them. This license shall:

a) apply throughout the actual or intended working life (whichever is longer) of the relevant parts of the Works,

b) entitle any person in proper possession of the relevant part of the Works to copy, use and communicate the Contractor's Documents for the purposes of completing, operating, maintaining, altering, adjusting, repairing and demolishing the Works, and

c) in the case of Contractor's Documents which are in the form of computer programs and other software, permit their use on any computer on the Site and other places as envisaged by the Contract, including replacements of any computers supplied by the Contractor.

1.10.2 The Contractor's Documents and other design documents made by (or on behalf of) the Contractor shall not, without the Contractor's consent, be used, copied or communicated to a third party by (or on behalf of) the Procuring Entity for purposes other than those permitted under this Sub-Clause.

1.11 Contractor's Use of Procuring Entity's Documents

As between the Parties, the Procuring Entity shall retain the copyright and other intellectual property rights in the Specification, the Drawings and other documents made by (or on behalf of) the Procuring Entity. The Contractor may, at his cost, copy, use, and obtain communication of these documents for the purposes of the Contract. They shall not, without the Procuring Entity's consent, be copied, used or communicated to a third party by the Contractor, except as necessary for the purposes of the Contract.

1.12 Confidential Details

The Contractor's and the Procuring Entity's Personnel shall disclose all such confidential and other information as may be reasonably required in order to verify compliance with the Contract and allow its proper implementation.

1.13 Compliance with Laws

The Contractor shall, in performing the Contract, comply with applicable Laws. Unless otherwise stated in the Particular Conditions:

a) The Procuring Entity shall have obtained (or shall obtain) the planning, zoning, building permit or similar permission for the Permanent Works, and any other permissions described in the Specification as having been (or to be) obtained by the Procuring Entity; and the Procuring Entity shall indemnify and hold the Contractor harmless against and from the consequences of any failure to do so; and

b) the Contractor shall give all notices, pay all taxes, duties and fees, and obtain all permits, licenses and approvals, as required by the Laws in relation to the execution and completion of the Works and the remedying of any defects; and the Contractor shall indemnify and hold the Procuring Entity harmless against and from the consequences of any failure to do so, unless the Contractor is impeded to accomplish these actions and shows evidence of its diligence.

1.14 Joint and Several Liability

If the Contractor constitutes (under applicable Laws) a joint venture, consortium or other unincorporated

grouping of two or more persons:

a) These persons shall be deemed to be jointly and severally liable to the Procuring Entity for the performance of the Contract;

b) these persons shall notify the Procuring Entity of their leader who shall have authority to bind the Contractor and each of these persons; and

c) the Contractor shall not alter its composition or legal status without the prior consent of the Procuring Entity.

1.15 Inspections and Audit by the Procuring Entity

Pursuant to paragraph 2.2 e. of Appendix B to the General Conditions, the Contractor shall permit and shall cause its subcontractors and sub-consultants to permit, the Procuring Entity and/or persons appointed by the Procuring Entity to inspect the Site and/or the accounts and records relating to the procurement process, selection and/or contract execution, and to have such accounts and records audited by auditors appointed by the Procuring Entity if requested by the Procuring Entity. The Contractor's and its Subcontractors' and sub-consultants' attention is drawn to Sub-Clause15.6 (Fraud and Corruption) which provides, interalia, that acts intended to materially impede the exercise of the Procuring Entity's inspection and audit rights constitute a prohibited practice subject to contract termination (as well as to a determination of ineligibility pursuant to the Procuring Entity's prevailing sanctions procedures).

2. THE PROCURING ENTITY

2.1 Right of Access to the Site

2.1.1 The Procuring Entity shall give the Contractor right of access to, and possession of, all parts of the Site within the time (or times) stated in the **SCC**. The right and possession may not be exclusive to the Contractor. If, under the Contract, the Procuring Entity is required to give (to the Contractor) possession of any foundation, structure, plant or means of access, the Procuring Entity shall do so in the time and manner stated in the Specification. However, the Procuring Entity may withhold any such right or possession until the Performance Security has been received.

2.1.2 If no such time is stated in the **SCC**, the Procuring Entity shall give the Contractor right of access to, and possession of, the Site within such times as required to enable the Contractor to proceed without disruption in accordance with the Programme submitted under Sub-Clause 8.3 [Programme].

2.1.3 I f the Contractor suffers delay and/or incurs Cost as a result of a failure by the Procuring Entity to give any such right or possession within such time, the Contractor shall give notice to the Engineer and shall been titled subject toSub-Clause20.1 [Contractor's Claims] to:

a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and

b) payment of any such Cost-plus profit, which shall be included in the Contract Price.

2.1.4 After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause3.5 [Determinations] to agree or determine these matters.

2.1.5 However, if and to the extent that the Procuring Entity's failure was caused by any error or delay by the Contractor, including an error in, or delay in the submission of, any of the Contractor's Documents, the Contractor shall not be entitled to such extension of time, Cost or profit.

2.2 Permits, Licenses or Approvals

The Procuring Entity shall provide, at the request of the Contractor, such reasonable assistance as to allow the Contractor to obtain properly:

a) Copies of the Laws of the Country which are relevant to the Contract but are not readily available, and

b) Any permits, licenses or approvals required by the Laws of the Country:

i) Which the Contractor is required to obtain under Sub-Clause 1.13 [Compliance with Laws],
ii) For the delivery of Goods, including clearance through customs, and

iii) For the export of Contractor's Equipment when it is removed from the Site.

2.3 Procuring Entity's Personnel

The Procuring Entity shall be responsible for ensuring that the Procuring Entity's Personnel and the Procuring Entity's other contractors on the Site:

a) co-operate with the Contractor's efforts under Sub-Clause 4.6 [Co-operation], and

b) take actions similar to those which the Contractor is required to take under sub-paragraphs (a), (b) and (c) of Sub-Clause 4.8 [Safety Procedures] and under Sub-Clause 4.18 [Protection of the Environment].

2.4 Procuring Entity's Financial Arrangement

2.4.1 The Procuring Entity shall submit, before the Commencement Date and there after within 30 days after receiving any request from the Contractor, reasonable evidence that financial arrangements have been made and are being maintained which will enable the Procuring Entity to pay the Contract Price punctually (as estimated at that time) in accordance with Clause 14 [Contract Price and Payment]. Before the Procuring Entity makes any material change to his financial arrangements, the Procuring Entity shall give notice to the Contractor with detailed particulars.

2.4.2 In addition, if the Procuring Entity has notified to the Contractor that the Procuring Entity has suspended disbursements under its loan, which finances in whole or in part the execution of the Works, the Procuring Entity shall give notice of such suspension to the Contractor with detailed particulars, including the date of such notification, with a copy to the 2.4.3 Engineer, within 7 days of the Procuring Entity having received the suspension notification from the Procuring Entity. If alternative funds will be available in appropriate currencies to the Procuring Entity to continue making payments to the Contractor beyond a date 60 day after the date of Procuring Entity notification of the suspension, the Procuring Entity shall provide reasonable evidence in his notice of the extent to which such funds will be available.

2.5 Procuring Entity's Claims

2.5.1 If the Procuring Entity considers itself to be entitled to any payment under any Clause of these Conditions or otherwise in connection with the Contract, and/or to any extension of the Defects Notification Period, the Procuring Entity or the shall give notice and particulars to the Contractor. However, notice is not required for payments due under Sub-Clause 4.19 [Electricity, Water and Gas], under Sub-Clause 4.20 [Procuring Entity's Equipment and Free-Issue Materials], or for other services requested by the Contractor.

2.5.2 The notice shall be given as soon as practicable and no longer than 30 days after the Procuring Entity became aware, or should have become aware, of the event or circumstances giving rise to the claim. A notice relating to any extension of the Defects Notification Period shall be given before the expiry of such period.

2.5.3 The particulars shall specify the Clause or other basis of the claim and shall include substantiation of the amount and/or extension to which the Procuring Entity considers itself to be entitled in connection with the Contract. The Engineer shall then proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) the amount (if any) which the Procuring Entity is entitled to be paid by the Contractor, and/or(ii) the extension (if any) of the Defects Notification Period in accordance with Sub-Clause 11.3 [Extension of Defects Notification Period].

3. THE ENGINEER

3.1 Engineer's Duties and Authority

3.1.1 The Procuring Entity shall appoint the Engineer who shall carry out the duties assigned to him in the Contract. The Engineer's staff shall include suitably qualified engineers and other professionals who are competent to carry out these duties.

The Engineer shall have no authority to amend the Contract.
The Engineer may exercise the authority attributable to the Engineer as specified in or necessarily to be implied from the Contract. If the Engineer is required to obtain the approval of the Procuring Entity before

exercising a specified authority, the requirements shall be as stated in the Particular Conditions. The Procuring Entity shall promptly inform the Contractor of any change to the authority attributed to the Engineer.

3.1.2 However, whenever the Engineer exercises a specified authority for which the Procuring Entity's approval is required, then (for the purposes of the Contract) the Procuring Entity shall be deemed to have given approval. Except as otherwise stated in these Conditions:

a) Whenever carrying out duties or exercising authority, specified in or implied by the Contract, the Engineer shall be deemed to act for the Procuring Entity; the Engineer has no authority to relieve either Party of any duties, obligations or

b) any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test, or similar act by the Engineer (including absence of disapproval) shall not relieve the Contractor from any responsibility he has under the Contract, including responsibility for errors, omissions, discrepancies and non-compliances; and

c) any act by the Engineer in response to a contractor's request except as otherwise expressly specified shall be notified in writing to the Contractor within 14 days of receipt.

3.1.2 The following provisions shall apply; The Engineer shall obtain the specific approval of the Procuring Entity before taking action under the-following Sub-Clauses of these Conditions:

a) Sub-Clause 4.12: agreeing or determining an extension of time and/or additional cost.

b) Sub-Clause13.1: instructing a Variation, except;

   i) In an emergency situation as determined by the Engineer, or

   ii) If such a Variation would increase the Accepted Contract Amount by less than the percentage specified in the **SCC**.

c) Sub-Clause13.3: Approving a proposal for Variation submitted by the Contractor in accordance with Sub Clause13.1or13.2.

d) Sub-Clause13.4: Specifying the amount payable in each of the applicable currencies.

3.1.3 Notwithstanding the obligation, as set out above, to obtain approval, if, in the opinion of the Engineer, an emergency occurs affecting the safety of life or of the Works or of adjoining property, he may, without relieving the Contractor of any of his duties and responsibility under the Contract, instruct the Contract or to execute all such work or to do all such things as may, in the opinion of the Engineer, be necessary to abate or reduce the risk. The Contractor shall forthwith comply, despite the absence of approval of the Procuring Entity, with any such instruction of the Engineer. The Engineer shall determine an addition to the Contract Price, in respect of such instruction, in accordance with Clause 13 and shall notify the Contractor accordingly, with a copy to the Procuring Entity.

3.2 Delegation by the Engineer

3.2.1 The Engineer may from time to time assign duties and delegate authority to assistants, and may also revoke such assignment or delegation. These assistants may include a resident engineer, and/or independent inspectors appointed to inspect and/or test items of Plant and/or Materials. The assignment, delegation or revocation shall be in writing and shall not take effect until copies have been received by both Parties. However, unless otherwise agreed by both Parties, the Engineer shall not delegate the authority to determine any matter in accordance with Sub-Clause3.5 [Determinations].

3.2.2 Each assistant, to whom duties have been assigned or authority has been delegated, shall only be authorized to issue instructions to the Contractor to the extent defined by the delegation. Any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test, or similar act by an assistant, in accordance with the delegation, shall have the same effect as though the act had been an act of the Engineer. However:

a) Any failure to disapprove any work, Plant or Materials shall not constitute approval, and shall therefore not prejudice the right of the Engineer to reject the work, Plant or Materials;

b) If the Contractor questions any determination or instruction of an assistant, the Contractor may refer the matter to the Engineer, who shall promptly confirm, reverse or vary the determination or instruction.

3.3 Instructions of the Engineer

3.3.1 The Engineer may issue to the Contractor (at any time) instructions and additional or modified Drawings which may be necessary for the execution of the Works and the remedying of any defects, all in accordance with the Contract. The Contractor shall only take instructions from the Engineer, or from an assistant to whom the appropriate authority has been delegated under this Clause. If an instruction constitutes a Variation, Clause 13 [Variations and Adjustments] shall apply.

3.3.2 The Contractor shall comply with the instructions given by the Engineer or delegated assistant, on any matter related to the Contract. Whenever practicable, their instructions shall be given in writing. If the Engineer or a delegated assistant:

a) Gives an oral instruction,
b) Receives a written confirmation of the instruction, from (or on behalf of) the Contractor, within two working days after giving the instruction, and
c) Does not reply by issuing a written rejection and/or instruction within two working days after receiving the confirmation, then the confirmation shall constitute the written instruction of the Engineer or delegated assistant (as the case may be).

3.4 Replacement of the Engineer

If the Procuring Entity intends to replace the Engineer, the Procuring Entity shall, not less than 21 days before the intended date of replacement, give notice to the Contractor of the name, address and relevant experience of the intended replacement Engineer. If the Contractor considers the intended replacement Engineer to be unsuitable, he has the right to raise objection against him by notice to the Procuring Entity, with supporting particulars, and the Procuring Entity shall give full and fair consideration to this objection.

3.5 Determinations

3.5.1 Whenever these Conditions provide that the Engineer shall proceed in accordance with this Sub-Clause 3.5 to agree or determine any matter, the Engineer shall consult with each Party in an endeavor to reach agreement. If agreement is not achieved, the Engineer shall make a fair determination in accordance with the Contract, taking due regard of all relevant circumstances.

3.5.2 The Engineer shall give notice to both Parties of each agreement or determination, with supporting particulars, within 30 days from the receipt of the corresponding claim or request except when otherwise specified. Each Party shall give effect to each agreement or determination unless and until revised under Clause 20 [Claims, Disputes and Arbitration].

4. THE CONTRACTOR

4.1 Contractor's General Obligations

4.1.1 The Contractor shall design (to the extent specified in the Contract), execute and complete the Works in accordance with the Contract and with the Engineer's instructions, and shall remedy any defects in the Works.

4.1.2 The Contractor shall provide the Plant and Contractor’s Documents specified in the Contract, and all Contractor's Personnel, Goods, consumables and other things and services, whether of a temporary or permanent nature, required in and for this design, execution, completion and remedying of defects.

4.1.3 All equipment, material, and services to be incorporated in or required for the Works shall have their origin in any eligible source country as defined by the Procuring Entity.

4.1.4 The Contractor shall be responsible for the adequacy, stability and safety of all Site operations and of all methods of construction. Except to the extent specified in the Contract, the Contractor (i) shall be responsible for all Contractor's Documents, Temporary Works, and such design of each item of Plant and Materials as is required for the item to be in accordance with the Contract, and (ii) shall not otherwise be responsible for the design or specification of the Permanent Works.

4.1.5 The Contractor shall, whenever required by the Engineer, submit details of the arrangements and methods

which the Contractor proposes to adopt for the execution of the Works. No significant alteration to these arrangements and methods shall be made without this having previously been notified to the Engineer.

4.1.6 The Contractor shall not commence any Works, including mobilization and/or pre-construction activities (e.g. limited clearance for haul roads, site accesses and work site establishment, geotechnical investigations or investigations to select ancillary features such as quarries and borrow pits), unless the Engineer is satisfied that appropriate measures are in place to address environmental, social, health and safety risks and impacts.

4.1.7 If the Contract specifies that the Contract or shall design any part of the Permanent Works, then unless otherwise stated in the Particular Conditions:

a) The Contractor shall submit to the Engineer the Contractor's Documents for this part in accordance with the procedures specified in the Contract;

b) These Contractor's Documents shall be in accordance with the Specification and Drawings, shall be written in the language for communications defined in Sub-Clause 1.4 [Law and Language], and shall include additional information required by the Engineer to add to the Drawings for co-ordination of each Party's designs;

c) The Contractor shall be responsible for this part and it shall, when the Works are completed, be fit for such purposes for which the part is intended as are specified in the Contract; and

d) Prior to the commencement of the Tests on Completion, the Contractor shall submit to the Engineer the "as- built" documents and, if applicable, operation and maintenance manuals in accordance with the Specification and insufficient detail for the Procuring Entity to operate, maintain, dismantle, reassemble, adjust and repair this part of the Works. Such part shall not be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [Taking Over of the Works and Sections] until these documents and manuals have been submitted to the Engineer.

4.2 Performance Security

4.2.1 Performance security shall not be required for contracts estimated to cost less than Kenya shillings five million shillings.

4.2.2 The Contractor shall obtain (at his cost) a Performance Security for proper performance, in the amount stated in the **SCC** and denominated in the currency (ies) of the Contractor in a freely convertible currency acceptable to the Procuring Entity. If an amount is not stated in the **SCC,** this Sub-Clause shall not apply.

4.2.3 The Contractor shall deliver the Performance Security to the Procuring Entity within 14 days after receiving the Letter of Acceptance and shall send a copy to the Engineer. The Performance Security shall be issued by a reputable Procuring Entity or financial institution selected by the Contractor and shall be in the form annexed to the Particular Conditions, as stipulated by the Procuring Entity in the **SCC**, or in another form approved by the Procuring Entity.

4.2.4 The Contractor shall ensure that the Performance Security is valid and enforceable until the Contractor has executed and completed the Works and remedied any defects. If the terms of the Performance Security specify its expiry date, and the Contractor has not become entitled to receive the Performance Certificate by the date 30 days prior to the expiry date, the Contractor shall extend the validity of the Performance Security until the Works have been completed and any defects have been remedied.

4.2.5 The Procuring Entity shall not make a claim under the Performance Security, except for amounts to which the Procuring Entity is entitled under the Contract.

The Procuring Entity shall indemnify and hold the Contractor harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from a claim under the Performance Security to the extent to which the Procuring Entity was not entitled to make the claim.

4.2.6 The Procuring Entity shall return the Performance Security to the Contractor within 21 days after receiving a copy of the Performance Certificate.

4.2.7 Without limitation to the provisions of the rest of this Sub-Clause, whenever the Engineer determines an addition or are duction to the Contract Price as a result of a change in cost and/or legislation, or as a result of a Variation, amounting to more than 25 percent of the portion of the Contract Price payable in a specific

currency, the Contractor shall at the Engineer's request promptly increase, or may decrease, as the case may be, the value of the Performance Security in that currency by an equal percentage.

4.3 Contractor's Representative

4.3.1 The Contractor shall appoint the Contractor's Representative and shall give him all authority necessary to act on the Contractor's behalf under the Contract. Unless the Contractor's Representative is named in the Contract, the Contractor shall, prior to the Commencement Date, submit to the Engineer for consent the name and particulars of the person the Contractor proposes to appoint as Contractor's Representative. If consent is withheld or subsequently revoked in terms of Sub-Clause 6.9 [Contractor's Personnel], or if the appointed person fails to act as Contractor's Representative, the Contractor shall similarly submit the name and particulars of another suitable person for such appointment.

The Contractor shall not, without the prior consent of the Engineer, revoke the appointment of the Contractor's Representative or appoint a replacement.

4.3.2 The whole time of the Contractor's Representative shall be given to directing the Contractor's performance of the Contract. If the Contractor's Representative is to be temporarily absent from the Site during the execution of the Works, a suitable replacement person shall be appointed, subject to the Engineer's prior consent, and the Engineer shall be notified accordingly.

4.3.3 The Contractor's Representative shall, on behalf of the Contractor, receive instructions under Sub-Clause 3.3 [Instructions of the Engineer].

The Contractor's Representative may delegate any powers, functions and authority to any competent person, and may at any time revoke the delegation. Any delegation or revocation shall not take effect until the Engineer has received prior notice signed by the Contractor's Representative, naming the person and specifying the powers, functions and authority being delegated or revoked.

4.3.4 The Contractor's Representative shall be fluent in the language for communications defined in Sub-Clause1.4 [Law and Language]. If the Contractor's Representative's delegates are not fluent in the said language, the Contractor shall make competent interpreters available during all working hours in a number deemed sufficient by the Engineer.

4.4 Subcontractors

4.4.1 The Contractor shall not subcontract the whole of the Works.

4.4.2 The Contractor shall be responsible for the acts or defaults of any Subcontractor, his agents or employees, as if they were the acts or defaults of the Contractor. Unless otherwise stated in the Particular Conditions:

a) The Contractor shall not be required to obtain consent to suppliers solely of Materials, or to a subcontract for which the Subcontractor is named in the Contract;

b) The prior consent of the Engineer shall be obtained to other proposed Sub contractors;

c) the Contractor shall give the Procuring entity not less than 14 days' notice of the intended date of the commencement of each Subcontractor's work, and of the commencement of such work on the Site; and

d) each subcontract shall include provisions which would entitle the Procuring Entity to require the subcontract to be assigned to the Procuring Entity under Sub-Clause 4.5 [Assignment of Benefit of Subcontract] (if or when applicable) or in the event of termination under Sub-Clause15.2 [Termination by Procuring Entity].

4.4.3 The Contractor shall ensure that the requirements imposed on the Contractor by Sub-Clause 1.12 [Confidential Details] apply equally to each Subcontractor.

4.4.4 Where practicable, the Contractor shall give fair and reasonable opportunity for contractors from the Country to be appointed as Subcontractors.

4.5 Assignment of Benefit of Subcontract

If a Subcontractor's obligations extend beyond the expiry date of the relevant Defects Notification Period and the Engineer, prior to this date, instructs the Contractor to assign the benefit of such obligations to the Procuring Entity, then the Contractor shall do so. Unless otherwise stated in the assignment, the Contractor shall have no liability to the Procuring Entity for the work carried out by the Subcontractor after the assignment takes effect.

4.6 Co-operation

4.6.1 The Contractor shall, as specified in the Contract or as instructed by the Engineer, allow appropriate opportunities for carrying out work to:

a) The Procuring Entity's Personnel,
b) Any other contractors employed by the Procuring Entity, and
c) The personnel of any legally constituted public authorities, who may be employed in the execution on or near the Site of any work not included in the Contract.

4.6.2 Any such instruction shall constitute a Variation if and to the extent that it causes the Contractor to suffer delays and/or to incur Unforeseeable Cost. Services for these personnel and other contractors may include the use of Contractor's Equipment, Temporary Works or access arrangements which are the responsibility of the Contractor.

If, under the Contract, the Procuring Entity is required to give to the Contractor possession of any foundation, structure, plant or means of access in accordance with Contractor's Documents, the Contractor shall submit such documents to the Engineer in the time and manner stated in the Specification.

4.7 Setting Out

4.7.1 The Contractor shall set out the Works in relation to original points, lines and levels of reference specified in the Contractor notified by the Engineer. The Contractor shall be responsible for the correct positioning of all parts of the Works, and shall rectify any error in the positions, levels, dimensions or alignment of the Works.

The Procuring Entity shall be responsible for any errors in these specified or notified items of reference, but the Contractor shall use reasonable efforts to verify their accuracy before they are used.

4.7.2 If the Contractor suffers delay and/or incurs Cost from executing work which was necessitated by an error in these items of reference, and an experienced contractor could not reasonably have discovered such error and avoided this delay and/or Cost, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
b) payment of any such Cost-plus profit, which shall be included in the Contract Price.

4.7.3 After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) whether and (if so) to what extent the error could not reasonably have been discovered, and (ii) the matters described in sub-paragraphs (a) and (b) above related to these.

4.8 Safety Procedures

The Contractor shall:

a) Comply with all applicable safety regulations,
b) Take care for the safety of all persons entitled to be on the Site,
c) Use reasonable efforts to keep the Site and Works clear of unnecessary obstructions as to avoid danger to these persons,
d) provide fencing, lighting, guarding and watching of the Works until completion and taking over under Clause10 [Procuring Entity's Taking Over], and
e) 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.

4.9 Quality Assurance

4.9.1 The Contractor shall institute a quality assurance system to demonstrate compliance with the requirements of the Contract. The system shall be in accordance with the details stated in the Contract. The Engineer shall be entitled to audit any aspect of the system.

4.9.2 Details of all procedures and compliance documents shall be submitted to the Engineer for information before each design and execution stage is commenced. When any document of a technical nature is issued to the Engineer, evidence of the prior approval by the Contractor itself shall be apparent on the document itself. Compliance with the quality assurance system shall not relieve the Contractor of any of his duties, obligations or responsibilities under the Contract.

4.10 Site Data

4.10.1 The Procuring Entity shall have made available to the Contractor for his information, prior to the Base Date, all relevant data in the Procuring Entity's possession on sub-surface and hydrological conditions at the Site, including environmental aspects. The Procuring Entity shall similarly make available to the Contract or all such data which come into the Procuring Entity's possession after the Base Date. The Contractor shall be responsible for interpreting all such data.

4.10.2 To the extent which was practicable (taking account of cost and time), the Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Tender or Works. To the same extent, the Contractor shall be deemed to have inspected and examined the Site, its surroundings, the above data and other available information, and to have been satisfied before submitting the Tender as to all relevant matters, including (without limitation):

a) The form and nature of the Site, including sub-surface conditions,
b) The hydrological and climatic conditions,
c) The extent and nature of the work and Goods necessary for the execution and completion of the Works and the remedying of any defects,
d) The Laws, procedures and labor practices of the Country, and
e) The Contractor's requirements for access, accommodation, facilities, personnel, power, transport, water and other services.

4.11 Sufficiency of the Accepted Contract Amount

4.11.1 The Contractor shall be deemed to:

a) Have satisfied itself as to the correctness and sufficiency of the Accepted Contract Amount, and
b) Have based the Accepted Contract Amount on the data, interpretations, necessary information, inspections, examinations and satisfaction as to all relevant matters referred to in Sub-Clause 4.10 [Site Data].

4.11.2 Unless otherwise stated in the Contract, the Accepted Contract Amount covers all the Contractor's obligations under the Contract (including those under Provisional Sums, if any) and all things necessary for the proper execution and completion of the Works and the remedying of any defects.

4.12 Unforeseeable Physical Conditions

4.12.1 In this Sub-Clause, “physical conditions” means natural physical conditions and man-made and other physical obstructions and pollutants, which the Contractor encounters at the Site when executing the Works, including sub-surface and hydrological conditions but excluding climatic conditions.

4.12.2 If the Contractor encounters adverse physical conditions which he considers to have been Unforeseeable, the Contractor shall give notice to the Engineer as soon as practicable.

This notice shall describe the physical conditions, so that they can be inspected by the Engineer, and shall set out the reasons why the Contractor considers them to be Unforeseeable. The Contractor shall continue executing the Works, using such proper and reasonable measures as are appropriate for the physical conditions, and shall comply with any instructions which the Engineer may give. If an instruction constitutes a Variation, Clause 13 [Variations and Adjustments] shall apply.

4.12.3 If and to the extent that the Contractor encounters physical conditions which are Unforeseeable, gives such a notice, and suffers delay and/or incurs Cost due to these conditions, the Contractor shall be entitled subject to notice under Sub-Clause 20.1 [Contractor's Claims] to:

a) An extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
b) Payment of any such Cost, which shall be included in the Contract Price.

4.12.4 Upon receiving such notice and inspecting and/or investigating these physical conditions, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) whether and (if so) to what extent these physical conditions were Unforeseeable, and (ii) the matters described in sub-paragraphs (a) and (b) above related to this extent.

4.12.5 However, before additional Cost is finally agreed or determined under sub-paragraph (ii), the Engineer may also review whether other physical conditions in similar parts of the Works (if any) were more favorable than could reasonably have been foreseen when the Contractor submitted the Tender. If and to the extent that these more favorable conditions were encountered, the Engineer may proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the reductions in Cost which were due to these conditions, which may be included (as deductions) in the Contract Price and Payment Certificates. However, the net effect of all adjustments under sub-paragraph (b) and all these reductions, for all the physical conditions encountered in similar parts of the Works, shall not result in any reduction in the Contract Price.

4.12.6 The Engineer shall take account of any evidence of the physical conditions foreseen by the Contractor when submitting the Tender, which shall be made available by the Contractor, but shall not be bound by the Contractor's interpretation of any such evidence.

4.13 Rights of Way and Facilities

Unless otherwise specified in the Contract the Procuring Entity shall provide effective access to and possession of the Site including special and/or temporary rights-of-way which are necessary for the Works. The Contractor shall obtain, at his risk and cost, any additional rights of way or facilities outside the Site which he may require for the purposes of the Works.

4.14 Avoidance of Interference

4.14.1 The Contractor shall not interfere unnecessarily or improperly with:

a) The convenience of the public, or
b) The access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Procuring Entity or of others.

4.14.2 The Contractor shall indemnify and hold the Procuring Entity harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.

4.15 Access Route

4.15.1 The Contractor shall be deemed to have been satisfied as to the suitability and availability of access routes to the Site at Base Date. The Contractor shall use reasonable efforts to prevent any road or bridge from being damaged by the Contractor's traffic or by the Contractor's Personnel. These efforts shall include the proper use of appropriate vehicles and routes

4.15.2 Except as otherwise stated in these Conditions:

a) The Contractor shall (as between the Parties) be responsible for any maintenance which may be required for his use of access routes;
b) the Contractor shall provide all necessary signs or directions along access routes, and shall obtain any permission which may be required from the relevant authorities for his use of routes, signs and directions;
c) the Procuring Entity shall not be responsible for any claims which may arise from the use or otherwise of any access route;

d) the Procuring Entity does not guarantee the suitability or availability of particular access routes; and

e) Costs due to non-suitability or non-availability, for the use required by the Contractor, of access routes shall be borne by the Contractor.

4.16 Transport of Goods

Unless otherwise stated in the Particular Conditions:

a) The Contractor shall give the Engineer not less than 21 days' notice of the date on which any Plant or a major item of other Goods will be delivered to the Site;

b) The Contractor shall be responsible for packing, loading, transporting, receiving, unloading, storing and protecting all Goods and other things required for the Works; and

c) The Contractor shall indemnify and hold the Procuring Entity harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from the transport of Goods, and shall negotiate and pay all claims arising from their transport.

4.17 Contractor's Equipment

The Contractor shall be responsible for all Contractor's Equipment. When brought onto the Site, Contractor's Equipment shall be deemed to be exclusively intended for the execution of the Works. The Contractor shall not remove from the Site any major items of Contractor's Equipment without the consent of the Engineer. However, consent shall not be required for vehicles transporting Goods or Contractor's Personnel off Site.

4.18 Protection of the Environment

4.18.1 The Contractor shall take all reasonable steps to protect the environment (both on and off the Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations.

4.18.2 The Contractor shall ensure that emissions, surfaced is charges and effluent from the Contractor's activities shall not exceed the values stated in the Specification or prescribed by applicable Laws.

4.19 Electricity, Water and Gas

4.19.1 The Contractor shall, except as stated below, be responsible for the provision of all power, water and other services he may require for his construction activities and to the extent defined in the Specifications, for the tests.

The Contractor shall be entitled to use for the purposes of the Works such supplies of electricity, water, gas and other services as may be available on the Site and of which details and prices are given in the Specification. The Contractor shall, at his risk and cost, provide any apparatus necessary for his use of these services and for measuring the quantities consumed.

4.19.2 The quantities consumed and the amounts due (at these prices) for such services shall be agreed or determined by the Engineer in accordance with Sub-Clause 2.5 [Procuring Entity's Claims] and Sub-Clause 3.5 [Determinations]. The Contractor shall pay these amounts to the Procuring Entity.

4.20 Procuring Entity's Equipment and Free-Issue Materials

4.20.1 The Procuring Entity shall make the Procuring Entity's Equipment (if any) available for the use of the Contractor in the execution of the Works in accordance with the details, arrangements and prices stated in the Specification. Unless otherwise stated in the Specification:

a) The Procuring Entity shall be responsible for the Procuring Entity's Equipment, except that

b) The Contractor shall be responsible for each item of Procuring Entity's Equipment whilst any of the Contractor's Personnel is operating it, driving it, directing it or in possession or control of it.

4.20.2 The appropriate quantities and the amounts due (at such stated prices) for the use of Procuring Entity's Equipment shall be agreed or determined by the Engineer in accordance with Sub-Clause 2.5 [Procuring Entity's Claims] and Sub-Clause 3.5 [Determinations]. The Contractor shall pay these amounts to the Procuring Entity.

The Procuring Entity shall supply, free of charge, the “free-issue materials” (if any) in accordance with the

details stated in the Specification. The Procuring Entity shall, at his risk and cost, provide these materials at the time and place specified in the Contract. The Contractor shall then visually inspect them and shall promptly give notice to the Engineer of any shortage, defect or default in these materials. Unless otherwise agreed by both Parties, the Procuring Entity shall immediately rectify the notified shortage, defect or default.

4.20.3 After this visual inspection, the free-issue materials shall come under the care, custody and control of the Contractor. The Contractor's obligations of inspection, care, custody and control shall not relieve the Procuring Entity of liability for any shortage, defect or default not apparent from visual inspection.

4.21 Progress Reports

4.21.1 Unless otherwise stated in the Particular Conditions, monthly progress reports shall be prepared by the Contractor and submitted to the Engineer in six copies. The first report shall cover the period up to the end of the first calendar month following the Commencement Date. Reports shall be submitted monthly thereafter, each within 7 days after the last day of the period to which it relates.

4.21.2 Reporting shall continue until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

4.21.3 Each report shall include:

a) charts and detailed descriptions of progress, including each stage of design (if any), Contractor's Documents, procurement, manufacture, delivery to Site, construction, erection and testing; and including these stages for work by each nominated Subcontractor (as defined in Clause 5 [Nominated Subcontractors]),
b) photographs showing the status of manufacture and of progress on the Site;
c) for the manufacture of each main item of Plant and Materials, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:
    i) commencement of manufacture,
    ii) Contractor's inspections,
    iii) tests, and
    iv) shipment and arrival at the Site;
d) the details described in Sub-Clause 6.10 [Records of Contractor's Personnel and Equipment];
e) copies of quality assurance documents, test results and certificates of Materials;
f) list of notices given under Sub-Clause 2.5 [Procuring Entity's Claims] and notices given under Sub-Clause 20.1 [Contractor's Claims];
g) safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations; and
h) comparisons of actual and planned progress, with details of any events or circumstances which may jeopardize the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.

4.21.4 The Contractor shall provide immediate notification to the Engineer of incidents in the following categories. Full details of such incidents shall be provided to the Engineer within the time frame agreed with the Engineer.

a) confirmed or likely violation of any law or international agreement;
b) any fatality or serious injury;
c) significant adverse effects or damage to private property (e.g. vehicle accident, damage from fly rock, working beyond the boundary);
d) major pollution of drinking water aquifer or damage or destruction of rare or endangered habitat (including protected areas) or species; or
e) any allegation of sexual harassment or sexual misbehavior, child abuse, defilement, or other violations involving children.

4.22 Security of the Site

Unless otherwise stated in the Particular Conditions:

a) The Contractor shall be responsible for keeping unauthorized persons off the Site, and

b) Authorized persons shall be limited to the Contractor's Personnel and the Procuring Entity's Personnel; and to any other personnel notified to the Contractor, by the Procuring Entity or the Engineer, as authorized personnel of the Procuring Entity's other contractors on the Site.

4.23 Contractor's Operations on Site

4.23.1 The Contractor shall confine his operations to the Site, and to any additional areas which may be obtained by the Contractor and agreed by the Engineer as additional working areas. The Contractor shall take all necessary precautions to keep Contractor's Equipment and Contractor's Personnel within the Site and these additional areas, and to keep them off adjacent land.

During the execution of the Works, the Contractor shall keep the Site free from all unnecessary obstruction and shall store or dispose of any Contractor's Equipment or surplus materials. The Contractor shall clear away and remove from the Site any wreckage, rubbish and Temporary Works which are no longer required.

4.23.2 Upon the issue of a Taking-Over Certificate, the Contractor shall clear away and remove, from that part of the Site and Works to which the Taking-Over Certificate refers, all Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works. The Contractor shall leave that part of the Site and the Works in a clean and safe condition. However, the Contractor may retain on Site, during the Defects Notification Period, such Goods as are required for the Contractor to fulfil obligations under the Contract.

4.24 Fossils

4.24.1 All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the Procuring Entity. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.

4.24.2 The Contractor shall, upon discovery of any such finding, promptly give notice to the Engineer, who shall issue instructions for dealing with it. If the Contractor suffers delay and/or incurs Cost from complying with the instructions, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and

b) payment of any such Cost, which shall be included in the Contract Price.

After receiving this further notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

5. NOMINATED SUB CONTRACTORS

5.1 Definition of "nominated Subcontractor

In the Contract, "nominated Subcontractor" means a Subcontractor:

a) Who is stated in the Contract as being a nominated Subcontractor, or

b) whom the Engineer, under Clause 13 [Variations and Adjustments], instructs the Contractor to employ as a Subcontractor subject to Sub-Clause 5.2 [Objection to Notification].

5.2 Objection to Nomination

The Contractor shall not be under any obligation to employ a nominated Subcontractor against whom the Contractor raises reasonable objection by notice to the Engineer as soon as practicable, with supporting particulars. An objection shall be deemed reasonable if it arises from (among other things) any of the following matters, unless the Procuring Entity agrees in writing to indemnify the Contractor against and from the consequences of the matter:

a) there are reasons to believe that the Subcontractor does not have sufficient competence, resources or financial strength;

b) the nominated Subcontract or does not accept to indemnify the Contractor against and from any

negligence or misuse of Goods by the nominated Subcontractor, his agents and employees; or

c) the nominated Subcontractor does not accept to enter into a subcontract which specifies that, for the subcontracted work (including design, if any), the nominated Subcontract or shall:

i) undertake to the Contractor such obligations and liabilities as will enable the Contractor to discharge his obligations and liabilities under the Contract;

ii) indemnify the Contractor against and from all obligations and liabilities arising under or in connection with the Contract and from the consequences of any failure by the Subcontractor to perform these obligations or to fulfil these liabilities, and

iii) be paid only if and when the Contractor has received from the Procuring Entity payments for sums due under the Subcontract referred to under Sub-Clause 5.3 [Payment to nominated Subcontractors].

5.3 Payments to nominated Subcontractors

The Contractor shall pay to the nominated Subcontractor the amounts shown on the nominated Subcontractor's invoices approved by the Contractor which the Engineer certifies to be due in accordance with the subcontract. These amounts plus other charges shall be included in the Contract Price in accordance with sub-paragraph (b) of Sub-Clause 13.5 [Provisional Sums], except as stated in Sub-Clause 5.4 [Evidence of Payments].

5.4 Evidence of Payments

Before issuing a Payment Certificate which includes an amount payable to a nominated Subcontractor, the Engineer may request the Contractor to supply reasonable evidence that the nominated Subcontractor has received all amounts due in accordance with previous Payment Certificates, less applicable deductions for retention or otherwise. Unless the Contractor:

a) Submits this reasonable evidence to the Engineer, or

b) i) satisfies the Engineer in writing that the Contractor is reasonably entitled to withhold or refuse to pay these amounts, and

ii) submits to the Engineer reasonable evidence that the nominated Subcontractor has been notified of the Contractor's entitlement, then the Procuring Entity may (at his sole discretion) pay, direct to the nominated Subcontractor, part or all of such amounts previously certified (less applicable deductions) as are due to the nominated Subcontractor and for which the Contractor has failed to submit the evidence described in sub-paragraphs (a) or (b) above. The Contractor shall then repay, to the Procuring Entity, the amount which the nominated Subcontractor was directly paid by the Procuring Entity.

6. STAFF AND LABOR

6.1 Engagement of Staff and Labor

Except as otherwise stated in the Specification, the Contractor shall make arrangements for the engagement of all staff and labor, local or otherwise, and for their payment, feeding, transport, and, when appropriate, housing. The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labor with appropriate qualifications and experience from sources within the Country.

6.2 Rates of Wages and Conditions of Labor

6.2.1 The Contractor shall pay rates of wages, and observe conditions of labor, which are not lower than those established for the trade or industry where the work is carried out. If no established rates or conditions are applicable, the Contractor shall pay rates of wages and observe conditions which are not lower than the general level of wages and conditions observed locally by Procuring Entity's whose trade or industry is similar to that of the Contractor.

6.2.2 The Contractor shall inform the Contractor's Personnel about their liability to pay personal income taxes in Kenya in respect of such of their salaries, wages, allowances and any benefits as are subject to tax under the Laws of Kenya for the time being in force, and the Contractor shall perform such duties in regard to such deductions there of as may be imposed on him by such Laws.

6.3 Persons in the Service of Procuring Entity

The Contractor shall not recruit, or attempt to recruit, staff and labor from amongst the Procuring Entity's Personnel.

6.4 Labor Laws

6.4.1 The Contractor shall comply with all the relevant labor Laws applicable to the Contractor's Personnel, including Laws relating to their employment, health, safety, welfare, immigration and emigration, and shall allow them all their legal rights.

6.4.2 The Contractor shall require his employees to obey all applicable Laws, including those concerning safety at work.

6.5 Working Hours

No work shall be carried out on the Site on locally recognized days of rest, or outside the normal working hours stated in the **SCC**, unless:

a) Otherwise stated in the Contract,
b) The Engineer gives consent, or
c) The work is unavoidable, or necessary for the protection of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer.

6.6 Facilities for Staff and Labor

6.6.1 Except as otherwise stated in the Specification, 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 Procuring Entity's Personnel as stated in the Specification.

6.6.2 The Contractor shall not permit any of the Contractor's Personnel to maintain any temporary or permanent living quarters within the structures forming part of the Permanent Works.

6.7 Health and Safety

6.7.1 The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel. In collaboration with local health authorities, the Contractor shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site and at any accommodation for Contractor's and Procuring Entity's Personnel, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.

6.7.2 The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the execution of the Works, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.

6.7.3 The Contractor shall send, to the Engineer, details of any accident as soon as practicable after its occurrence. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Engineer may reasonably require.

6.7.4 HIV-AIDS Prevention. The Contractor shall conduct an HIV-AIDS awareness Programme via an approved service provider and shall undertake such other measures as are specified in this Contract to reduce the risk of the transfer of the HIV virus between and among the Contractor's Personnel and the local community, to promote early diagnosis and to assist affected individuals.

6.8 Contractor's Superintendence

6.8.1 Throughout the execution of the Works, and as long thereafter as is necessary to fulfil the Contractor's obligations, the Contractor shall provide all necessary superintendence to plan, arrange, direct, manage, inspect and test the work.

6.8.2 Superintendence shall be given by a sufficient number of persons having adequate knowledge of the language for communications (defined in Sub-Clause 1.4 [Law and Language]) and of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents), for the satisfactory and safe execution of the Works.

6.9 Contractor's Personnel

6.9.1 The Contractor's Personnel specified in the **SCC** shall be appropriately qualified, skilled and experienced in their respective trades or occupations. The Engineer may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative if applicable, who:

a) Persists in any misconduct or lack of care,

b) Carries out duties incompetently or negligently,

c) Fails to conform with any provisions of the Contract,

d) Persists in any conduct which is prejudicial to safety, health, or the protection of the environment, or

e) Based on reasonable evidence, is determined to have engaged in Fraud and Corruption during the execution of the Works.

6.9.2 If appropriate, the Contractor shall then appoint (or cause to be appointed) a suitable replacement person.

6.10 Records of Contractor's Personnel and Equipment

The Contractor shall submit, to the Engineer, details showing the number of each class of Contractor's Personnel and of each type of Contractor's Equipment on the Site. Details shall be submitted each calendar month, in a form approved by the Engineer, until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

6.11 Disorderly Conduct

The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst the Contractor's Personnel, and to preserve peace and protection of persons and property on and near the Site.

6.12 Foreign Personnel

6.12.1 The Contractor may bring in to the 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 Procuring Entity will, if requested by the Contractor, use his Lowest endeavors in a timely and expeditious manner to assist the Contract or in obtaining any local, state, national or government permission required for bringing in the Contractor's personnel.

6.12.2 The Contractor shall be responsible for the return of these personnel to the place where they were recruited or to their domicile. In the event of the death in the Country of any of these personnel or members of their families, the Contractor shall similarly be responsible for making the appropriate arrangements for their return or burial.

6.13 Supply of Foodstuffs

6.13.1 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.

6.14 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.

6.15 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.

6.16 Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Laws of the Country, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter or disposal thereof by Contractor's Personnel.

6.17 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.

6.18 Festivals and Religious Customs

The Contractor shall respect the Country's recognized festivals, days of rest and religious or other customs.

6.19 Funeral Arrangements

The Contractor shall be responsible, to the extent required by local regulations, for making any funeral arrangements for any of his local employees who may die while engaged upon the Works.

6.20 Prohibition of Forced or Compulsory Labor

The Contractor shall not employ forced labor, which 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.

6.21 Prohibition of Harmful Child Labor

The Contractor shall not employ children in a manner that is economically exploitative, or 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. Where the relevant labor laws of the Country have provisions for employment of minors, the Contract or shall follow those laws applicable to the Contractor. Children below the age of 18 years shall not be employed in dangerous work.

6.22 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 Engineer. These records shall be included in the details to be submitted by the Contractor under Sub-Clause 6.10 [Records of Contractor's Personnel and Equipment].

6.23 Workers' Organizations

The Contractor shall comply with laws on workers' rights to form and to join workers' organizations without interference and to bargain collectively.

6.24 Non-Discrimination and Equal Opportunity

The Contractor shall not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment relationship on the principle of equal opportunity and fair treatment and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline.

7. PLANT, MATERIALS AND WORKMANSHIP

7.1 Manner of Execution

The Contractor shall carry out the manufacture of Plant, the production and manufacture of Materials, and all

other execution of the Works:

a) In the manner (if any) specified in the Contract,
b) In a proper workman like and careful manner, in accordance with recognized good practice, and
c) With properly equipped facilities and non-hazardous Materials, except as otherwise specified in the Contract.

7.2 Samples

The Contractor shall submit the following samples of Materials, and relevant information, to the Engineer for consent prior to using the Materials in or for the Works:

a) manufacturer's standard samples of Materials and samples specified in the Contract, all at the Contractor's cost, and
b) additional samples instructed by the Engineer as a Variation.

Each sample shall be labeled as to origin and intended use in the Works.

7.3 Inspection

7.3.1 The Procuring Entity's Personnel shall at all reasonable times:

a) Have full access to all parts of the Site and to all places from which natural Materials are being obtained, and
b) During production, manufacture and construction (at the Site and elsewhere), be entitled to examine, inspect, measure and test the materials and workmanship, and to check the progress of manufacture of Plant and production and manufacture of Materials.

7.3.2 The Contractor shall give the Procuring Entity's Personnel full opportunity to carry out these activities, including providing access, facilities, permissions and safety equipment. No such activity shall relieve the Contractor from any obligation or responsibility.

The Contractor shall give notice to the Engineer whenever any work is ready and before it is covered up, put out of sight, or packaged for storage or transport. The Engineer shall then either carry out the examination, inspection, measurement or testing without unreasonable delay, or promptly give notice to the Contractor that the Engineer does not require to do so. If the Contractor fails to give the notice, he shall, if and when required by the Engineer, uncover the work and thereafter reinstate and make good, all at the Contractor's cost.

7.4 Testing

7.4.1 This Sub-Clause shall apply to all tests specified in the Contract, other than the Tests after Completion (if any).

7.4.2 Except as otherwise specified in the Contract, the Contractor shall provide all apparatus, assistance, documents and other information, electricity, equipment, fuel, consumables, instruments, labor, materials, and suitably qualified and experienced staff, as are necessary to carry out the specified tests efficiently. The Contractor shall agree, with the Engineer, the time and place for the specified testing of any Plant, Materials and other parts of the Works.

The Engineer may, under Clause 13 [Variations and Adjustments], vary the location or details of specified tests, or instruct the Contractor to carry out additional tests. If these varied or additional tests show that the tested Plant, Materials or workmanship is not in accordance with the Contract, the cost of carrying out this Variation shall be borne by the Contractor, notwithstanding other provisions of the Contract.

7.4.3 The Engineer shall give the Contractor not less than 24 hours' notice of the Engineer's intention to attend the tests. If the Engineer does not attend at the time and place agreed, the Contractor may proceed with the tests, unless otherwise instructed by the Engineer, and the tests shall then be deemed to have been made in the Engineer’s presence.

If the Contractor suffers delay and/or incurs Cost from complying with these instructions or as a result of a delay for which the Procuring Entity is responsible, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

a) An extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
b) Payment of any such Cost-plus profit, which shall be included in the Contract Price.

7.4.4 After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

The Contractor shall promptly forward to the Engineer duly certified reports of the tests. When the specified tests have been passed, the Engineer shall endorse the Contractor's test certificate, or issue a certificate to him, to that effect. If the Engineer has not attended the tests, he shall be deemed to have accepted the readings as accurate.

7.5 Rejection

7.5.1 If, as a result of an examination, inspection, measurement or testing, any Plant, Materials or workmanship is found to be defective or otherwise not in accordance with the Contract, the Engineer may reject the Plant, Materials or workmanship by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the defect and ensure that the rejected item complies with the Contract.

7.5.2 If the Engineer requires this Plant, Materials or workmanship to be retested, the tests shall be repeated under the same terms and conditions. If the rejection and retesting cause the Procuring Entity to incur additional costs, the Contractor shall subject to Sub-Clause 2.5 [Procuring Entity's Claims] pay these costs to the Procuring Entity.

7.6 Remedial Work

7.6.1 Notwithstanding any previous test or certification, the Engineer may instruct the Contractor to:

a) remove from the Site and replace any Plant or Materials which is not in accordance with the Contract,

b) remove and re-execute any other work which is not in accordance with the Contract, and

c) execute any work which is urgently required for the safety of the Works, whether because of an accident, unforeseeable event or otherwise.

7.6.2 The Contractor shall comply with the instruction within a reasonable time, which shall be the time (if any) specified in the instruction, or immediately if urgency is specified under sub-paragraph (c).

7.6.3 If the Contractor fails to comply with the instruction, the Procuring Entity shall be entitled to employ and pay other persons to carry out the work. Except to the extent that the Contractor would have been entitled to payment for the work, the Contractor shall subject to Sub-Clause 2.5 [Procuring Entity's Claims] pay to the Procuring Entity all costs arising from this failure.

7.7 Ownership of Plant and Materials

Except as otherwise provided in the Contract, each item of Plant and Materials shall, to the extent consistent with the Laws of the Country, become the property of the Procuring Entity at whichever is the earlier of the following times, free from liens and other encumbrances:

a) When it is incorporated in the Works;

b) When the Contractor is paid the corresponding value of the Plant and Materials under Sub-Clause 8.10 [Payment for Plant and Materials in Event of Suspension].

7.8 Royalties

Unless otherwise stated in the Specification, the Contractor shall pay all royalties, rents and other payments for:

a) Natural Materials obtained from outside the Site, and

b) The disposal of material from demolitions and excavations and of other surplus material (whether natural or man-made), except to the extent that disposal areas within the Site are specified in the Contract.

8. COMMENCEMENT, DELAYS AND SUSPENSION

8.1 Commencement of Works

8.1.1 Except as otherwise specified in the Special Conditions of Contract, the Commencement Date shall be the date at which the following precedent conditions have all been fulfilled and the Engineer's notification recording the agreement of both Parties on such fulfilment and instructing to commence the Work is received by the Contractor:

a) Contract by relevant authorities of the Country;
b) delivery to the Contractor of reasonable evidence of the Procuring Entity's financial arrangements (under Sub-Clause 2.4 [Procuring Entity's Financial Arrangements]);
c) signature of the Contract Agreement by both Parties, and if required, approval of the except if otherwise specified in the **SCC**, effective access to and possession of the Site given to the Contractor together with such permission(s) under (a) of Sub-Clause 1.13 [Compliance with Laws] as required for the commencement of the Works
d) receipt by the Contract or of the Advance Payment under Sub-Clause14.2 [Advance Payment] provided that the corresponding Procuring Entity guarantee has been delivered by the Contractor.

8.1.2 If the said Engineer's instruction is not received by the Contractor within 180 days from his receipt of the Letter of Acceptance, the Contractor shall be entitled to terminate the Contract under Sub-Clause 16.2 [Termination by Contractor].

8.1.3 The Contractor shall commence the execution of the Works as soon as is reasonably practicable after the Commencement Date and shall then proceed with the Works with due expedition and without delay.

8.2 Time for Completion

The Contractor shall complete the whole of the Works, and each Section (if any), within the Time for Completion for the Works or Section (as the case may be), including:
a) achieving the passing of the Tests on Completion, and
b) completing all work which is stated in the Contract as being required for the Works or Section to be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [Taking Over of the Works and Sections].

8.3 Programme

8.3.1 The Contractor shall submit a detailed time Programme to the Engineer within 14 days after receiving the notice under Sub-Clause 8.1 [Commencement of Works]. The Contractor shall also submit a revised Programme whenever the previous Programme is inconsistent with actual progress or with the Contractor's obligations. Each Programme shall include:
a) the order in which the Contractor intends to carry out the Works, including the anticipated timing of each stage of design (if any), Contractor's Documents, procurement, manufacture of Plant, delivery to Site, construction, erection and testing,
b) each of these stages for work by each nominated Subcontractor (as defined in Clause 5 [Nominated Subcontractors]),
c) the sequence and timing of inspections and tests specified in the Contract, and
d) a supporting report which includes:
   i) a general description of the methods which the Contract or intends to adopt, and of the major stages, in the execution of the Works, and
   ii) details showing the Contractor's reasonable estimate of the number of each class of Contractor's Personnel and of each type of Contractor's Equipment, required on the Site for each major stage.

8.3.2 Unless the Engineer, within 14 days after receiving a Programme, gives notice to the Contractor stating the extent to which it does not comply with the Contract, the Contractor shall proceed in accordance with the Programme, subject to his other obligations under the Contract. The Procuring Entity's Personnel shall be entitled to rely upon the Programme when planning their activities.

8.3.3 The Contractor shall promptly give notice to the Engineer of specific probable future events or circumstances which may adversely affect the work, increase the Contract Price or delay the execution of the Works. The Engineer may require the Contractor to submit an estimate of the anticipated effect of the future event or circumstances, and/or a proposal under Sub-Clause 13.3 [Variation Procedure].

8.3.4 If, at any time, the Engineer gives notice to the Contractor that a Programme fails (to the extent stated) to comply with the Contract or to be consistent with actual progress and the Contractor's stated intentions, the Contractor shall submit a revised Programme to the Engineer in accordance with this Sub-Clause.

8.4 Extension of Time for Completion

8.4.1 The Contractor shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to an extension of the Time for Completion if and to the extent that completion for the purposes of Sub-Clause10.1 [Taking Over of the Works and Sections] is or will be delayed by any of the following causes:

a) a Variation (unless an adjustment to the Time for Completion has been agreed under Sub-Clause 13.3 [Variation Procedure]) or other substantial change in the quantity of an item of work included in the Contract,
b) a cause of delay giving an entitlement to extension of time under a Sub-Clause of these Conditions,
c) exceptionally adverse climatic conditions,
d) Unforeseeable shortages in the availability of personnel or Goods caused by epidemic or governmental actions, or
e) Any delay, impediment or prevention caused by or attributable to the Procuring Entity, the Procuring Entity's Personnel, or the Procuring Entity's other contractors.

8.4.2 If the Contractor considers itself to be entitled to an extension of the Time for Completion, the Contractor shall give notice to the Engineer in accordance with Sub-Clause 20.1 [Contractor's Claims]. When determining each extension of time under Sub-Clause 20.1, the Engineer shall review previous determinations and may increase, but shall not decrease, the total extension of time.

8.5 Delays Caused by Authorities

If the following conditions apply, namely:

a) The Contractor has diligently followed the procedures laid down by the relevant legally constituted public authorities in the Country,
b) These authorities delay or disrupt the Contractor's work, and
c) The delay or disruption was Unforeseeable, then this delay or disruption will be considered as a cause of delay under sub-paragraph (b) of Sub-Clause 8.4 [Extension of Time for Completion].

8.6 Rate of Progress

8.6.1 If, at any time:

a) Actual progress is too slow to complete within the Time for Completion, and/or
b) Progress has fallen (or will fall) behind the current Programme under Sub-Clause 8.3 [Programme], other than as a result of a cause listed in Sub-Clause 8.4 [Extension of Time for Completion], then the Engineer may instruct the Contractor to submit, under Sub-Clause 8.3 [Programme], a revised Programme and supporting report describing the revised methods which the Contractor proposes to adopt in order to expedite progress and complete within the Time for Completion.

Unless the Engineer notifies otherwise, the Contractor shall adopt these revised methods, which may require increases in the working hours and/or in the numbers of Contractor's Personnel and/or Goods, at the risk and cost of the Contractor. If these revised methods cause the Procuring Entity to incur additional costs, the Contractor shall subject to notice under Sub-Clause 2.5 [Procuring Entity's Claims] pay these costs to the Procuring Entity, in addition to delay damages (if any) under Sub-Clause 8.7 below.

8.6.2 Additional costs of revised methods including acceleration measures, instructed by the Engineer to reduce delays resulting from causes listed under Sub-Clause 8.4 [Extension of Time for Completion] shall be paid by the Procuring Entity, without generating, however, any other additional payment benefit to the Contractor.

8.7 Delay Damages

8.7.1 If the Contractor fails to comply with Sub-Clause 8.2 [Time for Completion], the Contractor shall subject to notice under Sub-Clause 2.5 [Procuring Entity's Claims] pay delay damages to the Procuring Entity for this default. These delay damages shall be the sum stated in the **SCC**, which shall be paid for everyday which shall elapse between the relevant Time for Completion and the date stated in the Taking-Over Certificate. However, the total amount due under this Sub-Clause shall not exceed the maximum amount of delay damages (if any) stated in the **SCC**.

8.7.2 These delay damages shall be the only damages due from the Contractor for such default, other than in the

event of termination under Sub-Clause 15.2 [Termination by Procuring Entity] prior to completion of the Works. These damages shall not relieve the Contractor from his obligation to complete the Works, or from any other duties, obligations or responsibilities which he may have under the Contract.

8.8 Suspension of Work

8.8.1 The Engineer may at any time instruct the Contractor to suspend progress of part or all of the Works. During such suspension, the Contractor shall protect, store and secure such part or the Works against any deterioration, loss or damage.

8.8.2 The Engineer may also notify the cause for the suspension. If and to the extent that the cause is notified and is the responsibility of the Contractor, the following Sub-Clauses 8.9, 8.10 and 8.11 shall not apply.

8.9 Consequences of Suspension

8.9.1 If the Contractor suffers delay and/or incurs Cost from complying with the Engineer's instructions under Sub-Clause 8.8 [Suspension of Work] and/or from resuming the work, the Contractor shall give notice to the Engineer and shall been titled subject to Sub-Clause 20.1 [Contractor's Claims] to:

a) An extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and

b) Payment of any such Cost, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

8.9.2 The Contractor shall not be entitled to an extension of time for, or to payment of the Cost incurred in, making good the consequences of the Contractor's faulty design, workmanship or materials, or of the Contractor's failure to protect, store or secure in accordance with Sub-Clause 8.8 [Suspension of Work].

8.10 Payment for Plant and Materials in Event of Suspension

The Contractor shall be entitled to payment of the value (as at the date of suspension) of Plant and/or Materials which have not been delivered to Site, if:

a) the work on Plant or delivery of Plant and/or Materials has been suspended for more than 30 days, and

b) the Contractor has marked the Plant and/or Materials as the Procuring Entity's property in accordance with the Engineer's instructions.

8.11 Prolonged Suspension

If the suspension under Sub-Clause 8.8 [Suspension of Work] has continued for more than 84 days, the Contractor may request the Engineer's permission to proceed. If the Engineer does not give permission within 30 days after being requested to do so, the Contractor may, by giving notice to the Engineer, treat the suspension as an omission under Clause 13 [Variations and Adjustments] of the affected part of the Works. If the suspension affects the whole of the Works, the Contractor may give notice of termination under Sub-Clause 16.2 [Termination by Contractor].

8.12 Resumption of Work

After the permission or instruction to proceed is given, the Contractor and the Engineer shall jointly examine the Works and the Plant and Materials affected by the suspension. The Contractor shall make good any deterioration or defect in or loss of the Works or Plant or Materials, which has occurred during the suspension after receiving from the Engineer an instruction to this effect under Clause13 [Variations and Adjustments].

9. TESTS ON COMPLETION

9.1 Contractor's Obligations

9.1.1 The Contractor shall carry out the Tests on Completion in accordance with this Clause and Sub-Clause 7.4 [Testing], after providing the documents in accordance with sub-paragraph (d) of Sub-Clause 4.1 [Contractor's

General Obligations].

9.1.2 The Contractor shall give to the Engineer not less than 21 days' notice of the date after which the Contract or will be ready to carry out each of the Tests on Completion. Unless otherwise agreed, Tests on Completion shall be carried out within 14 days after this date, on such day or days as the Engineer shall instruct.

9.1.3 In considering the results of the Tests on Completion, the Engineer shall make allowances for the effect of any use of the Works by the Procuring Entity on the performance or other characteristics of the Works. As soon as the Works, or a Section, have passed any Tests on Completion, the Contractor shall submit a certified report of the results of these Tests to the Engineer.

9.2 Delayed Tests

9.2.1 If the Tests on Completion are being unduly delayed by the Procuring Entity, Sub-Clause 7.4 [Testing] (fifth paragraph) and/or Sub-Clause 10.3 [Interference with Tests on Completion] shall be applicable.

If the Tests on Completion are being unduly delayed by the Contractor, the Engineer may by notice require the Contractor to carry out the Tests within 21 days after receiving the notice. The Contractor shall carry out the Tests on such day or days within that period as the Contract or may fix and of which he shall give notice to the Engineer.

If the Contractor fails to carry out the Tests on Completion within the period of 21 days, the Procuring Entity's Personnel may proceed with the Tests at the risk and cost of the Contractor. The Tests on Completion shall then be deemed to have been carried out in the presence of the Contract or and the results of the Tests shall be accepted as accurate.

9.3 Retesting

If the Works, or a Section, fail to pass the Tests on Completion, Sub-Clause 7.5 [Rejection] shall apply, and the Engineer or the Contractor may require the failed Tests, and Tests on Completion on any related work, to be repeated under the same terms and conditions.

9.4 Failure to Pass Tests on Completion

9.4.1 If the Works, or a Section, fail to pass the Tests on Completion repeated under Sub-Clause 9.3 [Retesting], the Engineer shall be entitled to:

a) Order further repetition of Tests on Completion under Sub-Clause 9.3;
b) If the failure deprives the Procuring Entity of substantially the whole benefit of the Works or Section, reject the Works or Section (as the case may be), in which event the Procuring Entity shall have the same remedies as are provided in sub-paragraph (c) of Sub-Clause 11.4 [Failure to Remedy Defects]; or
c) Issue a Taking-Over Certificate, if the Procuring Entity so requests.

9.4.2 In the event of sub-paragraph (c), the Contractor shall proceed in accordance with all other obligations under the Contract, and the Contract Price shall be reduced by such amount as shall be appropriate to cover the reduced value to the Procuring Entity as a result of this failure. Unless the relevant reduction for this failure is stated (or its method of calculation is defined) in the Contract, the Procuring Entity may require the reduction to be (i) agreed by both Parties (in full satisfaction of this failure only) and paid before this Taking-Over Certificate is issued, or
(ii) determined and paid under Sub-Clause 2.5 [Procuring Entity's Claims] and Sub-Clause 3.5 [Determinations].

10. PROCURING ENTITY'S TAKING OVER

10.1 Taking Over of the Works and Sections

10.1.1 Except as stated in Sub-Clause 9.4 [Failure to Pass Tests on Completion], the Works shall be taken over by the Procuring Entity when (i) the Works have been completed in accordance with the Contract, including the matters described in Sub-Clause 8.2 [Time for Completion] and except as allowed in sub-paragraph (a) below, and (ii) a Taking-Over Certificate for the Works has been issued, or is deemed to have been issued in

accordance with this Sub-Clause.

10.1.2 The Contract or may apply by notice to the Engineer for a Taking-Over Certificate not earlier than 14 days before the Works will, in the Contractor's opinion, be complete and ready for taking over. If the Works are divided into Sections, the Contract or may similarly apply for a Taking-Over Certificate for each Section.

10.1.3 The Engineer shall, within 30 days after receiving the Contractor's application:

a) issue the Taking-Over Certificate to the Contractor, stating the date on which the Works or Section were completed in accordance with the Contract, except for any minor outstanding work and defects which will not substantially affect the use of the Works or Section for their intended purpose (either until or whilst this work is completed and these defects are remedied); or

b) reject the application, giving reasons and specifying the work required to be done by the Contractor to enable the Taking-Over Certificate to be issued. The Contractor shall then complete this work before issuing a further notice under this Sub-Clause.

10.1.4 If the Engineer fails either to issue the Taking-Over Certificate or to reject the Contractor's application within the period of 30 days, and if the Works or Section (as the case may be) are substantially in accordance with the Contract, the Taking-Over Certificate shall be deemed to have been issued on the last day of that period.

10.2 Taking Over of Parts of the Works

10.2.1 The Engineer may, at the sole discretion of the Procuring Entity, issue a Taking-Over Certificate for any part of the Permanent Works.

The Procuring Entity shall not use any part of the Works (other than as a temporary measure which is either specified in the Contract or agreed by both Parties) unless and until the Engineer has issued a Taking-Over Certificate for this part. However, if the Procuring Entity does use any part of the Works before the Taking-Over Certificate is issued:

a) The part which is used shall be deemed to have been taken over as from the date on which it is used,

b) The Contractor shall cease to be liable for the care of such part as from this date, when responsibility shall pass to the Procuring Entity, and

c) If requested by the Contractor, the Engineer shall issue a Taking-Over Certificate for this part.

10.2.2 After the Engineer has issued a Taking-Over Certificate for a part of the Works, the Contractor shall be given the earliest opportunity to take such steps as may be necessary to carry out any outstanding Tests on Completion. The Contractor shall carry out these Tests on Completion as soon as practicable before the expiry date of the relevant Defects Notification Period.

10.2.3 If the Contractor incurs Cost as a result of the Procuring Entity taking over and/or using a part of the Works, other than such use as is specified in the Contractor agreed by the Contractor, the Contractor shall (i) give notice to the Engineer and (ii) be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to payment of any such Cost-plus profit, which shall be included in the Contract Price. After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine this Cost and profit.

10.2.4 If a Taking-Over Certificate has been issued for a part of the Works (other than a Section), the delay damages thereafter for completion of the remainder of the Works shall be reduced. Similarly, the delay damages for the remainder of the Section (if any) in which this part is included shall also be reduced. For any period of delay after the date stated in this Taking-Over Certificate, the proportional reduction in these delay damages shall be calculated as the proportion which the value of the part so certified bears to the value of the Works or Section (as the case may be) as a whole. The Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these proportions. The provisions of this paragraph shall only apply to the daily rate of delay damages under Sub-Clause 8.7 [Delay Damages] and shall not affect the maximum amount of these damages.

10.3 Interference with Tests on Completion

10.3.1 If the Contractor is prevented, for more than 14 days, from carrying out the Tests on Completion by a cause for which the Procuring Entity is responsible, the Procuring Entity shall be deemed to have taken over the Works or Section (as the case may be) on the date when the Tests on Completion would otherwise have been completed.

The Engineer shall then issue a Taking-Over Certificate accordingly, and the Contractor shall carry out the Tests on Completion as soon as practicable, before the expiry date of the Defects Notification Period. The Engineer shall require the Tests on Completion to be carried out by giving 14 days' notice and in accordance with the relevant provisions of the Contract.

10.3.2 If the Contractor suffers delay and/or incurs Cost as a result of this delay in carrying out the Tests on Completion, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

a) An extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
b) Payment of any such Cost-plus profit, which shall be included in the Contract Price.

10.3.3 After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

10.4 Surfaces Requiring Reinstatement

Except as otherwise stated in a Taking-Over Certificate, a certificate for a Section or part of the Works shall not be deemed to certify completion of any ground or other surfaces requiring reinstatement.

11. DEFECTS LIABILITY

11.1 Completion of Outstanding Work and Remedying Defects

11.1.1 In order that the Works and Contractor's Documents, and each Section, shall be in the condition required by the Contract (fair wear and tear excepted) by the expiry date of the relevant Defects Notification Period or as soon as practicable thereafter, the Contractor shall:

a) complete any work which is outstanding on the date stated in a Taking-Over Certificate, within such reasonable time as is instructed by the Engineer, and

b) execute all work required to remedy defects or damage, as may be notified by (or on behalf of) the Procuring Entity on or before the expiry date of the Defects Notification Period for the Works or Section (as the case may be).

11.1.2 If a defect appears or damage occurs, the Contractor shall be notified accordingly, by (or on behalf of) the Procuring Entity.

11.2 Cost of Remedying Defects

11.2.1 All work referred to in sub-paragraph (b) of Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects] shall be executed at the risk and cost of the Contractor, if and to the extent that the work is attributable to:

a) Any design for which the Contractor is responsible,
b) Plant, Materials or workmanship not being in accordance with the Contract, or
c) Failure by the Contractor to comply with any other obligation.

11.2.2 If and to the extent that such work is attributable to any other cause, the Contractor shall be notified promptly by (or on behalf of) the Procuring Entity, and Sub-Clause 13.3 [Variation Procedure] shall apply.

11.3 Extension of Defects Notification Period

11.3.1 The Procuring Entity shall be entitled subject to Sub-Clause 2.5 [Procuring Entity's Claims] to an extension of the Defects Notification Period for the Works or a Section if and to the extent that the Works, Section or a major item of Plant (as the case may be, and after taking over) cannot be used for the purposes for which they are intended by reason of a defect or by reason of damage attributable to the Contractor. However, a Defects Notification Period shall not be extended by more than two years.

11.3.2 If delivery and/or erection of Plant and/or Materials was suspended under Sub-Clause 8.8 [Suspension of Work] or Sub-Clause 16.1 [Contractor's Entitlement to Suspend Work], the Contractor's obligations under this Clause shall not apply to any defects or damage occurring more than two years after the Defects Notification Period for the Plant and/or Materials would otherwise have expired.

11.4 Failure to Remedy Defects

11.4.1 If the Contractor fails to remedy any defector damage within a reasonable time, a date may be fixed by (or on behalf of) the Procuring Entity, on or by which the defect or damage is to be remedied. The Contractor shall be given reasonable notice of this date.

11.4.2 If the Contractor fails to remedy the defect or damage by this notified date and this remedial work was to be executed at the cost of the Contractor under Sub-Clause 11.2 [Cost of Remedying Defects], the Procuring Entity may (at his option):

a) Carry out the work itself or by others, in a reasonable manner and at the Contractor's cost, but the Contractor shall have no responsibility for this work; and the Contractor shall subject to Sub-Clause 2.5 [Procuring Entity's Claims] pay to the Procuring Entity the costs reasonably incurred by the Procuring Entity in remedying the defect or damage;
b) Require the Engineer to agree or determine a reasonable reduction in the Contract Price in accordance with Sub-Clause3.5 [Determinations]; or
c) If the defect or damage deprives the Procuring Entity of substantially the whole benefit of the Works or any major part of the Works, terminate the Contract as a whole, or in respect of such major part which cannot be put to the intended use.

11.4.3 Without prejudice to any other rights, under the Contractor otherwise, the Procuring Entity shall then be entitled to recover all sums paid for the Works or for such part (as the case may be), plus financing costs and the cost of dismantling the same, clearing the Site and returning Plant and Materials to the Contractor.

11.5 Removal of Defective Work

If the defect or damage cannot be remedied expeditiously on the Site and the Procuring Entity gives consent, the Contractor may remove from the Site for the purposes of repair such items of Plant as are defective or damaged. This consent may require the Contractor to increase the amount of the Performance Security by the full replacement cost of these items, or to provide other appropriate security.

11.6 Further Tests

11.6.1 If the work of remedying of any defect or damage may affect the performance of the Works, the Engineer may require the repetition of any of the tests described in the Contract. The requirement shall be made by notice within 30 days after the defect or damage is remedied.

11.6.2 These tests shall be carried out in accordance with the terms applicable to the previous tests, except that hey shall be carried out at the risk and cost of the Party liable, under Sub-Clause 11.2 [Cost of Remedying Defects], for the cost of the remedial work.

11.7 Right of Access

Until the Performance Certificate has been issued, the Contractor shall have such right of access to the Works as is reasonably required in order to comply with this Clause, except as may be inconsistent with the Procuring Entity's reasonable security restrictions.

11.8 Contractor to Search

The Contractor shall, if required by the Engineer, search for the cause of any defect, under the direction of the Engineer. Unless the defect is to be remedied at the cost of the Contractor under Sub-Clause 11.2 [Cost of Remedying Defects], the Cost of the search plus profit shall be agreed or determined by the Engineer in accordance with Sub-Clause 3.5 [Determinations] and shall be included in the Contract Price.

11.9 Completion Certificate

11.9.1 Performance of the Contractor's obligations shall not be considered to have been completed until the Engineer has issued the Performance Certificate to the Contractor, stating the date on which the Contractor completed his obligations under the Contract.

11.9.2 The Engineer shall issue the Performance Certificate within 30 days after the latest of the expiry dates of the Defects Notification Periods, or as soon thereafter as the Contractor has supplied all the Contractor's Documents and completed and tested all the Works, including remedying any defects. A copy of the Performance Certificate shall be issued to the Procuring Entity.

11.9.3 Only the Performance Certificate shall be deemed to constitute acceptance of the Works.

11.10 Unfulfilled Obligations

After the Performance Certificate has been issued, each Party shall remain liable for the fulfilment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of unperformed obligations, the Contract shall be deemed to remain in force.

11.11 Clearance of Site

11.11.1 Upon receiving the Performance Certificate, the Contractor shall remove any remaining Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works from the Site.

11.11.2 If all these items have not been removed within 30 days after receipt by the Contractor of the Performance Certificate, the Procuring Entity may sell or otherwise dispose of any remaining items. The Procuring Entity shall be entitled to be paid the costs incurred in connection with, or attributable to, such sale or disposal and restoring the Site.

Any balance of the moneys from the sale shall be paid to the Contractor. If these moneys are less than the Procuring Entity's costs, the Contractor shall pay the outstanding balance to the Procuring Entity.

12. MEASUREMENT AND EVALUATION

12.1 Works to be Measured

12.1.1 The Works shall be measured, and valued for payment, in accordance with this Clause. The Contractor shall show in each application under Sub-Clauses 14.3 [Application for Interim Payment Certificates], 14.10 [Statement on Completion] and 14.11 [Application for Final Payment Certificate] the quantities and other particulars detailing the amounts which he considers to be entitled under the Contract.

12.1.2 Whenever the Engineer requires any part of the Works to be measured, reasonable notice shall be given to the Contractor's Representative, who shall:

a) promptly either attend or send another qualified representative to assist the Engineer in making the measurement, and

(b) supply any particulars requested by the Engineer.

If the Contractor fails to attend or send a representative, the measurement made by (or on behalf of) the Engineer shall be accepted as accurate.

12.1.3 Except as otherwise stated in the Contract, wherever any Permanent Works are to be measured from records, these shall be prepared by the Engineer. The Contractor shall, as and when requested, attend to examine and agree the records with the Engineer, and shall sign the same when agreed. If the Contractor does not attend, the records shall be accepted as accurate.

12.1.4 If the Contractor examines and disagrees the records, and/or does not sign them as agreed, then the Contractor shall give notice to the Engineer of the respects in which the records are asserted to be inaccurate. After receiving this notice, the Engineer shall review the records and either confirm or vary them and certify the payment of the undisputed part. If the Contractor does not so give notice to the Engineer within 14 days after being requested to examine the records, they shall be accepted as accurate.

12.2 METHOD OF MEASUREMENT

Except as otherwise stated in the Contract and notwithstanding local practice:

a) Measurement shall be made of the net actual quantity of each item of the Permanent Works, and
b) The method of measurement shall be in accordance with the Bills of Quantities or other applicable Schedules.

12.3 Evaluation

12.3.1 Except as otherwise stated in the Contract, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the Contract Price by evaluating each item of work, applying the measurement agreed or determined in accordance with the above Sub-Clauses 12.1 and 12.2 and the appropriate rate or price for the item.

For each item of work, the appropriate rate or price for the item shall be the rate or price specified for such item in the Contractor, if there is no such item, specified for similar work.

12.3.2 Any item of work included in the Bills of Quantities for which no rate or price was specified shall be considered as included in other rates and prices in the Bills of Quantities and will not be paid for separately.

However, a new rate or price shall be appropriate for an item of work if:

a) I) the measured quantity of the item is changed by more than 25% from the quantity of this item in the Bills of Quantities or another Schedule,
   ii) This change in quantity multiplied by such specified rate of this item exceeds 0.25% of the Accepted Contract Amount,
   iii) This change in quantity directly changes the Cost per unit quantity of this item by more than 1%, and
   iv) This item is not specified in the Contract as a "fixed rate item"; or
b) i) the work is instructed under Clause 13 [Variations and Adjustments],
   ii) no rate or price is specified in the Contract for this item, and
   iii) no specified rate or price is appropriate because the item of work is not of similar character, or is not executed under similar conditions, as any item in the Contract.

12.3.3 Each new rate or price shall be derived from any relevant rates or prices in the Contract, with reasonable adjustments to take account of the matters described in sub-paragraph (a) and/or (b), as applicable. If no rates or prices are relevant for the derivation of a new rate or price, it shall be derived from the reasonable Cost of executing the work, together with profit, taking account of any other relevant matters.

12.3.4 Until such time as an appropriate rate or price is agreed or determined, the Engineer shall determine a provisional rate or price for the purposes of Interim Payment Certificates as soon as the concerned work commences.

12.3.5 Where the contract price is different from the corrected tender price, in order to ensure the contractor is not paid less or more relative to the contract price (*which would be the tender price*), payment valuation certificates and variation orders on omissions and additions valued based on rates in the Bill of Quantities or schedule of rates in the Tender, will be adjusted by a plus or minus percentage. The percentage already worked out during tender evaluation is worked out as follows: *(corrected tender price–tender price)/tender price X 100*.

12.4 Omissions

Whenever the omission of any work form's part (or all) of a Variation, the value of which has not been

agreed, if:

a) the Contractor will incur (or has incurred) cost which, if the work had not been omitted, would have been deemed to be covered by a sum forming part of the Accepted Contract Amount;
b) the omission of the work will result (or has resulted) in this sum not forming part of the Contract Price; and
c) this cost is not deemed to be included in the evaluation of any substituted work; then the Contractor shall give notice to the Engineer accordingly, with supporting particulars. Upon receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5
[Determinations] to agree or determine this cost, which shall be included in the Contract Price.

13. VARIATIONS AND ADJUSTMENTS

13.1 Right to Vary

13.1.1 Variations may be initiated by the Engineer at any time prior to issuing the Taking-Over Certificate for the Works, either by an instruction or by a request for the Contractor to submit a proposal.

13.1.2 The Contractor shall execute and be bound by each Variation, unless the Contractor promptly gives notice to the Engineer stating (with supporting particulars) that (i) the Contractor cannot readily obtain the Goods required for the Variation, or (ii) such Variation triggers a substantial change in the sequence or progress of the Works. Upon receiving this notice, the Engineer shall cancel, confirm or vary the instruction.
Each Variation may include:

a) Changes to the quantities of any item of work included in the Contract (however, such changes do not necessarily constitute a Variation),
b) Changes to the quality and other characteristics of any item of work,
c) Changes to the levels, positions and/or dimensions of any part of the Works,
d) Omission of any work unless it is to be carried out by others,
e) Any additional work, Plant, Materials or services necessary for the Permanent Works, including any associated Tests on Completion, boreholes and other testing and exploratory work, or
f) Changes to the sequence or timing of the execution of the Works.

13.1.3 The Contractor shall not make any alteration and/or modification of the Permanent Works, unless and until the Engineer instructs or approves a Variation.

13.2 Value Engineering

13.2.1 The Contract or may, at any time, submit to the Engineer a written proposal which (in the Contractor's opinion) will, if adopted, (i) accelerate completion, (ii) reduce the cost to the Procuring Entity of executing, maintaining or operating the Works, (iii) improve the efficiency or value to the Procuring Entity of the completed Works, or (iv) otherwise be of benefit to the Procuring Entity.

13.2.2 The proposal shall be prepared at the cost of the Contract or and shall include the items listed in Sub- Clause 13.3 [Variation Procedure].

If a proposal, which is approved by the Engineer, includes a change in the design of part of the Permanent Works, then unless otherwise agreed by both Parties:

a) The Contractor shall design this part,
b) Sub-paragraphs (a) to (d) of Sub-Clause 4.1 [Contractor's General Obligations] shall apply, and
c) If this change results in a reduction in the contract value of this part, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine a fee, which shall be included in the Contract Price. This fee shall be half (50%) of the difference between the following amounts:

i) such reduction in contract value, resulting from the change, excluding adjustments under Sub-Clause 13.7 [Adjustments for Changes in Legislation] and Sub-Clause 13.8 [Adjustments for Changes in Cost], and

ii) the reduction (if any) in the value to the Procuring Entity of the varied works, taking account of any reductions in quality, anticipated life or operational efficiencies.

13.2.3 However, if amount (i) is less than amount (ii), there shall not be a fee.

13.3 Variation Procedure

13.3.1 If the Engineer requests a proposal, prior to instructing a Variation, the Contractor shall respond in writing as soon as practicable, either by giving reasons why he cannot comply (if this is the case) or by submitting:

a) a description of the proposed work to be performed and a Programme for its execution,

b) the Contractor's proposal for any necessary modifications to the Programme according to Sub- Clause 8.3 [Programme] and to the Time for Completion, and

c) the Contractor's proposal for evaluation of the Variation.

13.3.2 The Engineer shall, as soon as practicable after receiving such proposal (under Sub-Clause 13.2 [Value Engineering] or otherwise), respond with approval, disapproval or comments. The Contractor shall not delay any work whilst awaiting a response.

13.3.3 Each instruction to execute a Variation, with any requirements for the recording of Costs, shall be issued by the Engineer to the Contractor, who shall acknowledge receipt.

Each Variation shall be evaluated in accordance with Clause 12 [Measurement and Evaluation], unless the Engineer instructs or approves otherwise in accordance with this Clause.

13.4 Payment in Applicable Currencies

If the Contract provides for payment of the Contract Price in more than one currency, then whenever an adjustment is agreed, approved or determined as stated above, the amount payable in each of the applicable currencies shall be specified. For this purpose, reference shall be made to the actual or expected currency proportions of the Cost of the varied work, and to the proportions of various currencies specified for payment of the Contract Price.

13.5 Provisional Sums

13.5.1 Each Provisional Sum shall only be used, in whole or in part, in accordance with the Engineer's instructions, and the Contract Price shall be adjusted accordingly. The total sum paid to the Contractor shall include only such amounts, for the work, supplies or services to which the Provisional Sum relates, as the Engineer shall have instructed. For each Provisional Sum, the Engineer may instruct:

a) Work to be executed (including Plant, Materials or services to be supplied) by the Contractor and valued under Sub-Clause 13.3 [Variation Procedure]; and/or

b) Plant, Materials or services to be purchased by the Contractor, from a nominated Subcontractor (as defined in Clause 5 [Nominated Subcontractors]) or otherwise; and for which there shall be included in the Contract Price:

i) The actual amounts paid (or due to be paid) by the Contractor, and

ii) A sum for overhead charges and profit, calculated as a percentage of these actual amounts by applying the relevant percentage rate (if any) stated in the appropriate Schedule.

iii) If there is no such rate, the percentage rate stated in the **SCC** shall be applied.

13.5.2 The Contractor shall, when required by the Engineer, produce quotations, invoices, vouchers and accounts or receipts in substantiation.

13.6 Daywork

13.6.1 For work of a minor or incidental nature, the Engineer may instruct that a Variation shall be executed on a daywork basis. The work shall then be valued in accordance with the Daywork Schedule included in the Contract, and the following procedure shall apply. If a Daywork Schedule is not included in the Contract, this Sub-Clause shall not apply.

Before ordering Goods for the work, the Contractor shall submit quotations to the Engineer. When applying for payment, the Contractor shall submit invoices, vouchers and accounts or receipts for any Goods.

13.6.2 Except for any items for which the Daywork Schedule specifies that payment is not due, the Contractor shall deliver each day to the Engineer accurate statements in duplicate which shall include the following details of the resources used in executing the previous day's work:

a) The names, occupations and time of Contractor's Personnel,

b) The identification, type and time of Contractor's Equipment and Temporary Works, and

c) The quantities and types of Plant and Materials used.

13.6.3 One copy of each statement will, if correct, or when agreed, be signed by the Engineer and returned to the Contractor. The Contractor shall then submit priced statements of these resources to the Engineer, prior to their inclusion in the next Statement under Sub-Clause 14.3 [Application for Interim Payment Certificates].

13.7 Adjustments for Changes in Legislation

13.7.1 The Contract Price shall be adjusted to take account of any increase or decrease in Cost resulting from a change in the Laws of the Country (including the introduction of new Laws and the repeal or modification of existing Laws) or in the judicial or official governmental interpretation of such Laws, made after the Base Date, which affect the Contractor in the performance of obligations under the Contract.

13.7.2 If the Contract or suffers (or will suffer) delay and/or incurs (or will incur) additional Cost as a result of these changes in the Laws or in such interpretations, made after the Base Date, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

a) An extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and

b) Payment of any such Cost, which shall be included in the Contract Price.

After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

13.7.3 Notwithstanding the foregoing, the Contractor shall not be entitled to an extension of time if the relevant delay has already been taken into account in the determination of a previous extension of time and such Cost shall not be separately paid if the same shall already have been taken into account in the indexing of any inputs to the table of adjustment data in accordance with the provisions of Sub-Clause
13.8 [Adjustments for Changes in Cost].

13.8 Adjustments for Changes in Cost

13.8.1 In this Sub-Clause, "table of adjustment data" means the completed table of adjustment data for local and foreign currencies included in the Schedules. If there is no such table of adjustment data, this Sub- Clause shall not apply.

13.8.2 If this Sub-Clause applies, the amounts payable to the Contractor shall be adjusted for rises or falls in the cost of labor, Goods and other inputs to the Works, by the addition or deduction of the amounts determined by the formulae prescribed in this Sub-Clause. To the extent that full compensation for any rise or fall in Costs is not covered by the provisions of this or other Clauses, the Accepted Contract Amount shall be deemed to have included amounts to cover the contingency of other rises and falls in costs.

13.8.3 The adjustment to be applied to the amount otherwise payable to the Contractor, as valued in accordance with the appropriate Schedule and certified in Payment Certificates, shall be determined from formulae for each of the currencies in which the Contract Price is payable. No adjustment is to be applied to work valued on the basis of Cost or current prices. The formulae shall be of the following general type:

Pn = a + b Ln/ Lo + c En/Eo + d Mn/Mo + ... where:

"Pn" is the adjustment multiplier to be applied to the estimated contract value in the relevant currency of the work carried out in period "n", this period being a month unless otherwise stated in the **SCC**;

"a" is a fixed coefficient, stated in the relevant table of adjustment data, representing the non-adjustable portion in contractual payments;

"b", "c", "d", … are coefficients representing the estimated proportion of each cost element related to the execution of the Works, as stated in the relevant table of adjustment data; such tabulated cost elements may be indicative of resources such as labor, equipment and materials;

"Ln", "En", "Mn", … are the current cost indices or reference prices for period "n", expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the date 49 days prior to the last day of the period (to which the particular Payment Certificate relates); and

"Lo", "Eo", "Mo" … are the base cost indices or reference prices, expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the Base Date.

13.8.4 The cost indices or reference prices stated in the table of adjustment data shall be used. If their source is in doubt, it shall be determined by the Engineer. For this purpose, reference shall be made to the values of the indices at stated dates (quoted in the fourth and fifth columns respectively of the table) for the purposes of clarification of the source; although these dates (and thus these values) may not correspond to the base cost indices.

13.8.5 In cases where the "currency of index" is not the relevant currency of payment, each index shall be converted into the relevant currency of payment at the selling rate, established by the central Procuring Entity of the Country, of this relevant currency on the above date for which the index is required to be applicable.

13.8.6 Until such time as each current cost index is available, the Engineer shall determine a provisional index for the issue of Interim Payment Certificates. When a current cost index is available, the adjustment shall be recalculated accordingly.

13.8.7 If the Contractor fails to complete the Works within the Time for Completion, adjustment of prices thereafter shall be made using either (i) each index or price applicable on the date 49 days prior to the expiry of the Time for Completion of the Works, or (ii) the current index or price, whichever is more favorable to the Procuring Entity.

13.8.8 The weightings (coefficients) for each of the factors of cost stated in the table(s) of adjustment data shall only be adjusted if they have been rendered unreasonable, unbalanced or inapplicable, as a result of Variations.

14. CONTRACT PRICE AND PAYMENT

14.1 The Contract Price

14.1.1 Unless otherwise stated in the Particular Conditions:

a) the Contract Price shall be agreed or determined under Sub-Clause 12.3 [Evaluation] and be subject to adjustments in accordance with the Contract;
b) the Contractor shall pay all taxes, duties and fees required to be paid by him under the Contract, and the Contract Price shall not be adjusted for any of these costs except as stated in Sub-Clause 13.7 [Adjustments for Changes in Legislation];
c) any quantities which may be set out in the Bills of Quantities or other Schedule are estimated quantities and are not to be taken as the actual and correct quantities:
   i) of the Works which the Contractor is required to execute, or
   ii) for the purposes of Clause 12 [Measurement and Evaluation]; and
d) the Contractor shall submit to the Engineer, within 30 days after the Commencement Date, a proposed breakdown of each lumpsum price in the Schedules.

14.1.2 The Engineer may take account of the breakdown when preparing Payment Certificates, but shall not be bound by it.

14.1.3 Notwithstanding the provisions of subparagraph (b), Contractor's Equipment, including essential spare parts there for, imported by the Contractor for the sole purpose of executing the Contract shall be exempt from the payment of import duties and taxes upon importation.

14.2 Advance Payment

14.2.1 The Procuring Entity shall make an advance payment, as an interest- free loan for mobilization and cashflow support, when the Contractor submits a guarantee in accordance with this Sub-Clause. The total advance payment, the number and timing of instalments (if more than one), and the applicable currencies and proportions, shall be as stated in the **SCC**. Unless and until the Procuring Entity receives this guarantee, or if the total advance payment is not stated in the **SCC**, this Sub-Clause shall not apply.

14.2.2 The Engineer shall deliver to the Procuring Entity and to the Contractor an Interim Payment Certificate for the advance payment or its first instalment after receiving a Statement (under Sub-Clause 14.3 [Application for Interim Payment Certificates]) and after the Procuring Entity receives (i) the Performance Security in accordance with Sub-Clause 4.2 [Performance Security] and (ii) a guarantee in amounts and currencies equal to the advance payment. This guarantee shall be issued by a reputable Procuring Entity or financial institution selected by the Contractor and shall be in the form annexed to the Particular Conditions or in another form approved by the Procuring Entity.

14.2.3 The Contractor shall ensure that the guarantee is valid and enforceable until the advance payment has been repaid, but its amount shall be progressively reduced by the amount repaid by the Contractor as indicated in the Payment Certificates. If the terms of the guarantee specify its expiry date, and the advance payment has not been repaid by the date 30 days prior to the expiry date, the Contractor shall extend the validity of the guarantee until the advance payment has been repaid.

14.2.4 Unless stated otherwise in the SCC, the advance payment shall be repaid through percentage deductions from the interim payments determined by the Engineer in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates], as follows:

a) Deductions shall commence in the next interim Payment Certificate following that in which the total of all certified interim payments (excluding the advance payment and deductions and repayments of retention) exceeds 30 percent (30%) of the Accepted Contract Amount Less Provisional Sums; and

b) Deductions shall be made at the amortization rate stated in the **SCC** of the amount of each Interim Payment Certificate (excluding the advance payment and deductions for its repayments as well as deductions for retention money) in the currencies and proportions of the advance payment until such time as the advance payment has been repaid; provided that the advance payment shall be completely repaid prior to the time when 90 percent (90%) of the Accepted Contract Amount less Provisional Sums has been certified for payment.

14.2.5 If the advance payment has not been repaid prior to the issue of the Taking-Over Certificate for the Works or prior to termination under Clause 15 [Termination by Procuring Entity], Clause 16 [Suspension and Termination by Contractor] or Clause 19 [Force Majeure] (as the case may be), the whole of the balance then outstanding shall immediately become due and in case of termination under Clause 15 [Termination by Procuring Entity], except for Sub-Clause 15.5 [Procuring Entity's Entitlement to Termination for Convenience], payable by the Contractor to the Procuring Entity.

14.3 Application for Interim Payment Certificates

14.3.1 The Contractor shall submit a Statement in six copies to the Engineer after the end of each month, in a form approved by the Engineer, showing in detail the amounts to which the Contractor considers itself to been titled, together with supporting documents which shall include the report on the progress during this month in accordance with Sub-Clause 4.21 [Progress Reports].

14.3.2 The Statement shall include the following items, as applicable, which shall be expressed in the various currencies in which the Contract Price is payable, in the sequence listed:

a) the estimated contract value of the Works executed and the Contractor's Documents produced up to the end of the month (including Variations but excluding items described in sub-paragraphs (b) to (g) below);
b) any amounts to be added and deducted for changes in legislation and changes in cost, in accordance with Sub-Clause 13.7 [Adjustments for Changes in Legislation] and Sub-Clause 13.8 [Adjustments for Changes in Cost];
c) any amount to be deducted for retention, calculated by applying the percentage of retention stated in the **SCC** to the total of the above amounts, until the amount so retained by the Procuring Entity reaches the limit of Retention Money (if any) stated in the **SCC**;
d) any amounts to be added for the advance payment and (if more than one instalment) and to be deducted for its repayments in accordance with Sub-Clause 14.2 [Advance Payment];
e) any amounts to be added and deducted for Plant and Materials in accordance with Sub-Clause14.5[Plant and Materials intended for the Works];
f) any other additions or deductions which may have become due under the Contract or otherwise, including those under Clause 20 [Claims, Disputes and Arbitration]; and
g) the deduction of amounts certified in all previous Payment Certificates.

14.3.3 Where the contract price is different from the corrected tender price, in order to ensure the contractor is not paid less or more relative to the contract price (*which would be the tender price*), payment valuation certificates and variation orders on omissions and additions valued based on rates in the Bill of Quantities or schedule of rates in the Tender, will be adjusted by a plus or minus percentage. The percentage already worked out during tender evaluation is worked out as follows: *(corrected tender price–tender price)/tender priceX100*.

14.4 Schedule of Payments

14.4.1 If the Contract includes a schedule of payments specifying the instalments in which the Contract Price will be paid, then unless otherwise stated in this schedule:

a) The instalments quoted in this schedule of payments shall be the estimated contract values for the purposes of sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates];
b) Sub-Clause14.5[Plant and Materials intended for the Works] shall not apply; and
c) If these instalments are not defined by reference to the actual progress achieved in executing the Works, and if actual progress is found to be less or more than that on which this schedule of payments was based, then the Engineer may proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine revised instalments, which shall take account of the extent to which progress is less or more

than that on which the instalments were previously based.

14.4.2 If the Contract does not include a schedule of payments, the Contractor shall submit non-binding estimates of the payments which he expects to become due during each quarterly period. The first estimate shall be submitted within 42 days after the Commencement Date. Revised estimates shall be submitted at quarterly intervals, until the Taking-Over Certificate has been issued for the Works.

14.5 Plant and Materials intended for the Works *(see SCC for lists)*

14.5.1 If this Sub-Clause applies, Interim Payment Certificates shall include, under sub-paragraph (e) of Sub-Clause 14.3, (i) an amount for Plant and Materials which have been sent to the Site for incorporation in the Permanent Works, and (ii) a reduction when the contract value of such Plant and Materials is included as part of the Permanent Works under sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates].

14.5.2 If the lists referred to in sub-paragraphs (b) (i) or (c) (i) below are not included in the Schedules, this Sub-Clause shall not apply. The Engineer shall determine and certify each addition if the following conditions are satisfied:

a) The Contractor has:
   i) Kept satisfactory records (including the orders, receipts, Costs and use of Plant and Materials) which are available for inspection, and
   ii) Submitted a statement of the Cost of acquiring and delivering the Plant and Materials to the Site, supported by satisfactory evidence; and either:

b) The relevant Plant and Materials:
   i) Are those listed in the Schedules for payment when shipped,
   ii) Have been shipped to the Country, enroute to the Site, in accordance with the Contract; and
   iii) are described in a clean shipped bill of lading or other evidence of shipment, which has been submitted to the Engineer together with evidence of payment of freight and insurance, any other documents reasonably required, and an Procuring Entity guarantee in a form and issued by an entity approved by the Procuring Entity in amounts and currencies equal to the amount due under this Sub-Clause: this guarantee may be in a similar form to the form referred to in Sub-Clause 14.2[Advance Payment] and shall be valid until the Plant and Materials are properly stored on Site and protected against loss, damage or deterioration;

c) the relevant Plant and Materials:
   i) are those listed in the Schedules for payment when delivered to the Site, and
   ii) have been delivered to and are properly stored on the Site, are protected against loss, damage or deterioration, and appear to be in accordance with the Contract.

14.5.3 The additional amount to be certified shall be the equivalent of eighty percent (80%) of the Engineer's determination of the cost of the Plant and Materials (including delivery to Site), taking account of the documents mentioned in this Sub-Clause and of the contract value of the Plant and Materials.

14.5.4 The currencies for this additional amount shall be the same as those in which payment will become due when the contract value is included under sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates]. At that time, the Payment Certificate shall include the applicable reduction which shall be equivalent to, and in the same currencies and proportions as, this additional amount for the relevant Plant and Materials.

14.6 Issue of Interim Payment Certificates

14.6.1 No amount will be certified or paid until the Procuring Entity has received and approved the Performance Security. Thereafter, the Engineer shall, within 30 days after receiving a Statement and supporting documents, deliver to the Procuring Entity and to the Contractor an Interim Payment Certificate which shall state the amount which the Engineer fairly determines to be due, with all supporting particulars for any reduction or withholding made

However, prior to issuing the Taking-Over Certificate for the Works, the Engineer shall not be bound to issue an Interim Payment Certificate in an amount which would (after retention and other deductions) be less than the minimum amount of Interim Payment Certificates (if any) stated in the **SCC**. In this event, the Engineer shall give notice to the Contractor accordingly.

14.6.2 An Interim Payment Certificate shall not be withheld for any other reason, although:

a) if anything supplied or work done by the Contractor is not in accordance with the Contract, the cost of rectification or replacement may be withheld until rectification or replacement has been completed; and/or

b) if the Contractor was or is failing to perform any work or obligation in accordance with the Contract, and had been so notified by the Engineer, the value of this work or obligation may be withheld until the work or obligation has been performed.

14.6.3 The Engineer may in any Payment Certificate make any correction or modification that should properly be made to any previous Payment Certificate. A Payment Certificate shall not be deemed to indicate the Engineer's acceptance, approval, consent or satisfaction.

14.7 Payment

14.7.1 The Procuring Entity shall pay to the Contractor:

a) The first instalment of the advance payment within 42 days after issuing the Letter of Acceptance or within 21 days after receiving the documents in accordance with Sub-Clause 4.2 [Performance Security] and Sub-Clause 14.2 [Advance Payment], whichever is later;

b) the amount certified in each Interim Payment Certificate within 56 days after the Engineer receives the Statement and supporting documents; or, at a time when the Procuring Entity's loan or credit (from which part of the payments to the Contractor is being made) is suspended, the amount shown on any statement submitted by the Contractor within 14 days after such statement is submitted, any discrepancy being rectified in the next payment to the Contractor; and

c) the amount certified in the Final Payment Certificate within 56 days after the Procuring Entity receives this Payment Certificate; or, at a time when the Procuring Entity's loan or credit (from which part of the payments to the Contractor is being made) is suspended, the undisputed amount shown in the Final Statement within 56 days after the date of notification of the suspension in accordance with Sub-Clause 16.2 [Termination by Contractor].

14.7.2 Payment of the amount due in each currency shall be made in to the Procuring Entity account, nominated by the Contractor, in the payment country (for this currency) specified in the Contract.

14.8 Delayed Payment

14.8.1 If the Contractor does not receive payment in accordance with Sub-Clause 14.7 [Payment], the Contractor shall be entitled to receive financing charges compounded monthly on the amount unpaid during the period of delay. This period shall be deemed to commence on the date for payment specified in Sub-Clause 14.7 [Payment], irrespective (in the case of its sub-paragraph (b)) of the date on which any Interim Payment Certificate is issued.

14.8.2 Unless otherwise stated in the Particular Conditions, these financing charges shall be calculated at the annual rate of three percentage points above the discount rate of the central Procuring Entity in the country of the currency of payment, or if not available, the inter-Procuring Entity offered rate, and shall be paid in such currency.

The Contractor shall be entitled to this payment without formal notice or certification, and without prejudice to any other right or remedy.

14.9 Payment of Retention Money

14.9.1 When the Taking-Over Certificate has been issued for the Works, the first half of the Retention Money shall be certified by the Engineer for payment to the Contractor. If a Taking-Over Certificate is issued for a Section or part of the Works, a proportion of the Retention Money shall be certified and paid. This proportion shall be half (50%) of the proportion calculated by dividing the estimated contract value of the Section or part, by

the estimated final Contract Price.

14.9.2 Promptly after the latest of the expiry dates of the Defects Notification Periods, the outstanding balance of the Retention Money shall be certified by the Engineer for payment to the Contractor. If a Taking-Over Certificate was issued for a Section, a proportion of the second half of the Retention Money shall be certified and paid promptly after the expiry date of the Defects Notification Period for the Section. This proportion shall be half (50%) of the proportion calculated by dividing the estimated contract value of the Section by the estimated final Contract Price.

14.9.3 However, if any work remains to be executed under Clause 11 [Defects Liability], the Engineer shall be entitled to withhold certification of the estimated cost of this work until it has been executed.

14.9.4 When calculating these proportions, no account shall be taken of any adjustments under Sub-Clause 13.7 [Adjustments for Changes in Legislation] and Sub-Clause 13.8 [Adjustments for Changes in Cost].

14.9.5 Unless otherwise stated in the Particular Conditions, when the Taking-Over Certificate has been issued for the Works and the first half of the Retention Money has been certified for payment by the Engineer, the Contractor shall be entitled to substitute a guarantee, in the form annexed to the Particular Conditions or in another form approved by the Procuring Entity and issued by a reputable Procuring Entity or financial institution selected by the Contractor, for the second half of the Retention Money. The Contractor shall ensure that the guarantee is in the amounts and currencies of the second half of the Retention Money and is valid and enforceable until the Contract or has executed and completed the Works and remedied any defects, as specified for the Performance Security in Sub-Clause 4.2. On receipt by the Procuring Entity of the required guarantee, the Engineer shall certify and the Procuring Entity shall pay the second half of the Retention Money. The release of the second half of the Retention Money against a guarantee shall then be in lieu of the release under the second paragraph of this Sub-Clause. The Procuring Entity shall return the guarantee to the Contractor within 21 days after receiving a copy of the Performance Certificate.

14.9.6 If the Performance Security required under Sub-Clause 4.2 is in the form of a demand guarantee, and the amount guaranteed under it when the Taking-Over Certificate is issued is more than half of the Retention Money, then the Retention Money guarantee will not be required. If the amount guaranteed under the Performance Security when the Taking-Over Certificate is issued is less than half of the Retention Money, the Retention Money guarantee will only be required for the difference between half of the Retention Money and the amount guaranteed under the Performance Security.

14.10 Statement at Completion

Within 84 days after receiving the Taking-Over Certificate for the Works, the Contractor shall submit to the Engineer six copies of a Statement at completion with supporting documents, in accordance with Sub-Clause
14.3 [Application for Interim Payment Certificates], showing:

a) the value of all work done in accordance with the Contract up to the date stated in the Taking-Over Certificate for the Works,
b) any further sums which the Contractor considers to be due, and
c) an estimate of any other amounts which the Contractor considers will become due to him under the Contract. Estimated amounts shall be shown separately in this Statement at completion.

The Engineer shall then certify in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates].

14.11 Application for Final Payment Certificate

14.11.1 Within 56 days after receiving the Performance Certificate, the Contractor shall submit, to the Engineer, six copies of a draft final statement with supporting documents showing in detail in a form approved by the Engineer:

a) The value of all work done in accordance with the Contract, and
b) Any further sums which the Contractor considers to be due to him under the Contractor otherwise.

14.11.2 If the Engineer disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Engineer may reasonably require within 30 days from receipt of

said draft and shall make such changes in the draft as may be agreed between them. The Contractor shall then prepare and submit to the Engineer the final statement as agreed. This agreed statement is referred to in these Conditions as the "Final Statement".

14.11.3 However, if, following discussions between the Engineer and the Contractor and any changes to the draft final statement which are agreed, it becomes evident that a dispute exists, the Engineer shall deliver to the Procuring Entity (with a copy to the Contractor) an Interim Payment Certificate for the agreed parts of the draft final statement. Thereafter, if the dispute is finally resolved under Sub-Clause 20.4 [Obtaining Dispute Board's Decision] or Sub-Clause 20.5 [Amicable Settlement], the Contractor shall then prepare and submit to the Procuring Entity (with a copy to the Engineer) a Final Statement.

14.12 Discharge

When submitting the Final Statement, the Contractor shall submit a discharge which confirms that the total of the Final Statement represents full and final settlement of all moneys due to the Contractor under or in connection with the Contract. This discharge may state that it becomes effective when the Contractor has received the Performance Security and the outstanding balance of this total, in which event the discharge shall be effective on such date.

14.13 Issue of Final Payment Certificate

14.13.1 Within 30 days after receiving the Final Statement and discharge in accordance with Sub-Clause 14.11 [Application for Final Payment Certificate] and Sub-Clause 14.12 [Discharge], the Engineer shall deliver, to the Procuring Entity and to the Contractor, the Final Payment Certificate which shall state:

(a) The amount which he fairly determines is finally due, and
(b) After giving credit to the Procuring Entity for all amounts previously paid by the Procuring Entity and for all sums to which the Procuring Entity is entitled, the balance (if any) due from the Procuring Entity to the Contractor or from the Contractor to the Procuring Entity, as the case may be.

14.13.1 If the Contractor has not applied for a Final Payment Certificate in accordance with Sub-Clause 14.11 [Application for Final Payment Certificate] and Sub-Clause 14.12 [Discharge], the Engineer shall request the Contractor to do so. If the Contractor fails to submit an application within a period of 30 days, the Engineer shall issue the Final Payment Certificate for such amount as he fairly determines to be due.

14.14 Cessation of Procuring Entity's Liability

14.14.1 The Procuring Entity shall not be liable to the Contractor for any matter or thing under or in connection with the Contract or execution of the Works, except to the extent that the Contractor shall have included an amount expressly for it:
a) In the Final Statement and also
b) (Except for matters or things arising after the issue of the Taking-Over Certificate for the Works) in the Statement at completion described in Sub-Clause 14.10[Statement at Completion].

14.14.2 However, this Sub-Clause shall not limit the Procuring Entity's liability under his indemnification obligations, or the Procuring Entity's liability in any case of fraud, deliberate default or reckless misconduct by the Procuring Entity.

14.15 Currencies of Payment

The Contract Price shall be paid in the currency or currencies named in the Schedule of Payment Currencies. If more than one currency is so named, payments shall be made as follows:
a) If the Accepted Contract Amount was expressed in Local Currency only:
   (i) The proportions or amounts of the Local and Foreign Currencies, and the fixed rates of exchange to be used for calculating the payments, shall be as stated in the Schedule of Payment Currencies, except as otherwise agreed by both Parties;
   ii) payments and deductions under Sub-Clause 13.5 [Provisional Sums] and Sub-Clause 13.7 [Adjustments for Changes in Legislation] shall be made in the applicable currencies and proportions; and

iii) other payments and deductions under sub-paragraphs (a) to (d) of Sub-Clause 14.3 [Application for Interim Payment Certificates] shall be made in the currencies and proportions specified in sub-paragraph (a) (i) above;

b) payment of the damages specified in the **SCC**, shall be made in the currencies and proportions specified in the Schedule of Payment Currencies;
c) other payments to the Procuring Entity by the Contractor shall be made in the currency in which the sum was expended by the Procuring Entity, or in such currency as may be agreed by both Parties;
d) if any amount payable by the Contractor to the Procuring Entity in a particular currency exceeds the sum payable by the Procuring Entity to the Contractor in that currency, the Procuring Entity may recover the balance of this amount from the sums otherwise payable to the Contractor in other currencies; and
e) if no rates of exchange are stated in the Schedule of Payment Currencies, they shall be those prevailing on the Base Date and determined by the central Procuring Entity of the Country.

15. TERMINATION BY PROCURING ENTITY

15.1 Notice to Correct

If the Contractor fails to carry out any obligation under the Contract, the Engineer may by notice require the Contractor to make good the failure and to remedy it within a specified reasonable time.

15.2 Termination by Procuring Entity

15.2.1 The Procuring Entity shall be entitled to terminate the Contract if the Contractor:
a) fails to comply with Sub-Clause 4.2 [Performance Security] or with a notice under Sub-Clause 15.1 [Notice to Correct],
b) abandons the Works or otherwise plainly demonstrates the intention not to continue performance of his obligations under the Contract,
c) without reasonable excuse fails:
   (i) to proceed with the Works in accordance with Clause 8 [Commencement, Delays and Suspension], or
   ii) to comply with a notice issued under Sub-Clause 7.5 [Rejection] or Sub- Clause 7.6 [Remedial Work], within 30 days after receiving it,
d) subcontracts the whole of the Works or as signs the Contract without the required agreement,
e) becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events, or
f) gives or offers to give (directly or indirectly) to any person any bribe, gift, gratuity, commission or other thing of value, as an inducement or reward:
   i) for doing or forbearing to do any action in relation to the Contract, or
   ii) for showing or for bearing to show favor or disfavor to any person in relation to the Contract, or if any of the Contractor's Personnel, agents or Subcontractors gives or offers to give (directly or indirectly) to any person any such inducement or reward as is described in this sub-paragraph (f). However, lawful inducements and rewards to Contractor's Personnel shall not entitle termination, or
g) based on reasonable evidence, has engaged in Fraud and Corruption as defined in paragraph 2.2 of the Appendix B to these General Conditions, in competing for or in executing the Contract.

15.2.2 In any of these events or circumstances, the Procuring Entity may, upon giving 14 days' notice to the Contractor, terminate the Contract and expel the Contractor from the Site. However, in the case of sub-paragraph (e) or (f) or (g), the Procuring Entity may by notice terminate the Contract immediately.

15.2.3 The Procuring Entity's election to terminate the Contract shall not prejudice any other rights of the Procuring Entity, under the Contract or otherwise.

The Contractor shall then leave the Site and deliver any required Goods, all Contractor's Documents, and other design documents made by or for him, to the Engineer. However, the Contractor shall use his lowest

efforts to comply immediately with any reasonable instructions included in the notice (i) for the assignment of any subcontract, and (ii) for the protection of life or property or for the safety of the Works.

After termination, the Procuring Entity may complete the Works and/or arrange for any other entities to do so. The Procuring Entity and these entities may then use any Goods, Contractor's Documents and other design documents made by or on behalf of the Contractor.

The Procuring Entity shall then give notice that the Contractor's Equipment and Temporary Works will be released to the Contractor at or near the Site. The Contractor shall promptly arrange their removal, at the risk and cost of the Contractor. However, if by this time the Contractor has failed to make a payment due to the Procuring Entity, these items may be sold by the Procuring Entity in order to recover this payment. Any balance of the proceeds shall then be paid to the Contractor.

15.3 Valuation at Date of Termination

As soon as practicable after a notice of termination under Sub-Clause 15.2 [Termination by Procuring Entity] has taken effect, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the value of the Works, Goods and Contractor's Documents, and any other sums due to the Contractor for work executed in accordance with the Contract.

15.4 Payment after Termination

After a notice of termination under Sub-Clause 15.2 [Termination by Procuring Entity] has taken effect, the Procuring Entity may:

a) Proceed in accordance with Sub-Clause 2.5 [Procuring Entity's Claims],

b) Withhold further payments to the Contractor until the costs of execution, completion and remedying of any defects, damages for delay in completion (if any), and all other costs incurred by the Procuring Entity, have been established, and/or

c) Recover from the Contractor any losses and damages incurred by the Procuring Entity and any extra costs of completing the Works, after allowing for any sum due to the Contractor under Sub-Clause 15.3 [Valuation at Date of Termination]. After recovering any such losses, damages and extra costs, the Procuring Entity shall pay any balance to the Contractor.

15.5 Procuring Entity's Entitlement to Termination for Convenience

15.5.1 The Procuring Entity shall be entitled to terminate the Contract, at any time for the Procuring Entity's convenience, by giving notice of such termination to the Contractor. The termination shall take effect 30 days after the later of the dates on which the Contractor receives this notice or the Procuring Entity returns the Performance Security. The Procuring Entity shall not terminate the Contract under this Sub-Clause in order to execute the Works itself or to arrange for the Works to be executed by another contractor or to avoid a termination of the Contract by the Contractor under Clause 16.2[Termination by Contractor].

15.5.2 After this termination, the Contractor shall proceed in accordance with Sub-Clause 16.3 [Cessation of Work and Removal of Contractor's Equipment] and shall be paid in accordance with Sub-Clause 16.4 [Payment on Termination].

15.6 Fraud and Corruption

The Procuring Entity requires compliance with the national law and regulations against corruption. All available sanctions will apply where corruption is detected.

16. SUSPENSION AND TERMINATION BY CONTRACTOR

16.1 Contractor's Entitlement to Suspend Work

16.1.1 If the Engineer fails to certify in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates] or the Procuring Entity fails to comply with Sub-Clause 2.4 [Procuring Entity's Financial Arrangements] or Sub- Clause 14.7 [Payment], the Contractor may, after giving not less than 21days' notice to the Procuring Entity, suspend work (or reduce the rate of work) unless and until the Contractor has received the Payment

Certificate, reasonable evidence or payment, as the case may be and as described in the notice.

16.1.2 Notwithstanding the above, if the Procuring Entity has suspended disbursements under the loan or credit from which payments to the Contractor are being made, in whole or in part, for the execution of the Works, and no alternative funds are available as provided for in Sub-Clause 2.4 [Procuring Entity's Financial Arrangements], the Contractor may by notice suspend work or reduce the rate of work at any time, but not less than 7 days after the Procuring Entity having received the suspension notification from the Procuring Entity.

16.1.3 The Contractor's action shall not prejudice his entitlements to financing charges under Sub-Clause 14.8 [Delayed Payment] and to termination under Sub-Clause 16.2[Termination by Contractor].

16.1.4 If the Contractor subsequently receives such Payment Certificate, evidence or payment (as described in the relevant Sub-Clause and in the above notice) before giving a notice of termination, the Contractor shall resume normal working as soon as is reasonably practicable.

16.1.5 If the Contractor suffers delay and/or incurs Cost as a result of suspending work (or reducing the rate of work) in accordance with this Sub-Clause, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
b) payment of any such Cost-plus profit, which shall be included in the Contract Price.

16.1.6 After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

16.2 Termination by Contractor

16.2.1 The Contractor shall be entitled to terminate the Contract if:

a) the Contractor does not receive the reasonable evidence within 42 days after giving notice under Sub-Clause 16.1 [Contractor's Entitlement to Suspend Work] in respect of a failure to comply with Sub-Clause 2.4 [Procuring Entity's Financial Arrangements],
b) the Engineer fails, within 56 days after receiving a Statement and supporting documents, to issue the relevant Payment Certificate,
c) the Contractor does not receive the amount due under an Interim Payment Certificate within 42 days after the expiry of the time stated in Sub-Clause 14.7 [Payment] within which payment is to be made (except for deductions in accordance with Sub-Clause 2.5 [Procuring Entity's Claims]),
d) the Procuring Entity substantially fails to perform his obligations under the Contract in such manner as to materially and adversely affect the economic balance of the Contract and/or the ability of the Contractor to perform the Contract,
e) the Procuring Entity fails to comply with Sub-Clause 1.6 [Contract Agreement] or Sub-Clause 1.7 [Assignment],
f) a prolonged suspension affects the whole of the Works as described in Sub-Clause 8.11 [Prolonged Suspension], or
g) the Procuring Entity becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events.
h) The Contractor does not receive the Engineer's instruction recording the agreement of both Parties on the fulfilment of the conditions for the Commencement of Works under Sub-Clause 8.1 [Commencement of Works.

16.2.2 In any of these events or circumstances, the Contractor may, upon giving 14 days' notice to the Procuring Entity, terminate the Contract. However, in the case of sub-paragraph (f) or (g), the Contractor may by notice terminate the Contract immediately.

16.2.3 In the event the Procuring Entity suspends the loan or credit from which part or whole of the payments to the Contractor are being made, if the Contractor has not received the sums due to him upon expiration of

the14 days referred to in Sub-Clause 14.7 [Payment] for payments under Interim Payment Certificates, the Contractor may, without prejudice to the Contractor's entitlement to financing charges under Sub-Clause14.8 [Delayed Payment], take one of the following actions, namely (i) suspend work or reduce the rate of work under Sub-Clause 16.1 above, or (ii) terminate the Contract by giving notice to the Procuring Entity, with a copy to the Engineer, such termination to take effect 14 days after the giving of the notice.

The Contractor's election to terminate the Contract shall not prejudice any other rights of the Contractor, under the Contract or otherwise.

16.3 Cessation of Work and Removal of Contractor's Equipment

After a notice of termination under Sub-Clause 15.5 [Procuring Entity's Entitlement to Termination for Convenience], Sub-Clause 16.2 [Termination by Contractor] or Sub-Clause 19.6 [Optional Termination, Payment and Release] has taken effect, the Contractor shall promptly:

a) Cease all further work, except for such work as may have been instructed by the Engineer for the protection of life or property or for the safety of the Works,

b) Handover Contractor's Documents, Plant, Materials and other work, for which the Contractor has received payment, and

c) Remove all other Goods from the Site, except as necessary for safety, and leave the Site.

16.4 Payment on Termination

After a notice of termination under Sub-Clause 16.2 [Termination by Contractor] has taken effect, the Procuring Entity shall promptly:

a) Return the Performance Security to the Contractor,

b) Pay the Contractor in accordance with Sub-Clause 19.6 [Optional Termination, Payment and Release], and

c) Pay to the Contractor the amount of any loss or damage sustained by the Contractor as a result of this termination.

17. RISK AND RESPONSIBILITY

17.1 Indemnities

17.1.1 The Contractor shall indemnify and hold harmless the Procuring Entity, the Procuring Entity's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of:

(a) Bodily injury, sickness, disease or death, of any person whatsoever arising out of or in the course of or by reason of the Contractor's design (if any), the execution and completion of the Works and the remedying of any defects, unless attributable to any negligence, willful actor breach of the Contract by the Procuring Entity, the Procuring Entity's Personnel, or any of the irrespective agents, and

(b) Damage to or loss of any property, real or personal (other than the Works), to the extent that such damage or loss arises out of or in the course of or by reason of the Contractor's design (if any), the execution and completion of the Works and the remedying of any defects, unless and to the extent that any such damage or loss is attributable to any negligence, willful act or breach of the Contract by the Procuring Entity, the Procuring Entity's Personnel, the irrespective agents, or any one directly or indirectly employed by any of them.

17.1.2 The Procuring Entity shall indemnify and hold harmless the Contractor, the Contractor's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of (1) bodily injury, sickness, disease or death, which is attributable to any negligence, willful act or breach of the Contract by the Procuring Entity, the Procuring Entity's Personnel, or any of their respective agents, and (2) the matters for which liability may be excluded from insurance cover, as described in sub-paragraphs (d)(i), (ii) and (iii) of Sub-Clause 18.3 [Insurance Against Injury to Persons and Damage to Property].

17.2 Contractor's Care of the Works

17.2.1 The Contractor shall take full responsibility for the care of the Works and Goods from the Commencement Date until the Taking-Over Certificate is issued (or is deemed to be issued under Sub-Clause 10.1 [Taking Over of the Works and Sections]) for the Works, when responsibility for the care of the Works shall pass to the Procuring Entity. If a Taking-Over Certificate is issued (or is so deemed to be issued) for any Section or part of the Works, responsibility for the care of the Section or part shall then pass to the Procuring Entity.

17.2.2 After responsibility has accordingly passed to the Procuring Entity, the Contractor shall take responsibility for the care of any work which is outstanding on the date stated in a Taking-Over Certificate, until this outstanding work has been completed.

17.2.3 If any loss or damage happens to the Works, Goods or Contractor's Documents during the period when the Contractor is responsible for their care, from any cause not listed in Sub-Clause 17.3 [Procuring Entity's Risks], the Contractor shall rectify the loss or damage at the Contractor's risk and cost, so that the Works, Goods and Contractor's Documents conform with the Contract.

17.2.4 The Contractor shall be liable for any loss or damage caused by any actions performed by the Contractor after a Taking-Over Certificate has been issued. The Contractor shall also be liable for any loss or damage which occurs after a Taking-Over Certificate has been issued and which arose from a previous event for which the Contractor was liable.

17.3 Procuring Entity's Risks

The risks referred to in Sub-Clause 17.4 [Consequences of Procuring Entity's Risks] below, insofar as they directly affect the execution of the Works in the Country, are:

a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
b) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war, within the Country,
c) riot, commotion or disorder within the Country by persons other than the Contractor's Personnel,
d) munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, within the Country, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity,
e) pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds,
f) use or occupation by the Procuring Entity of any part of the Permanent Works, except as may be specified in the Contract,
g) design of any part of the Works by the Procuring Entity's Personnel or by others for whom the Procuring Entity is responsible, and
h) any operation of the forces of nature which is Unforeseeable or against which an experienced contractor could not reasonably have been expected to have taken adequate preventive precautions.

17.4 Consequences of Procuring Entity's Risks

17.4.1 If and to the extent that any of the risks listed in Sub-Clause 17.3 above results in loss or damage to the Works, Goods or Contractor's Documents, the Contractor shall promptly give notice to the Engineer and shall rectify this loss or damage to the extent required by the Engineer.

17.4.2 If the Contractor suffers delay and/or incurs Cost from rectifying this loss or damage, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1[Contractor's Claims] to: a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
b) payment of any such Cost, which shall be included in the Contract Price. In the case of sub-paragraphs (f) and (g) of Sub-Clause 17.3 [Procuring Entity's Risks], Cost plus profit shall be payable.

17.4.3 After receiving this further notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

17.5 Intellectual and Industrial Property Rights

17.5.1 In this Sub-Clause, "infringement" means an infringement (or alleged infringement) of any patent, registered design, copyright, trademark, tradename, trade secret or other intellectual or industrial property right relating to the Works; and "claim" means a claim (or proceedings pursuing a claim) alleging an infringement.

17.5.2 Whenever a Party does not give notice to the other Party of any claim within 30 days of receiving the claim, the first Party shall be deemed to have waived any right to indemnity under this Sub-Clause.

17.5.3 The Procuring Entity shall indemnify and hold the Contractor harmless against and from any claim alleging an infringement which is or was:

a) An unavoidable result of the Contractor's compliance with the Contract, or

b) A result of any Works being used by the Procuring Entity:

i) For a purpose other than that indicated by, or reasonably to be inferred from, the

ii) Contract, or

iii) In conjunction with anything not supplied by the Contractor, unless such use was disclosed to the Contractor prior to the Base Date or is stated in the Contract.

17.5.4 The Contractor shall indemnify and hold the Procuring Entity harmless against and from any other claim which arises out of or in relation to (i) the manufacture, use, sale or import of any Goods, or (ii) any design for which the Contractor is responsible.

17.5.5 If a Party is entitled to be indemnified under this Sub-Clause, the indemnifying Party may (at its cost) conduct negotiations for the settlement of the claim, and any litigation or arbitration which may arise from it. The other Party shall, at the request and cost of the indemnifying Party, assist in contesting the claim. This other Party (and its Personnel) shall not make any admission which might be prejudicial to the indemnifying Party, unless the indemnifying Party failed to take over the conduct of any negotiations, litigation or arbitration upon being requested to do so by such other Party.

17.6 Limitation of Liability

17.6.1 Neither Party shall be liable to the other Party for loss of use of any Works, loss of profit, loss of any contractor for any indirect or consequential loss or damage which may be suffered by the other Party in connection with the Contract, other than as specifically provided in Sub-Clause 8.7 [Delay Damages]; Sub-Clause 11.2 [Cost of Remedying Defects]; Sub-Clause 15.4 [Payment after Termination]; Sub-Clause 16.4 [Payment on Termination]; Sub-Clause17.1 [Indemnities]; Sub-Clause 17.4 (b) [Consequences of Procuring Entity's Risks] and Sub-Clause 17.5[Intellectual and Industrial Property Rights].

17.6.2 The total liability of the Contractor to the Procuring Entity, under or in connection with the Contract other than under Sub-Clause 4.19 [Electricity, Water and Gas], Sub-Clause 4.20 [Procuring Entity's Equipment and Free- Issue Materials], Sub-Clause 17.1 [Indemnities] and Sub-Clause 17.5 [Intellectual and Industrial Property Rights], shall not exceed the sum resulting from the application of a multiplier (less or greater than one) to the Accepted Contract Amount, as stated in the **SCC**, or (if such multiplier or other sum is not so stated) the Accepted Contract Amount.

17.6.3 This Sub-Clause shall not limit liability in any case of fraud, deliberate default or reckless misconduct by the defaulting Party.

17.7 Use of Procuring Entity's Accommodation/Facilities

17.7.1 The Contractor shall take full responsibility for the care of the Procuring Entity provided accommodation and facilities, if any, as detailed in the Specification, from the respective dates of hand-over to the Contract or until cessation of occupation (where hand-over or cessation of occupation may take place after the date stated in the Taking-Over Certificate for the Works).

17.7.2 If any loss or damage happens to any of the above items while the Contractor is responsible for their care arising from any cause whatsoever other than those for which the Procuring Entity is liable, the Contractor shall, at his own cost, rectify the loss or damage to the satisfaction of the Engineer.

18. INSURANCE

18.1 General Requirements for Insurances

18.1.1 In this Clause, "insuring Party" means, for each type of insurance, the Party responsible for effecting and maintaining the insurance specified in the relevant Sub-Clause.

18.1.2 Wherever the Contractor is the insuring Party, each insurance shall be effected with insurers and in terms approved by the Procuring Entity. These terms shall be consistent with any terms agreed by both Parties before the date of the Letter of Acceptance. This agreement of terms shall take precedence over the provisions of this Clause.

18.1.3 Wherever the Procuring Entity is the insuring Party, each insurance shall be effected with insurers and in terms acceptable to the Contractor. These terms shall be consistent with any terms agreed by both Parties before the date of the Letter of Acceptance. This agreement of terms shall take precedence over the provisions of this Clause.

18.1.4 If a policy is required to indemnify joint insured, the cover shall apply separately to each insured as though a separate policy had been issued for each of the joint insured. If a policy indemnifies additional joint insured, namely in addition to the insured specified in this Clause, (i) the Contractor shall act under the policy on behalf of these additional joint insured except that the Procuring Entity shall act for Procuring Entity's Personnel, (ii) additional joint insured shall not be entitled to receive payments directly from the insurer or to have any other direct dealings with the insurer, and (iii) the insuring Party shall require all additional joint insured to comply with the conditions stipulated in the policy.

18.1.5 Each policy insuring against loss or damage shall provide for payments to be made in the currencies required to rectify the loss or damage. Payments received from insurers shall be used for the rectification of the loss or damage.

18.1.6 The relevant insuring Party shall, within the respective periods stated in the **SCC** (calculated from the Commencement Date), submit to the other Party:

a) Evidence that the insurances described in this Clause have been effected, and

b) Copies of the policies for the insurances described in Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment] and Sub-Clause 18.3 [Insurance against Injury to Persons and Damage to Property].

18.1.7 When each premium is paid, the insuring Party shall submit evidence of payment to the other Party. Whenever evidence or policies are submitted, the insuring Party shall also give notice to the Engineer.

18.1.8 Each Party shall comply with the conditions stipulated in each of the insurance policies. The insuring Party shall keep the insurers informed of any relevant changes to the execution of the Works and ensure that insurance is maintained in accordance with this Clause.

Neither Party shall make any material alteration to the terms of any insurance without the prior approval of the other Party. If an insurer makes (or attempts to make) any alteration, the Party first notified by the insurer shall promptly give notice to the other Party.

18.1.9 The insuring Party fails to effect and keep in force any of the insurances it is required to effect and maintain under the Contract or fails to provide satisfactory evidence and copies of policies in accordance with this Sub- Clause, the other Party may (at its option and without prejudice to any other right or remedy) effect insurance for the relevant coverage and pay the premiums due. The insuring Party shall pay the amount of these premiums to the other Party, and the Contract Price shall be adjusted accordingly.

18.1.10 Nothing in this Clause limits the obligations, liabilities or responsibilities of the Contractor or the Procuring Entity, under the other terms of the Contractor otherwise. Any amounts not insured or not recovered from the insurers shall be borne by the Contractor and/or the Procuring Entity in accordance with these obligations, liabilities or responsibilities. However, if the insuring Party fails to effect and keep in force an insurance which is available and which it is required to effect and maintain under the Contract, and the other Party neither approves the omission nor effects insurance for the coverage relevant to this default, any moneys which should have been recoverable under this insurance shall be paid by the insuring Party.

18.1.11 Payments by one Party to the other Party shall be subject to Sub-Clause 2.5 [Procuring Entity's Claims] or Sub- Clause 20.1[Contractor's Claims], as applicable.

18.1.12 The Contractor shall be entitled to place all insurance relating to the Contract (including, but not limited to the insurance referred to Clause18) with insurers from any eligible source country.

18.2 Insurance for Works and Contractor's Equipment

18.2.1 The insuring Party shall insure the Works, Plant, Materials and Contractor's Documents for not less than the full reinstatement cost including the costs of demolition, removal of debris and professional fees and profit. This insurance shall be effective from the date by which the evidence is to be submitted under sub-paragraph (a) of Sub-Clause 18.1 [General Requirements for Insurances], until the date of issue of the Taking-Over Certificate for the Works.

18.2.2 The insuring Party shall maintain this insurance to provide cover until the date of issue of the Performance Certificate, for loss or damage for which the Contractor is liable arising from a cause occurring prior to the issue of the Taking-Over Certificate, and for loss or damage caused by the Contractor in the course of any other operations (including those under Clause 11 [Defects Liability]).

18.2.3 The insuring Party shall insure the Contractor's Equipment for not less than the full replacement value, including delivery to Site. For each item of Contractor's Equipment, the insurance shall be effective while it is being transported to the Site and until it is no longer required as Contractor's Equipment.

18.2.4 Unless otherwise stated in the Particular Conditions, insurances under this Sub-Clause:

a) Shall be effected and maintained by the Contractor as insuring Party,

b) shall be in the joint names of the Parties, who shall be jointly entitled to receive payments from the insurers, payments being held or allocated to the Party actually bearing the costs of rectifying the loss or damage,

c) shall cover all loss and damage from any cause not listed in Sub-Clause 17.3 [Procuring Entity's Risks],

d) shall also cover, to the extent specifically required in the tendering documents of the Contract, loss or damage to a part of the Works which is attributable to the use or occupation by the Procuring Entity of another part of the Works, and loss or damage from the risks listed in sub-paragraphs (c), (g) and (h) of Sub-Clause 17.3 [Procuring Entity's Risks], excluding (in each case) risks which are not insurable at commercially reasonable terms, with deductibles per occurrence of not more than the amount stated in the **SCC** (if an amount is not so stated, this sub-paragraph (d) shall not apply), and

e) may however exclude loss of, damage to, and reinstatement of:

   i) a part of the Works which is in a defective condition due to a defect in its design, materials or workmanship (but cover shall include any other parts which are lost or damaged as a direct result of this defective condition and not as described in sub-paragraph (ii) below),

   ii) a part of the Works which is lost or damaged in order to reinstate any other part of the Works if this other part is in a defective condition due to a defect in its design, materials or workmanship,

   iii) a part of the Works which has been taken over by the Procuring Entity, except to the extent that the Contractor is liable for the loss or damage, and

   iv) Goods while they are not in the Country, subject to Sub-Clause 14.5 [Plant and Materials intended for the Works].

18.2.5 If, more than one year after the Base Date, the cover described in sub-paragraph (d) above ceases to be available at commercially reasonable terms, the Contractor shall (as insuring Party) give notice to the Procuring Entity, with supporting particulars. The Procuring Entity shall then (i) be entitled subject to Sub-Clause 2.5 [Procuring Entity's Claims] to payment of an amount equivalent to such commercially reasonable terms as the Contractor should have expected to have paid for such cover, and (ii) be deemed, unless he obtains the cover at commercially reasonable terms, to have approved the omission under Sub-Clause 18.1 [General Requirements for Insurances].

18.3 Insurance against Injury to Persons and Damage to Property

18.3.1 The insuring Party shall insure against each Party's liability for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment]) or to any person (except persons insured under Sub-Clause 18.4 [Insurance for Contractor's Personnel]), which may arise out of the Contractor's performance of the Contract and occurring before the issue of the Performance Certificate.

18.3.2 This insurance shall be for a limit per occurrence of not less than the amount stated in the **SCC**, with no limit on the number of occurrences. If an amount is not stated in the **SCC**, this Sub-Clause shall not apply. Unless otherwise stated in the Particular Conditions, the insurances specified in this Sub-Clause:

a) Shall be effected and maintained by the Contractor as insuring Party,

b) S h a l l be in the joint names of the Parties,

c) Shall be extended to cover liability for all loss and damage to the Procuring Entity's property (except things insured under Sub-Clause 18.2) arising out of the Contractor's performance of the Contract, and

d) May however exclude liability to the extent that it arises from:

i) The Procuring Entity's right to have the Permanent Works executed on, over, under, in or through any land, and to occupy this land for the Permanent Works,

ii) damage which is an unavoidable result of the Contractor's obligations to execute the Works and remedy any defects, and

iii) a cause listed in Sub-Clause 17.3 [Procuring Entity's Risks], except to the extent that cover is available at commercially reasonable terms.

18.4 Insurance for Contractor's Personnel

18.4.1 The Contract or shall effect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel.

18.4.2 The insurance shall cover the Procuring Entity and the Engineer against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Procuring Entity or of the Procuring Entity's Personnel.

18.4.3 The insurance shall be maintained in full force and effect during the whole time that these personnel are assisting in the execution of the Works. For a Subcontractor's employees, the insurance may be effected by the Subcontractor, but the Contractor shall be responsible for compliance with this Clause.

19. FORCE MAJEURE

19.1 Definition of Force Majeure

19.1.1 In this Clause, "Force Majeure" means an exceptional event or circumstance:

a) Which is beyond a Party's control,

b) Which such Party could not reasonably have provided against before entering into the Contract,

c) Which, having arisen, such Party could not reasonably have avoided or overcome, and

d) Which is not substantially attributable to the other Party.

19.1.2 Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:

i) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,

ii) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war,

iii) riot, commotion, disorder, strike or lockout by persons other than the Contractor's Personnel,

iv) munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, and

v) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

19.2 Notice of Force Majeure

19.2.1 If a Party is or will be prevented from performing its substantial obligations under the Contract by Force

Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.

19.2.2 The Party shall, having given notice, be excused performance of its obligations for so long as such Force Majeure prevents it from performing them.

Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.

19.3 Duty to Minimize Delay

Each Party shall at all times use all reasonable endeavors to minimize any delay in the performance of the Contract as a result of Force Majeure. A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.

19.4 Consequences of Force Majeure

19.4.1 If the Contractor is prevented from performing his substantial obligations under the Contract by Force Majeure of which notice has been given under Sub-Clause 19.2 [Notice of Force Majeure], and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and

b) if the event or circumstance is of the kind described in sub-paragraphs (i) to (iv) of Sub-Clause 19.1 [Definition of Force Majeure] and, in sub-paragraphs (ii) to (iv), occurs in the Country, payment of any such Cost, including the costs of rectifying or replacing the Works and/or Goods damaged or destroyed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment].

19.4.2 After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these matters.

19.5 Force Majeure Affecting Subcontractor

If any Subcontractor is entitled under any contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Clause, such additional or broader force majeure events or circumstances shall not excuse the Contractor's non-performance or entitle him to relief under this Clause.

19.6 Optional Termination, Payment and Release

If the execution of substantially all the Works in progress is prevented for a continuous period of 84 days by reason of Force Majeure of which notice has been given under Sub-Clause 19.2 [Notice of Force Majeure], or for multiple periods which total more than 140 days due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 days after the notice is given, and the Contractor shall proceed in accordance with Sub-Clause 16.3 [Cessation of Work and Removal of Contractor's Equipment].

Upon such termination, the Engineer shall determine the value of the work done and issue a Payment Certificate which shall include:

a) The amounts payable for any work carried out for which a price is stated in the Contract;

b) The Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Procuring Entity when paid for by the Procuring Entity, and the Contractor shall place the same at the Procuring Entity's disposal;

c) other Cost or liabilities which in the circumstances were reasonably and necessarily incurred by the

Contractor in the expectation of completing the Works;

d) the Cost of removal of Temporary Works and Contractor's Equipment from the Site and there turn of these items to the Contractor's works in his country (or to any other destination at no greater cost); and

e) the Cost of repatriation of the Contractor's staff and labor employed wholly in connection with the Works at the date of termination.

19.7 Release from Performance

Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises which makes it impossible or unlawful for either or both Parties to fulfil its or their contractual obligations or which, under the law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party to the other Party of such event or circumstance:

a) The Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract, and

b) The sum payable by the Procuring Entity to the Contractor shall be the same as would have been payable under Sub-Clause 19.6 [Optional Termination, Payment and Release] if the Contract had been terminated under Sub-Clause 19.6.

20. CLAIMS, DISPUTES AND ARBITRATION

20.1 Contractor's Claims

20.1.1 If the Contractor considers itself to be entitled to any extension of the Time for Completion and/or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall give Notice to the Engineer, describing the event or circumstance giving rise to the claim. The notice shall be given as soon as practicable, and not later than 30 days after the Contractor became aware, or should have become aware, of the event or circumstance.

20.1.2 IftheContractorfailstogivenoticeofaclaimwithinsuchperiodof30days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Procuring Entity shall be discharged from all liability in connection with the claim. Otherwise, the following provisions of this Sub-Clause shall apply.

20.1.3 The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.

20.1.3 The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at another location acceptable to the Engineer. Without admitting the Procuring Entity's liability, the Engineer may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Engineer to inspect all these records, and shall (if instructed) submit copies to the Engineer.

20.1.4 Within 42 days after the Contractor became aware (or should have become aware) of the event or circumstance giving rise to the claim, or within such other period as may be proposed by the Contractor and approved by the Engineer, the Contractor shall send to the Engineer a fully detailed claim which includes full supporting particulars of the basis of the claim and of the extension of time and/or additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:

a) This fully detailed claim shall be considered as interim;

b) The Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed, and such further particulars as the Engineer may reasonably require; and

c) The Contractor shall send a final claim within 30 days after the end of the effects resulting from the event or circumstance, or within such other period as may be proposed by the Contractor and approved by the Engineer.

20.1.5 Within 42 days after receiving a Notice of a claim or any further particulars supporting a previous claim, or

within such other period as may be proposed by the Engineer and approved by the Contractor, the Engineer shall respond with approval, or with disapproval and detailed comments. He may also request any necessary further particulars, but shall nevertheless give his response on the principles of the claim within the above defined time period.

20.1.6 Within the above defined period of 42 days, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with Sub-Clause 8.4 [Extension of Time for Completion], and/or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.

20.1.7 Each Payment Certificate shall include such additional payment for any claim as has been reasonably substantiated as due under the relevant provision of the Contract. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim, the Contractor shall only be entitled to payment for such part of the claim as he has been able to substantiate.

20.1.8 If the Engineer does not respond within the time frame defined in this Clause, either Party may consider that the claim is rejected by the Engineer and any of the Parties may refer to Arbitration in accordance with Sub-Clause 20.4 [Arbitration].

20.1.9 The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply toa claim. If the Contractor fails to comply with this or another Sub-Clause in relation to any claim, any extension of time and/or additional payment shall take account of the extent (if any) to which the failure has prevented or prejudiced proper investigation of the claim, unless the claim is excluded under the second paragraph of Sub- Clause 20.3 (f).

20.2 Amicable Settlement

Where a notice of a claim has been given, both Parties shall attempt to settle the dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, the Party giving a notice of a claim in accordance with Sub-Clause 20.1 above should move to commence arbitration after the fifty-sixth day from the day on which a notice of a claim was given, even if no attempt at an amicable settlement has been made.

20.3 Matters that may be referred to arbitration

Notwithstanding anything stated herein the following matters may be referred to arbitration before the practical completion of the Works or abandonment of the Works or termination of the Contract by either party:

a) The appointment of a replacement Engineer upon the said person ceasing to act.
b) Whether or not the issue of an instruction by the Engineer is empowered by these Conditions.
c) Whether or not a certificate has been improperly withheld or is not in accordance with these Conditions.
e) Any dispute arising in respect of war risks or war damage.
f) All other matters shall only be referred to arbitration after the completion or alleged completion of the Works or termination or alleged termination of the Contract, unless the Procuring Entity and the Contract or agree otherwise in writing.

20.4 Arbitration

20.4.1 Any claim or dispute between the Parties arising out of or in connection with the Contract not settled amicably in accordance with Sub-Clause 20.3 shall be finally settled by arbitration.

20.4.2 No arbitration proceedings shall be commenced on any claim or dispute where notice of a claim or dispute has not been given by the applying party within ninety days of the occurrence or discovery of the matter or issue giving rise to the dispute.

20.4.3 Notwithstanding the issue of a notice as stated above, the arbitration of such a claim or dispute shall not commence unless an attempt has in the first instance been made by the parties to settle such claim or dispute amicably with or without the assistance of third parties. Proof of such attempt shall be required.

20.4.4 The Arbitrator shall, without prejudice to the generality of his powers, have powers to direct such measurements, computations, tests or valuations as may in his opinion be desirable in order to determine the rights of the parties and assess and award any sums which ought to have been the subject of or included in any certificate.

20.4.5 The Arbitrator shall, without prejudice to the generality of his powers, have powers to open up, review and revise any certificate, opinion, decision, requirement or notice and to determine all matters in dispute which shall be submitted to him in the same manner as if no such certificate, opinion, decision requirement or notice had been given.

20.4.6 The arbitrators shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Engineer, relevant to the dispute. Nothing shall disqualify representatives of the Parties and the Engineer from being called as a witness and giving evidence before the arbitrators on any matter whatsoever relevant to the dispute.

20.4.7 Neither Party shall be limited in the proceedings before the arbitrators to the evidence, or to the reasons for dissatisfaction given in its Notice of Dissatisfaction.

20.4.7 Arbitration may be commenced prior to or after completion of the Works. The obligations of the Parties, and the Engineer shall not be altered by reason of any arbitration being conducted during the progress of the Works.

20.4.8 The terms of the remuneration of each or all the members of Arbitration shall be mutually agreed upon by the Parties when agreeing the terms of appointment. Each Party shall be responsible for paying one-half of this remuneration.

20.5 Arbitration with National Contractors

20.5.1 If the Contract is with national contractors, arbitration proceedings will be conducted in accordance with the Arbitration Laws of Kenya. In case of any claim or dispute, such claim or dispute shall be notified in writing by either party to the other with a request to submit it to arbitration and to concur in the appointment of an Arbitrator within thirty days of the notice. The dispute shall be referred to the arbitration and final decision of a person to be agreed between the parties. Failing agreement to concur in the appointment of an Arbitrator, the Arbitrator shall be appointed, on the request of the applying party, by the Chairman or Vice Chairman of any of the following professional institutions;

i) Architectural Association of Kenya
ii) Institute of Quantity Surveyors of Kenya
iii) Association of Consulting Engineers of Kenya
iv) Chartered Institute of Arbitrators (Kenya Branch)
v) Institution of Engineers of Kenya

20.5.2 The institution written to first by the aggrieved party shall take precedence over all other institutions.

20.6 Arbitration with Foreign Contractors

20.7.1 Arbitration with foreign contractors shall be conducted in accordance with the arbitration rules of the United Nations Commission on International Trade Law (UNCITRAL); or with proceedings administered by the International Chamber of Commerce (ICC) and conducted under the ICC Rules of Arbitration; by one or more arbitrators appointed in accordance with said arbitration rules.

20.7.2 The place of arbitration shall be a location specified in the **SCC;** and the arbitration shall be conducted in the language for communications defined in Sub-Clause 1.4 [Law and Language].

20.7 Alternative Arbitration Proceedings

Alternatively, the Parties may refer the matter to the Nairobi Centre for International Arbitration (NCIA) which offers a neutral venue for the conduct of national and international arbitration with commitment to providing institutional support to the arbitral process.

20.8 Failure to Comply with Arbitrator's Decision

20.8.1 The award of such Arbitrator shall be final and binding upon the parties.

20.8.2 In the event that a Party fails to comply with a final and binding Arbitrator's decision, then the other Party may, without prejudice to any other rights it may have, refer the matter to a competent court of law.

20.9 Contract operations continue

Notwithstanding any reference to arbitration herein,

a) The parties shall continue to perform their respective obligations under the Contract unless they otherwise agree; and

b) The Procuring Entity shall pay the Contractor any monies due the Contractor.

SECTION IX - SPECIAL CONDITIONS OF CONTRACT

The following Particular Conditions shall supplement the GCC. Particular Conditions and SCC (Special Conditions of Contract) are synonymous and are used interchangeably and they modify the General Conditions of Contract. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

Conditions	GCC Clause	Data
Procuring Entity's name and address	1	**The Chief Executive Officer** **Northern Water Works Development Agency** **P. O. Box 495-70100, Garissa Maji House, Kismayu Road, Garissa Town, Kenya. Telephone: +254-46-2103598, 0711559995** **e-mail: info@nwwda.go.ke**
Time for Completion	1	**18 Months**
Engineer's name and address	1	**General Manager, Infrastructure Development** **Northern Water Works Development Agency** **P. O. Box 495-70100,** **Garissa Maji House,** **Kismayu Road, Garissa Town, Kenya. Telephone: +254-46-2103598**
Electronic transmission	1.3	**Not Applicable**
Time for the Parties entering into a Contract Agreement	1.6	**Not later than Twenty-One (21) Days after Contractor receives an acceptance letter through a letter of award.**
Time for access to the Site	2.1	**No later than the Commencement Date**
Engineer's Authority to make variations.	3.1.2 (b) (ii)	All variations resulting in an increase in the accepted contract amount require approval of the Procuring Entity
Performance Security	4.2.2	The Performance Security will be in the form of a **Unconditional Bank Guarantee** in the amount(s) of **10%** of the Accepted Contract Amount, and in the same currency(ies) as the Accepted Contract Amount.
Contractor's Representative's name	4.3	*[insert the name of the Contractor's Representative agreed by the Procuring Entity prior to Contract signature]*
Working Hours	6.5	Normal working hours shall be a total of 45 hrs. per week, Monday-Friday **8:00am to 5:00pm, Saturday 8.00am-1.00 p.m.** except on **holidays**
Key Personnel names	6.9.1	***[insert the name of each Key Personnel agreed by the Procuring Entity prior to Contract signature]***
Commencement of Works	8.1.1(c)	As per Engineer's order to commence works
Delay Damages	8.7.1	Delay damages shall be **0.005 %** of the Contract Price per day of delay.
Maximum amount of delay damages	8.7.1	**7.5%** of the final Contract Price.
Defects Notification Period		**12 Months**

Adjustments for Changes in Cost	13.8.3	**Not Applicable**
Provisional Sums	13.5. (b)(iii)	**10 %**
Total advance payment	14.2.1	**10%** Percentage of the Accepted Contract Amount payable in the currencies and proportions in which the
Repayment amortization rate of advance payment	14.2.4(b)	**20%** of each Interim payment certificate amount, commencing at 30% progress and be fully recovered by 90% progress.
Limit of Retention	14.3.2(c)	The limit of Retention Money (if any) shall be **10%**
Percentage of Retention	14.3.2(c)	**10%**
Plant and Materials	14.5.2(b)(i)	**Not Applicable**
	14.5.2(c)(i)	**Not Applicable**
Minimum Amount of Interim Payment Certificates	14.6.1	**5%** of the Accepted Contract Amount.
Publishing source of commercial interest rates for financial charges in case of delayed payment	14.8	**Not Applicable**
Maximum total liability of the Contractor to the Procuring Entity	17.6.2	**The Accepted Contract Amount.**
Periods for submission of insurance:	18.1.6	From the commencement date
a. evidence of insurance.		**7 days**
b. relevant policies		**28 days**
Maximum number of deductibles for insurance of the Procuring Entity's risks	18.2(d)	The minimum insurance amounts and deductibles shall be: (a) For loss or damage to the Works, Plant, Materials and Contractor's Equipment: • Minimum Insurance Amount shall be the Contract Sum plus the value of the Contractor's Plant & Equipment plus Ksh. 5,000,000 for clearance of debris • Maximum Deductible shall be 5% of Each Loss (b) For Personal Injury or death of the Contractor's Employees: **Ksh 2,000,000** per occurrence, number of occurrences unlimited. • Maximum Deductible shall be **5%** of Each Loss
Minimum amount of third-party insurance	18.3.2	i) For damage to Third Party Property: **Ksh. 50,000,000.00/= per occurrence with number of occurrences unlimited** For Personal Injury or death of Third Parties: **Kshs.5,000,000/= per occurrence with number of occurrences unlimited**
The place of arbitration	20.7.2	**Nairobi, Kenya**

SECTION X - CONTRACT FORMS

TABLE OF FORMS

FORM NO. I - NOTIFICATION OF INTENTION TO AWARD

[*This Notification of Intention to Award shall be sent to each Tenderer that submitted a Tender.*] [*Send trinification to the Tenderer's Authorized Representative named in the Tender Information Form*]

FORMAT

For the attention of Tenderer's Authorized Representative

Name……..... *[insert Authorized Representative's name]*

Address: [*insert Authorized Representative's Address]*

Telephones: *[insert Authorized Representative's telephone/fax numbers]*

Email Address: *[insert Authorized Representative's email address]*

*[**IMPORTANT:** insert the date that this Notification is transmitted to Tenderers. The Notification must be sent to all Tenderers simultaneously. This means on the same date and as close to the same time as possible.]*

Date of Transmission: This Notification is sent by: [*email*] on [*date*] (local time)

Procuring Entity: *[insert the name of the Procuring Entity]* Contract title: *[insert the name of the contract]*

Country: Kenya, County_____(*if the Procuring Entity is from a County*)

This Notification of Intention to Award (Notification) notifies you of our decision to award the above contract. The transmission of this Notification begins the Standstill Period. During the Standstill Period, you may:

a) Request a debriefing in relation the evaluation of your Tender, and/or

b) Submit a Procurement-related Complaint in relation to the decision to award the contract.

1. The successful Tenderer

Name: [*insert name of successful Tenderer*].

Address: [*insert address of the successful Tenderer*]

Contract price: [*insert contract price of the successful Tender*]

2. Other Tenderers: *insert names of all Tenderers that submitted a Tender. If the Tender's price was evaluated include the evaluated price as well as the Tender price as read out.]*

	Name of Tenderer	**Tender price**	**Evaluated Tender price**	*Comments (if any)*
1				
2				
3				
4				
5				
6				
Etc.				

1. How to request a debriefing

DEADLINE: The deadline to request a debriefing expires at midnight on [*insert date*] (local time).

You may request a debriefing in relation to the results of the evaluation of your Tender. If you decide to request a debriefing your written request must be made within three (3) Business Days of receipt of this Notification of Intention to Award. Provide the contract name, reference number, name of the Tenderer, contact details; and address the request for debriefing as follows:

Attention: [*insert full name of person, if applicable*] **Title/position**: *[insert title/position*] **Procuring Entity**:

[*insert name of Procuring Entity*] **Email address**: [*insert email address*]

If your request for a debriefing is received within the 3 Business Days deadline, we will provide the debriefing within five (5) Business Days of receipt of your request. If we are unable to provide the debriefing within this period, the Standstill Period shall be extended by five (5) Business Days after the date that the debriefing is provided. If this happens, we will notify you and confirm the date that the extended Standstill Period will end. The debriefing may be in writing, by phone, video conference call or in person. We shall promptly advise you in writing how the debriefing will take place and confirm the date and time.

If the deadline to request a debriefing has expired, you may still request a debriefing. In this case, we will provide the debriefing as soon as practicable, and normally no later than fifteen (15) Business Days from the date of publication of the Contract Award Notice.

2. How to make a complaint

Period: Procurement-related Complaint challenging the decision to award shall be submitted by midnight, [*insert date*] (local time).

Provide the contract name, reference number, name of the Tenderer, contact details; and address the Procurement-related Complaint as follows:

Attention: [*insert full name of person, if applicable*]

Title/position: [*insert title/position*] Procuring

Entity: [*insert name of Procuring Entity*] Email

address: [*insert email address*]

At this point in the procurement process, you may submit a Procurement-related Complaint challenging the decision to award the contract. You do not need to have requested, or received, a debriefing before making this complaint. Your complaint must be submitted within the Standstill Period and received by us before the Standstill Period ends.

In summary, there are four essential requirements:

a) You must be an 'interested party'. In this case, that means a Tenderer who submitted a Tender in this tendering process, and is the recipient of a Notification of Intention to Award.

b) The complaint can only challenge the decision to award the contract.

c) You must submit the complaint within the period stated above.

d) You must include, in your complaint, all of the information necessary to support your case.

e) The application must be accompanied by the fees set out in the Procurement Regulations, which shall not be refundable (information available from the Public Procurement Authority at www.ppoa.go.ke.

3. Standstill Period

DEADLINE: The Standstill Period is due to end at midnight on [*insert date*] (local time).

i) The Standstill Period lasts ten (14) Days after the date of transmission of this Notification of Intention to Award.
ii) The Standstill Period may be extended as stated in Section 4 above.

If you have any questions regarding this Notification please do not hesitate to contact

us. On behalf of the Procuring Entity:

Name_____

Title and Position_____

_____

Signature_____

Date_____

FORM NO. 2 - REQUEST FOR REVIEW

FORM FOR REVIEW (r.203 (1))

PUBLIC PROCUREMENT ADMINISTRATIVE REVIEW BOARD
APPLICATION NO……. OF……..20…….. BETWEEN
……..……. APPLICANT

AND

……RESPONDENT (Procuring Entity)

Request for review of the decision of the…… (Name of the Procuring Entity of ……dated the…day of ……20…….in the matter of Tender No……...…of ……...20….. for ..... (Tender description).

REQUEST FOR REVIEW

I/We……, the above-named Applicant(s), of address: Physical address……. P. O. Box No……. Tel. No……. Email ……, hereby request the Public Procurement Administrative Review Board to review the whole/part of the above-mentioned decision on the following grounds, namely:

1.

2.

By this memorandum, the Applicant requests the Board for an order/order that:

1.

2.

SIGNED ……. (Applicant) Dated on……. day of ……/…20……

FOR OFFICIAL USE ONLY Lodged with the Secretary Public Procurement Administrative Review Board on……day of ……....20….……

SIGNED

Board Secretary

FORM NO. 3 - LETTER OF AWARD

[Letter head paper of the Procuring Entity]
[Date]
FORMAT

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

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

You are requested to furnish the Performance Security within 30 days in accordance with the Conditions of Contract, using, for that purpose, one of the Performance Security Forms included in Section X, Contract Forms, of the tender document.

We attach a copy of the Contact for your

Authorized Signature:
Name and Title of
Signatory: Name of
Agency:

Attachment: Contract Agreement

FORM NO. 4 – CONTRACT AGREEMENT

THIS AGREEMENT made the _____ day of _____, ___, between _____ of _____(hereinafter "the Procuring Entity"), of the one part, and__of_____(herein after "the Contractor"), of the other part:

WHEREAS the Procuring Entity desires that the Works known as_____should be executed by the Contractor, and has accepted a Tender by the Contractor for the execution and completion of these Works and the remedying of any defects therein, The Procuring Entity 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 Tender

   c) The addenda Nos_____(if any)

   d) The Particular Conditions

   e) The General Conditions;

   f) The Specification

   g) The Drawings*;* and

   h) The completed Schedules and any other documents forming part of the contract.

3. In consideration of the payments to be made by the Procuring Entity to the Contractor as specified in this Agreement, the Contractor hereby covenants with the Procuring Entity to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Procuring Entity 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 Kenya on the day, month and year specified above.

Signed by_____

_____(For the Procuring Entity)

Signed by_____

_____(For the Contractor)

FORM NO. 5 - PERFORMANCE SECURITY
– (Unconditional Demand Bank Guarantee)

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: *[[insert name and Address of* Procuring Entity*]* **Date:** *[Insert date of issue]*

PERFORMANCE GUARANTEE No.:

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

1. We have been informed that (herein after called "the Applicant") has entered into Contract No. *dated* with the Beneficiary, for the execution of (herein after called "the Contract").

2. Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

3. At the request of the Applicant, we as Guarantor, here by irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of( ),[1] 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.

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

5. 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."

_____

_____

[Name of Authorized Official, signature(s) and seals/stamps]

Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.

---

[1] *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.*

[2] *Insert the date twenty-eight days after the expected completion date as described in GC Clause 11.9. The Procuring Entity should note that in the event of an extension of this date for completion of the Contract, the Procuring Entity 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 Procuring Entity might consider adding the following text to the form, at the end of the pen ultimate 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."*

FORM No. 6 - PERFORMANCE SECURITY OPTION 2– (Performance Bond)

*[**Note:** Procuring Entities are advised to use Performance Security–Unconditional Demand Bank Guarantee instead of Performance Bond due to difficulties involved in calling Bond holder to action]*

[Guarantor letterhead or SWIFT identifier code]

Beneficiary: _____ **[***insert name and Address of* Procuring

Entity*]* **Date:** _____ **[***Insert date of issue]* **PERFORMANCE**

BOND No.: _____

Guarantor: [*Insert name and address of place of issue, unless indicated in the letter head]*

1. By this Bond_____as Principal (hereinafter called "the Contractor") and_____] as Surety (hereinafter called "the Surety"), are held and firmly bound unto_____] as Obligee (hereinafter called "the Procuring Entity") in the amount of_____for the payment of which sum well and truly to be made in the types and proportions of currencies in which the Contract Price is payable, the Contractor and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

2 WHEREAS the Contractor has entered into a written Agreement with the Procuring Entity dated the day of, 20_____,for_____in accordance with the documents, plans, specifications, and amendments thereto, which to the extent here in provided for, are by reference made part hereof and are herein after referred to as the Contract.

3 NOW, THEREFORE, the Condition of this Obligation is such that, if the Contractor shall promptly and faithfully perform the said Contract (including any amendments thereto), then this obligation shall be null and void; otherwise, it shall remain in full force and effect. Whenever the Contractor shall be, and declared by the Procuring Entity to be, in default under the Contract, the Procuring Entity having performed the Procuring Entity's obligations there under, the Surety may promptly remedy the default, or shall promptly:

1) Complete the Contract in accordance with its terms and conditions; or

2) Obtain a tender or tenders from qualified tenderers for submission to the Procuring Entity for completing the Contract in accordance with its terms and conditions, and upon determination by the Procuring Entity and the Surety of the lowest responsive Tenderers, arrange for a Contract between such Tenderer, and Procuring Entity and make available as work progresses (even though there should be a default or a succession of defaults under the Contract or Contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the Balance of the Contract Price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "Balance of the Contract Price," as used in this paragraph, shall mean the total amount payable by Procuring Entity to Contractor under the Contract, less the amount properly paid by Procuring Entity to Contractor; or

3) Pay the Procuring Entity the amount required by Procuring Entity to complete the Contract in accordance with its terms and conditions up to a total not exceeding the amount of this Bond.

4 The Surety shall not be liable for a greater sum than the specified penalty of this Bond.

5 Any suit under this Bond must be instituted before the expiration of one year from the date of the issuing of the Taking-Over Certificate. No right of action shall accrue on this Bond to or for the use of any person or corporation other than the Procuring Entity named here in or the heirs, executors, administrators, successors, and assigns of the Procuring Entity.

6 In testimony where of, the Contractor has here unto set his hand and affixed his seal, and the Surety has caused these presents to be sealed with his corporate seal duly attested by the signature of his legal representative, this day
_____of_____20_____.

SIGNED ON_____on behalf of_____

By_____in the capacity of_____

In the presence of

SIGNED ON_____on behalf of_____

By_____in the capacity of_____

In the presence of

FORM NO. 7 - ADVANCE PAYMENT SECURITY

[Demand Bank Guarantee] *[Guarantor letterhead or SWIFT identifier code] [Guarantor letterhead or SWIFT identifier code]*

Beneficiary: *[Insert name and Address of* Procuring Entity*]* **Date:** *[Insert date of issue]*

ADVANCE PAYMENT GUARANTEE No.: *[Insert guarantee reference number]*

Guarantor: [*Insert name and address of place of issue, unless indicated in the letterhead]*

1. We have been informed that (herein after called "the Applicant") has entered into Contract No. *dated* with the Beneficiary, for the execution of (herein after called" the Contract").

2. Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum () is to be made against an advance payment guarantee.

3. 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 ()[1] 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 either that the Applicant:
   a) Has used the advance payment for purposes other than the costs of mobilization in respect of the works; or
   b) Has failed to repay the advance payment in accordance with the Contract conditions, specifying the amount which the Applicant has failed to repay.

4. A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary's bank stating that the advance payment referred to above has been credited to the Applicant on its account number at

5. The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Applicant as specified in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the interim payment certificate indicating that ninety (90) percent of the Accepted Contract Amount, less provisional sums, has been certified for payment, or on the day of ,2 ,[2] whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

6. 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.

   [Name of Authorized Official, signature(s) and seals/stamps]

Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.

[1] *The Guarantor shall insert an amount representing the amount of the advance payment and denominated either in the currency (ies) of the advance payment as specified in the Contract, or in a freely convertible currency acceptable to the Procuring Entity.*

[2] *Insert the expected expiration date of the Time for Completion. The Procuring Entity should note that in the event of an extension of the time for completion of the Contract, the Procuring Entity 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 Procuring Entity might consider adding the following text to the form, at the end of the penultimate 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."*

FORM NO. 8 - RETENTION MONEY SECURITY
[Demand Bank Guarantee]

[Guarantor letterhead]

Beneficiary: _____ **[***Insert name and Address of* Procuring Entity*]* **Date:** _____ **[***Insert date of issue]*

ADVANCE PAYMENT GUARANTEE No.: _____
[Insert guarantee reference number]

Guarantor: *[Insert name and address of place of issue, unless indicated in the letterhead]*

1. 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]* (herein after recalled" the Contractor") has entered into Contract No. _____ *[Insert reference number of the contract]* dated _____ with the Beneficiary, for the execution of _____ [*insert name of contract and brief description of* Works*]* (herein after called" the Contract").

2. Furthermore, we understand that, according to the conditions of the Contract, the Beneficiary retains moneys up to the limit set forth in the Contract ("the Retention Money"), and that when the Taking-Over Certificate has been issued under the Contract and the first half of the Retention Money has been certified for payment, and payment of *[*insert the second half of the Retention Money] is to be made against a Retention Money guarantee.

3. At the request of the Contractor, 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* _____ *])*[1] 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 Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or show grounds for your demand or the sum specified therein.

4. A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary's bank stating that the second half of the Retention Money as referred to above has been credited to the Contractor on its account number _____ at _____ [*insert name and address of Applicant's bank]*.

5. This guarantee shall expire no later than the…… Day of……..…, 2…[2], and any demand for payment under it must be received by us at the office indicated above on or before that date.

6. 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.

_____
[Name of Authorized Official, signature(s) and seals/stamps]

Note: All italicized text (including foot notes) is for use in preparing this form and shall be deleted from the final product.

[1] *The Guarantor shall insert an amount representing the amount of the second half of the Retention Money.*

[2] *Insert a date that is twenty-eight days after the expiry of retention period after the actual completion date of the contract. The Procuring Entity should note that in the event of an extension of this date for completion of the Contract, the Procuring Entity 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.*

FORM NO. 9 BENEFICIAL OWNERSHIP DISCLOSURE FORM
(Amended and issued pursuant to PPRA CIRCULAR No. 02/2022)

INSTRUCTIONS TO TENDERERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE FORM

This Beneficial Ownership Disclosure Form ("Form") is to be completed by the successful tenderer pursuant to Regulation 13 (2A) and 13 (6) of the Companies (Beneficial Ownership Information) Regulations, 2020. In case of joint venture, the tenderer must submit a separate Form for each member. The beneficial ownership information to be submitted in this Form shall be current as of the date of its submission.

For the purposes of this Form, a Beneficial Owner of a Tenderer is any natural person who ultimately owns or controls the legal person (tenderer) or arrangements or a natural person on whose behalf a transaction is conducted, and includes those persons who exercise ultimate effective control over a legal person (Tenderer) or arrangement.

Tender Reference No.:_____[*insert identification no*] Name of the Tender Title/Description:_____*[insert name of the assignment]* to:_____[*insert complete name of Procuring Entity]*

In response to the requirement in your notification of award dated___*[insert date of notification of award]* to furnish additional information on beneficial ownership:_____*[select one option as applicable and delete the options that are not applicable]*

I) We here by provide the following beneficial ownership information.

Details of beneficial ownership

	Details of all Beneficial Owners		**% of shares a person holds in the company Directly or indirectly**	**% of voting rights, a person holds in the company**	**Whether a person directly or indirectly holds a right to appoint or remove a member of the board of directors of the company or an equivalent governing body of the Tenderer** (Yes / No)	**Whether a person directly or indirectly exercises significant influence or control over the Company (tenderer) (Yes / No)**
1.	Full Name		Directly---------- % of shares Indirectly---------- % of shares	Directly…… ……. % of voting rights Indirectly---------- % of voting rights	1. Having the right to appoint a majority of the board of the directors or an equivalent governing body of the Tenderer: Yes -----No---- 2. Is this right held directly or indirectly? Direct…… …… Indirect…… ……...	1. Exercises significant influence or control over the Company body of the Company (tenderer) Yes -----No---- 2. Is this influence or control exercised directly or indirectly? Direct…… …..
	National identity card number or Passport number					
	Personal Identification Number (where applicable)					
	Nationality					
	Date of birth *[dd/mm/Yiyi]*					
	Postal address					
	Residential address					
	Telephone number					
	Email address					
	Occupation or					

	Details of all Beneficial Owners		**% of shares a person holds in the company Directly or indirectly**	**% of voting rights, a person holds in the company**	**Whether a person directly or indirectly holds a right to appoint or remove a member of the board of directors of the company or an equivalent governing body of the Tenderer** (Yes / No)	**Whether a person directly or indirectly exercises significant influence or control over the Company (tenderer) (Yes / No)**
	profession					Indirect…… …
2.	Full Name		Directly---------- % of shares Indirectly---------- % of shares	Directly…… ……. % of voting rights Indirectly---------- % of voting rights	1. Having the right to appoint a majority of the board of the directors or an equivalent governing body of the Tenderer: Yes -----No---- 2. Is this right held directly or indirectly? Direct…… …… Indirect…… ……...	1. Exercises significant influence or control over the Company body of the Company (tenderer**)** Yes -----No-- -- 2. Is this influence or control exercised directly or indirectly? Direct…… ….. Indirect…… …
	National identity card number or Passport number					
	Personal Identification Number (where applicable)					
	Nationality(ies)					
	Date of birth *[dd/mm/Yiyi]*					
	Postal address					
	Residential address					
	Telephone number					
	Email address					
	Occupation or profession					
3. **e.t .c**						

II) Am fully aware that beneficial ownership information above shall be reported to the Public Procurement Regulatory Authority together with other details in relation to contract awards and shall be maintained in the Government Portal, published and made publicly available pursuant to Regulation 13(5) of the Companies (Beneficial Ownership Information) Regulations, 2020.(Notwithstanding this paragraph Personally Identifiable Information in line with the Data Protection Act shall not be published or made public). *Note that Personally Identifiable Information (PII) is defined as any information that can be used to distinguish one person from another and can be used to deanonymize previously anonymous data. This information includes National identity card number or Passport number, Personal Identification Number, Date of birth, Residential address, email address and Telephone number.*

III) In determining who meets the threshold of who a beneficial owner is, the Tenderer must consider a natural person who in relation to the company:

(a) holds at least ten percent of the issued shares in the company either directly or indirectly;

(b) exercises at least ten percent of the voting rights in the company either directly or indirectly;

(c) holds a right, directly or indirectly, to appoint or remove a director of the company; or

(d) exercises significant influence or control, directly or indirectly, over the company.

IV) What is stated to herein above is true to the best of my knowledge, information and belief.

Name of the Tenderer: .....[insert complete name of the Tenderer]*_____

*Name of the person duly authorized to sign the Tender on behalf of the Tenderer: ** [insert complete name of person duly authorized to sign the Tender]*

Designation of the person signing the Tender: ..... [insert complete title of the person signing the Tender]

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

Date this ..... [insert date of signing] day of..... [Insert month], [insert year]

Bidder Official Stamp

REPUBLIC OF KENYA

NORTHERN WATER WORKS DEVELOPMENT AGENCY

CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT

-PHASE I

ITT No: NWWDA/T/CW/050/2023-2024

BIDDING DOCUMENT
VOLUME II

MARCH 2024

ITT No. NWWDA/T/CW/050/2023-2024

CONSTRUCTION OF MARALAL WATER SUPPLY PROJECT -

PHASE I

BID DOCUMENT

VOLUME II

TECHNICAL SPECIFICATIONS / EMPLOYER'S REQUIREMENTS

CONTENTS

SECTION 1

GENERAL AND SPECIFIC SPECIFICATIONS

CONSTRUCTION OF MARALAL WATER SUPPLY

ITT No. NWWDA/T/CW/050/2023-2024

GENERAL AND SPECIFIC SPECIFICATIONS

TABLE OF CONTENTS

1. 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, labour 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.

101. OFFICE AND ACCOMMODATION FOR ENGINEER'S REPRESENTATIVE

The Contractor is required to provide the Office within 8 weeks. The Contractor to provide suitable rented furnished Office for the Engineer's Representative and his Staff in a location convenient to the Engineer's Representative till the Office mentioned above has been constructed. The Contractor shall make arrangement for Offices to the satisfaction of the Engineer's Representative.

The Office shall be of a design and construction approved by the Engineer and shall be constructed of strong, durable and weatherproof materials with walls, ceilings and floors adequately insulated against heat and cold and in conformity to National Building by Laws for permanent Buildings.

The Office shall have a floor area of at least 200 square metres, and shall be provided with equipment and furniture detailed under the following clauses. Should the need arise to increase or decrease the floor area of the Office, then a cost adjustment (upwards or downwards) will be made to compensate for the increase or decrease in size of the Office.

This will be made under the appropriate item in the Bills of Quantities and shall be calculated on a pro-rata floor area basis.

The floor shall be concrete float finish and shall be at least 200mm above surrounding ground level. The Office shall have burglar proofing to all windows and external doors.

In addition to the above, provision will be made for shaded parking (carports) for at least three vehicles. Details to be submitted with the Bid.

The Resident's Office shall be separate from the Contractor's Yard and shall be situated in a compound fenced with 1.5m chain link fence on cedar posts or precast posts complete with gate including padlock and chain. Hard-standing and access drives (not exceeding 20% of the area of the compound) shall be provided within the compound and constructed with murram or other stable road making materials. The areas so provided shall be shaped to falls to provide adequate drainage and incidental kerbing and outfall drainage shall be provided where necessary, a lean-to corrugated iron shelter shall be provided as covered parking.

All equipment and furnishings detailed under this Clause shall be provided by the Contractor under item for Equipment for Resident Engineer's Office, Bill No. 1 – Preliminaries and General. **All the equipment and furnishings will revert to the Employer at the end of the Contract.**

The office shall be provided at all times with an adequate and safe electricity supply with lighting and a minimum of two 13-amp double-sockets in each room. The electrical cabling and switches will be installed using three compartment plastic/ metal trucking. The Contractor shall provide generator backup in order to ensure a continuous supply of electricity. The generator shall be located away from the offices to avoid nuisance from noise and/or diesel fumes. The generator shall be sufficiently sized to allow simultaneous use of all appliances.

The Contractor shall arrange for the provision of telephones (and if necessary extensions) with suitable privacy for conversation for the exclusive use of the Engineer's Representative 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 and all charges for installation, maintenance and removal of the telephones. All charges for hiring and telephone calls shall be under Bill No. 1 – Preliminaries and General. 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 offices shall have telephone and 24-hour Internet connections with hard wired networking between all work stations.

Security Guards shall be provided for day and night security at this Office. The Office, furniture and equipment shall be insured against fire, theft and natural calamity.

The Contractor shall be responsible for maintaining the Resident Engineer's Site Offices throughout the contract period and Defects Liability Period. This shall include, but not be limited to:

i) Payment for all services including water, electricity, sewerage, Telephone and

Internet;

ii) One dedicated office secretary who is conversant in English (both spoken and written), computer literate and conversant in Ms Office suite, do filing, receive and make telephone calls, maintain delivery / receipt registers, organize meetings, maintain office supplies, etc. (See Clause 101(c));
iii) One dedicated Office Assistant / cleaner / kitchen attendant (Clause 101(c));
iv) 24 hours guarding of the premises;
v) Maintaining insurance against theft of equipment and other materials from the offices;
vi) Provide box files, lever files, paper, toner cartridges, pens, CDs, and other office consumables (Clause 101(b));
vii) Service, maintain / repair office equipment and appliances;
viii) Provide clean towels in washroom and kitchen, soaps and cleaning agents, and toilet paper for the WC;
ix) Refreshments

101.(a) PROVISIONS FOR ENGINEER'S REPRESENTATIVE'S OFFICE AND SUB OFFICE

The offices/ kitchenette shall be suitably furnished with the following as minimum requirements (all shall revert to the Client at the end of Project):

Furniture	**Quantity**
Writing Desk with 3 lockable drawers	3 Nr
2.4m Executive desk with drawers and side desk. Include a chair	1Nr
Conference table with 12Nr chairs	1 set
Writing Desk without Locks	1 Nr
Metal Chairs with arm rests	5 Nr
Plan Chest with 4 lockable drawers suitable for A1 size drawings	1 Nr
Drawing racks suitable for A1 drawings	1 Nr
Lockable Steel Cupboard (Size 1m x 1.8m x 0.5m deep)	3 Nr
Office paper punch	3 Nr
Pin board 2.4m x 1.2m	1 Nr
Office Tray (3 tier)	4 Nr
Office Stapling Machines	4 Nr
Steel File Cabinet with locks / 4 drawers ('Mecol' or equivalent approved)	1 Nr
'Casio' or similar small portable scientific electronic calculator	3 Nr
'Casio' or similar small portable electronic calculator	1 Nr
First Aid kit (for 10 persons) in Metal Box	1 Nr
Potable Fire Extinguisher (5 liters)	2 Nr
Small office scissors	2 Nr
Wastepaper baskets	4 Nr
Electric kettle (capacity to make 6 cups of tea)	1 Nr
Coffee/Tea making facility including crockery for all supervisory staff 6 Nr. And 6 additional guests	1 Nr
Split high wall AC system	1Nr
Pedestal electric fan, size 400mm	3 Nr

Furniture	**Quantity**
Samsung or equivalent approved Refrigerator (0.2 cu.m. capacity)	1 Nr
Desktop – "HP" or approved equivalent 11th Generation Intel core i7, 2.5GHz, 1TB SSD, 16GB RAM, DVD R/CD-RW Optical Drive, with 15" Flat Panel Monitor. Windows 11 professional 64 bit and Microsoft Office 2019 or latest Version	1 Nr
Laptop – "HP" or approved equivalent 11th Generation Intel core i7, 2.5GHz, 1TB SSD, 16GB RAM, Optical Drive, 15.4" Wide Screen, WIFI / 56K Modem, Bluetooth, with Windows 11 professional 64 bit and Microsoft Office 2019 or latest Version.	2 Nr
HP LaserJet Printer A4 or approved equivalent	1 Nr
Printer and Photocopier – RICOH or approved equivalent, A3, 42 pages per minute	1 Nr
Binding machine	1Nr
Digital Camera as specified- Canon EOS R, Specifications- 30.3 Megapixels, Dual Pixel CMOS AF sensor, 8fps continuous shooting, 100-40000 ISO, Wi-Fi and Bluetooth connectivity, USB 3.1 port or approved equivalent	3 Nr
Smart Phones 2 No.– Samsung Note 23 or approved equivalent	2Nr
Soap dispenser	1 Nr
Sanitizer dispenser	1 Nr
Electric hand 'air dryer' machine	1 Nr

101.(b) MAINTENANCE AND ATTENDANCE TO THE RESIDENT ENGINEER'S OFFICES

Stationery required **per month** as follows (Stationery to be approved every month by the Engineer's Representative before ordering):

Stationery	**Quantity**
Photocopy paper A4	2 Reams
A3 paper	0.5 Reams
Biro pens blue/black	½ Doz.
Box files	as instructed
Spring Files	as instructed
Embossed (hardback cover)	2 Doz.
Cellotape (medium)	1 Nr
Masking tape (medium)	1 Nr
Staples	2 Pac.
Paper clips (various sizes)	2 Pac.
Highlighters (set of all colors)	as instructed
A6 hardcover notebooks	2 Nr
Soft Pencil Erasers (Staedtler or equivalent)	3 Nr
Envelopes (all sizes)	3 Doz.
Colour cartridges/ toners for the A4 printer	as instructed
Black ink cartridge/ toner for the A4 printer	as instructed

The List of Provisions and Consumables to be given by the Resident Engineer every month is tabulated above for which the contractor shall be compensated for against a provisional sum

item included in the Bill of Quantities. The Engineer reserves the authority to amend the list at any time he might deem it convenient.

Apart from the consumables, the rest of the equipment will revert to the Employer at the end of the Contract.

101.(c) SECRETARIES AND OFFICE ASSISTANTS

The Contractor shall provide 1Nr. Secretary for the exclusive use of the Resident Engineer for the duration of the Contract. The secretary shall be conversant in English, with a minimum 5 years' experience in secretarial / office administration work. The secretary shall be conversant with standard office computer hardware and software (MS-Word, Excel, PowerPoint, etc.). The Secretary shall be interviewed and tested by the Resident Engineer prior to deployment on the Works.

The secretary must possess the skills, capabilities, and knowledge expected of a graduate of a Secretarial Stage III course offered by the Kenya National Examinations Council (KNEC).

Office Assistants (messenger/ tea boy/ office cleaner) shall also be provided by the Contractor exclusively for the Resident Engineer's Office.

101.(d) ACCOMMODATION

The Contractor to make provision for accommodation for the Resident (RE), the Assistant Resident Engineers (AREs), Surveyor and Inspector of Work (IoW)s. All costs in connection with the accommodation, inclusive of the house consumables, consumption and maintenance of water supply, electrical power, house help, etc., shall be borne by the Contractor. The provision of this is made under Bill No. 1 – Preliminaries & General.

101.(e) MAINTENANCE OF VEHICLE

The Contractor shall service and maintain the vehicles to be used for supervision of the Contract by the Resident Engineer and his staff.

The Contractor shall ensure that all vehicles are licensed, comprehensively insured at all times, serviced and maintained in good condition to the satisfaction of the Resident Engineer or his authorized representative, so that the Resident Engineer shall at all times have the vehicles available for use in good serviceable condition. In the event of the vehicles being unserviceable for whatsoever reason, the Contractor shall provide alternative vehicles at his own cost of the same model in compliance with the provisions of this clause. The cost for such replacement vehicle to be covered by his rates.

The Contractor shall provide licensed drivers - minimum 10 years of clean driving record, for the exclusive use of and to the satisfaction of the Resident or his authorized representative. The drivers shall be available at all times during normal working hours and when specifically required by the Resident or his authorized representative, outside these hours.

Payments for maintenance shall include for provision of fuels, lubricants and tyres, all regular maintenance, minor and major repairs, including those occasioned by accidental damage from whatever cause arising, and everything else necessary to satisfy fully the requirements of this clause.

The makes, models and colours of the vehicles shall be approved by the Resident Engineer prior to ordering.

The Contractor shall, at completion bring the vehicle to the appropriate dealers for testing. The dealers shall recommend to the Engineer's Authorized Representative what repairs in addition to the ordinary service are required to be carried out on the vehicle. The Contractor shall then ensure the necessary service/repairs are done. A certificate of road worthiness and satisfactory mechanical condition to be obtained from the Dealer. The following will be carried out:

- Inspection by the Government Inspection Unit, if applicable
- Inspection and Valuation by the Automobile Association (AA) of Kenya

The Contractor shall hand over the respective Inspection / Valuation Reports to the Employer together with the vehicles. The costs for Inspection and Valuation Reports are deemed to be covered in the Contractor's Rates. The vehicles will revert back to the Employer at the end of the Contract.

101.(f) DRIVERS

The Contractor shall provide licensed drivers for the exclusive use of the Resident Engineer or his authorized representative. The drivers shall be available at all times during normal working hours and when specifically required by the Resident Engineer or his authorized representative, outside these hours.

The drivers shall have a minimum 10 years of clean driving record and a Certificate of Good Conduct from the Kenya Police. The drivers are to be employed and paid by the Contractor (including all overtime, NSSF, NHIF, etc.) but will report directly to the Resident Engineer for day-to-day instructions. The Resident Engineer will interview, test and approve the drivers prior to their deployment on the Works.

101.(g) 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 usual accompaniments such as necessary carrying containers, manuals or their references etc. The Equipment to revert to Employer at completion of all Works.

Equipment	**Quantity**
Complete GPS surveyor system with receivers and downloading cables (RTK Machine)	1 Nr
Total Station with accessories i.e. 1 tripod, 2 prisms and 2 tracking rods with bubbles.	1 Nr
Level Machine and metallic tripod	1 Nr
1 Levelling stave	1 Nr
Metric extending levelling staffs with vertical bubble	1 Nr
30m (enameled or otherwise protected) steel bands	1 Nr
3 meter ranging rods	6 Nr
Survey umbrellas with stand	1 Nr
5 meter steel tapes	4 Nr
100 meter steel tape	1 Nr
Builders spirit levels 1000mm long	1 Nr

Equipment	**Quantity**
Hammers 3 kg each	1 Nr
Ranging rods	4 Nr

GPS SPECIFICATIONS (OR APPROVED EQUIVALENT)

Supported GNSS Systems

GPS L2, GLONASS, Beidu, Galileo, Navic, SBAS, Q2SS

RTK performance

DGPS / RTCM, RTK unlimited, Network RTK, Position update & data recording, >5 Hz positioning

RTK initialization time <10s

RTK initialization reliability >99.9%

Raw data logging Format

RINEX logging, NMEA out

Additional features

RTK Reference Station functionality, GSM, UHF, compatible with all CORS

Real time Accuracy

1. Real time accuracy

Horizontal <8mm + 1 ppm

Vertical <15mm + 1mm

2. Static

Horizontal <3mm + 0.5mm, Vertical <5mm + 0.5mm

3. SBAS

Horizontal <60cm, Vertical <120cm

Network

Horizontal <8mm + 0.5ppm

Vertical <8mm + 0.5mm

Data Format

CMR, CMR+, RTCM2 X, RTCM 3X, RTCA

Data Logging Time

0.05 – 999 seconds

TOTAL STATION SPECIFICATIONS (OR APPROVED EQUIVALENT)

Angle measurement

Distance measurement to prism

Distance measurement to any surface (reflector-less)

Wide-Angle Camera

RS232, USB and SD card interface

Bluetooth

Internal Flash Memory (1GB)

Guide Light (EGL)

Arctic Option

Smart Station GS15 GNSS receiver

Smart Station GS12 GNSS receiver

CS10/CS15 (Radio) field controller

AUTOMATIC LEVEL MACHINE SPECIFICATION(S) (OR APPROVED EQUIVALENT)

Leica with accuracies of +/- 0.001

Supply of pegs, crayons, spray paint, nails, chalk, and all other items required for setting out and measuring the work.

The Contractor shall provide the services of two Chainmen for the sole use of the Engineer and Engineer's Representative for the whole period of the Contract.

The Contractor shall be responsible for maintaining the survey and field equipment throughout the Contract Period, including replacement of items damaged during the normal course of the Works.

The cost for provision of the above for use of the Resident Engineer shall be reimbursed from the relevant item in the Bill of Quantities.

The contractor shall ensure the attendance of his surveyor and chainmen as and when requested by the Resident Engineer checking out the works e.g. setting out. The c

102. OFFICE FOR CONTRACTOR

The Contractor shall have an office on the site to be approved by the Resident and which shall be open and attended to at all hours during which work is in progress.

Notwithstanding anything contained in Clause 1.3 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. LEVEL DATUM

Before the commencement of Constructional Work the Contractor shall establish, in a position to the approval of the Engineer, a bench mark comprising of steel datum pegs which shall be securely concreted in. The level of these pegs shall be established and agreed with the Engineer and all levels used in the construction of the Works shall be referred to these established datum points. The correctness of this datum shall be checked at regular intervals during the construction period as agreed with the Engineer.

Where possible construction drawings and all levels used for construction shall be referred to the national height datum as defined by the Survey of Kenya. The Contractor shall be responsible for obtaining the location and values of the permanent bench marks. In cases where such bench marks do not exist, the site datum shall be agreed with the Engineer.

104. SETTING OUT OF THE WORKS

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

The Contactor shall prepare detailed Setting Out Drawings and Data Sheets as necessary and submit them to the Engineer in triplicate for approval. Any modifications to the Setting Out Drawings or Data Sheets required by the Engineer shall be made by the Contractor and resubmitted for final approval. Should it be necessary during setting out or during

construction for the approved setting out details to be amended, the Contractor shall amend the Drawings or Data Sheets or make new ones for approval as required by the Engineer.

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

The Contractor shall prepare and submit to the Engineer, at an approved scale, Plans of the Water Pipeline Routes and profiles of ground levels after any initial clearing of the wayleave or easement showing the proposed pipe invert levels and precise chainages for all valves, fittings, manholes, etc. for approval. Following approval, the Contractor shall submit to the Engineer two copies of the agreed alignment and profiles.

The Contractor shall also be required to carry out Site / Engineering Survey of demarcated land where permanent structures / appurtenances will be constructed as directed by the Engineer after initial clearance of sites. The Contractor shall prepare an updated layout plan with contours at 0.5m interval. The contours shall be generated from a 10x10m grid topographic survey.

105. 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, color and type authorized. The Contractor shall be responsible for liaison with Police.

106. 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 to use 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 Resident.

107. 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 reflectorized or adequately illuminated at night by approved means.

108. PROTECTION OF WORKS

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

109. 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.

110. DAMAGE TO LAND

The Employer shall provide the Site upon which the Permanent Works are to be constructed. Where a drain or pipeline is to be within an existing road or track reserve or is otherwise located in land designated Public Domain, the Site width will be restricted to the limit of the public land. The existing boundary fences and walls shall not be disturbed without prior approval of the Engineer and, unless road diversions and closure notices are approved and posted, carriageways shall be left available for the safe passage of traffic.

The Contractor shall not enter upon or occupy with men, tools, equipment or materials any land other than the site without the written consent of the owner of such land.

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

111. 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.

112. REINSTATEMENT OF ROADS AND FOOTWAYS FOR WATER MAINS, STORM WATER AND SEWER CROSSINGS

Water Mains laid under roads shall be of approved 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.

Unless provided otherwise 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.

113. TEMPORARY WORKS

The Contractor shall provide, maintain and remove on completion of the Works all temporary Works including roadways, sleeper tracks and stagings 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.

114. 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 particular 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.

115. EXISTING 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.

116. CONNECTIONS TO EXISTING PIPES AND EQUIPMENT

The Contractor shall be responsible for joining up and making connections between water pipes, sewer pipes, etc. equipment installed by him and existing facilities. The Contractor shall submit to the Engineer a drawing showing the details of the connection, and shall state the date on which the particular connection is required, and the work shall not proceed until the Engineer's approval has been given.

The Contractor shall be responsible for ensuring the compatibility of new pipes with existing pipework, cables, tubing, equipment, etc.

117. 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.

118. 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.

119. 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.

120. 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.

121. 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.

122. 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 Offices if required. The cost of all these Works shall be deemed to be covered by rates and prices quoted by the Contractor.

123. 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.

124. 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 pipelaying. 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.

125. 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.

126. 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.

127. 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.

128. 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.

129. MONTHLY SITE MEETINGS

Throughout the project period, site meetings will be held at the Engineer's Representative's Office (or any other approved place) 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.

130. 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.

131. 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.

132. 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.

133. 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.

134. REJECTED MATERIALS

Should any material or manufactured articles be brought on to the site of the Works which are in the judgement 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.

135. 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.

136. 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 i.e. 1 month (30 calendar days).

The Contractor shall supply all necessary personnel, electricity, fuels, oils and chemicals for the test running and together with the Engineer's Representative 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 Engineer's Representative 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.

The Contractor shall make provision for the on-site training of up to 3 of the Employer's staff.

137. EQUIPMENT FOR THE ENGINEER'S REPRESENTATIVE

The Contractor shall provide 2 Nr Digital Cameras, 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 20 megapixels or more,

both optical and digital zoom capabilities, storage capacity of 8 GB, 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.

The Contractor shall provide for the Engineer, his Representative and assistants any additional protective clothing and safety equipment necessary for the proper discharge of their duties on the Site.

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

138. OPERATION AND MAINTENANCE MANUAL

A draft Operation and Maintenance Manual will be compiled prior to Commencement of Construction of the Works.

This Manual has to be revised and brought to a final draft state prior to the test running of the Scheme. The Contractor's rates should include for provision 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, 'As-Built' Drawings prepared by the Contractor, Digital Progress Report Photographs, etc.

Substantial completion of the Scheme will not be considered until such detailed information as is required in triplicate has been submitted by the Contractor to and accepted by the Engineer.

139. 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 Bid.

(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.

140. CONTRACT DOCUMENTS

Without affecting the provisions in the Conditions of Contract, the Contractor shall print and submit at his own cost to the Employer at least ten (10) bound copies of the Contract Documents except Volume III (Drawings) in the form and manner approved by the Employer. The Contractor's rates are deemed to cover these costs.

141. 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 Engineer's Representative "as-built-drawings" 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 Engineer's Representative one full-size original copy, six printed copies of the relevant "as-built-drawings" and the corresponding computer files (AutoCAD, Excel, MS Word, etc.) on CD-ROM 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 Engineer's 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 meter 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 meter 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. when tested in the laboratory it should have a crushing strength of 1.5 N/mm^2 - 20N/mm^2. Must be of a single continuous uniform mass of at least 3.0m^3

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 black trap or lava of a single continuous uniform mass of at least 3.0 m^3. 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 when tested in the laboratory it should have a crushing strength of 20 N/mm^2 - 40N/mm^2

Class 'C'

Phonolite in a formation which is massive and geologically homogeneous shall be known as Class 'C' rock, when tested in the laboratory it should have a crushing strength of not less than 40N/mm^2 Must be of a single continuous uniform mass of at least 3.0 m^3

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 authorized 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 meter of rock in-situ being taken to equal 1.5 cubic meter 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 meter 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 the 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 over breaks 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 tacheometer 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.

322. SUBMARINE PIPELINE

The Pipeline shall be laid with adequate anchor and lateral support to prevent lateral movement due to currents, waves or ground movement and avoiding long suspended spans. The pipeline may be laid exposed on the sea bed with adequate support or laid in trench. Trenching can be done prior to pipeline lay (pre-trenching), or afterward by seabed removal from below the pipeline (post-trenching). The materials for the pipes and fittings, jointing and concrete works shall be as per Chapter 7 of the Specifications.
The Contractor shall provide a Detailed Method Statement of Pipe Laying, Support, etc. prior to commencement of works for approval by the Engineer.

4. CONCRETE

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.

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.

401. THE DESIGN OF CONCRETE MIXES

a) Cement

Cement for structural concrete shall be CEM I – 42.5 to KS EAS 18-1 and KS EAS 183

b) 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^2 and the second figure is the maximum nominal size of aggregate in the mix expressed in millimeters.

c) 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^2	Maximum Nominal Size of Aggregate mm	Maximum Water / Cement Ratio		Trial Mixes Target Mean Strength (Clause 401 c) N/mm^2	Early Works Test Cubes (Clause 401 d)	
			A	B		Any one Cube N/mm^2	Average of any Group of 4 Cubes N/mm^2
10/75	10	75	0.60	0.55	13.5	8.5	13.3
15/75	15	75	0.60	0.50	21.5	12.8	20.0
15/40	15	40	0.60	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	0.48	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	0.46	36.5	21.3	32.5
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	0.45	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	0.43	51.5	34.0	47.5
40/10	40	10	0.45	0.43	51.5	34.0	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.

   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 that 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^3 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.

- **For the purposes of avoiding contradictions with other documents forming part of this contract/bidding process as an example the notation concrete class 15/40 in these specifications (Volume II) shall be interpreted to mean Concrete class 15 (cube strength = 15 N/mm^2) prepared with a nominal maximum size of aggregate of 40mm. Other similar notations as shown in table 4.1 and 4.2 above and elsewhere in this document shall be interpreted in a similar manner. Differing notations such as those in CESMM4 which also forms part of these contract/bidding process shall be interpreted accordingly.**

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: -

i) 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.

d) 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 $20m^3$ 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^2	**15N/mm^2 & above**	**20N/mm^2**
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 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 cores 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.

402. 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.

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.

403. 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 meter 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.

404. 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.

405. 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 days' 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 meter 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 metres 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, trucking, 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 possibly 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.

406. 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.

407. 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 724(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.

408. 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.

409. 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.

410. 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 screeded 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 meter 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.

411. 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 702(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 meter 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.

412. CONCRETE FOR SECONDARY PURPOSES

a) Non-structural concrete (NS concrete) shall be used only for non-structural purposes were 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 color 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 meter 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.

413. 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.

414. 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 scrabbled by mechanical means or wet sand blasted and then washed with clean water. The indentations produced by scrabbling 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.

415. 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.

416. WATERSTOPS

All references to water stops include grout stops.

Water stops shall be of the material and form shown on the drawings. No water stop 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.

Water stops 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 water stops 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) water stops shall be extruded from an unfilled plasticized PVC polymer or copolymer which does not contain any reclaimed or scrap PVC. PVC water stops 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 water stops 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^2 and shall allow a joint movement of at least 50mm.

Water stops 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.

Water stop material shall be stored carefully on site to avoid damage and contamination with oil, grease, or other pollutants. Rubber and plastic water stops shall be stored in cool well-ventilated places away from direct sunlight.

Rubber and plastic water stops 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.

Water stops 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 water stop is fixed. In no circumstances shall a water stop be punctured with nails etc. as a means of fixing.

Concrete shall be placed carefully round water stops so as to avoid distortion or displacement and shall be fully compacted. Where water stops lie in a horizontal or nearly horizontal plane the Contractor shall ensure that no voids are left on the underside of the water stop.

Formwork around water stops shall be carefully removed to avoid damage. If water stops suffer any damage which cannot be properly repaired in-situ the Engineer may require a section of concrete to be removed and the water stop replaced.

417. 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.

418. 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.

419. 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.

420. 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 were 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 color 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 period 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^2

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 KENYA 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 here under: -

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 thicknessed 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.

3. 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

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6. MASONRY

601. GENERAL

All masonry work shall be constructed from building stone as specified in Clause 804.

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 STONEWORK

Cast stone shall be as specified in Clause 735. Facing stones shall be brought up in courses to a height not exceeding 1 meter 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 socketed, coupled or flanged.

All specials shall be of such dimensions as will mate with the piping supplied. Screw down stop valves 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 odor 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 center 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 odor 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

Unplasticized 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 meter intervals showing their class and diameter.

707. G.R.P. PIPES AND SPECIALS

Glass Reinforced Plastic 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 mechanize 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 screw down 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 up to 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 non-corrosive 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 inter-changeable 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 $\pm$ 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 16.

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 aluminum 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) Galvanized 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, color nor odor 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 centers.

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 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 aluminum 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 colors will be selected by the Engineer from the standard range of colors.

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 colors 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 demolding 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 could 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 millimeters 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 this 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.

In general, the filter media shall allow the filtration cycle to achieve the following:

- Sedimentation (sieve effect)
- Adsorption

- Absorption;
- Biological action
- Straining.

The filter media shall be suitable for a simultaneous air/water backwash procedure. The filter bed shall be designed and suitable for air/water backwash procedure. The maximum backwash flow rate shall be designed not to exceed 20m/hr. to eliminate excessive media loss.
The filter control system shall be simple, safe and with reliable controllers and capable of maintaining an adequate head above the media surface. The control system shall incorporate a
slow start controller.

The filter area and filter media shall be capable of filtration rate of 7.5m3/m2/hr. The backwash air compressor for the air/water backwash system shall comprise of but not limited to the following:

- Blower main body;
- Inlet muffler (with air filter);
- Public base for motor and blower (including coupling cover);
- Inlet manual butterfly valve;
- Motor;
- Pressure gauge;
- Mounting bolts and connection accessories;
- Check valve;
- Outlet silencer;
- Outlet butterfly valve (manual or electrical);
- Release valve;
- Release silencer;
- Reducer;
- Flexible joint;
- Acoustic enclosure;
- Control cabinet

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 itemized 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 tones 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 sub-clause 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_3, when tested as set out in SRN 601, subject also to the further restriction given in the note on total sulphate content in sub-clause 724 (d).

Soundness: After five cycles of the test in AASHO 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 color 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_3 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 AASHO 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_3 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 sub-clause 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 3.5 N/sq.mm. The source of stone shall be approved by the Engineer and stone supplied therefrom shall be free from Magadi, overburden, mudstone, cracks, sand holes, veins, laminations or other imperfections.

The stone shall be chisel dressed into true rectangular blocks, with each surface even and at right angles to all adjoining surfaces, to the size specified. For exposed stonework the maximum permissible variation of any of the specified dimensions shall be 6mm provided that cut stone, supplied as 'rock face' stone may be hammer dressed on one face only, or on one face and one end, if in other respects it conforms with this specification. Stones shorter than 375mm will not be accepted.

Unless the Engineer allows otherwise the Contractor shall at his own expense provide and dress four 100mm cubes of stone for testing.

The stone shall be sound when tested in accordance with 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 black trap 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 semi-hydrated 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 707. 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 color 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 millimeter and the total movement of the dowel bar relative to the concrete shall not be less than 0.25 millimeters at that stress. The concrete specimens shall be 150 millimeters by 150 millimeters 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 UNDERLAY

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:

Test Cone Penetration	Hot-poured Materials	Cold-poured Materials
0.15 kg. for 5 secs. at 25^{o} centigrade using standard grease cone	Penetration not to exceed 9mm	Penetration to be not less than 5mm not more than 27.5mm
Flow		
On a plane inclined at 75^{o} to the horizontal, 5 hours at 60^{o} centigrade	Flow not to exceed 5mm	Flow not to exceed 20mm
Bond		
25mm wide joint extended 12mm at rate of 4mm per hour at 18^{o} 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 cold-poured 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 millimeter after 28 days. The blocks shall be cast in Metric sizes.

755. HIGH DENSITY POLYETHYLENE (HDPE) PIPES

HDPE Pressure Pipes and Fittings shall be manufactured using a pre-compounded blue pigmented PE100 resin, having a Minimum Required Strength (MRS) value of ≥ 10.0 MPa, at a service temperature of 20°C for a minimum design service life of 50 years.

The pipes and fittings shall be manufactured in accordance with EN 12201:2011, ISO 4427 / ISO 4437 or another acceptable International Standard.

The Pipes and Fittings shall comply with the following:

Pipes: Material: Polyethylene PE100 (MRS100), density ≥0.95 kg/dm³
Colour: **Blue**
Black with Blue stripes
Black with Blue outer coextruded layer
Pressure Rating: SDR 17 – PN10
SDR 11 – PN16
Supply Lengths: All pipe sizes up to and including OD 75 mm shall be supplied in coils of 50 or 100 meters. All pipes, OD 90mm and above shall be supplied in straight lengths not exceeding 12metres.

Fittings: Material: Polyethylene PE100 (MRS100), density ≥0.95 kg/dm³
Colour: Black or Blue
Type of Joint: Electrofusion / Spigot type for Butt Fusion / Compression (for sizes 110mm and below)
Pressure Rating: SDR 17 – PN10
SDR 11 – PN16

Diameters: *as per EN 12201-2*

PE 100 (MRS10), σ_{all} = 8.0 MPa			**PN 10.0**		**PN 16.0**	
Outside Diameter (d) (mm)	**Tolerance on OD (mm)**	**Maximum Ovality (mm)**	**SDR 17 Series 8**		**SDR 11 Series 5**	
			Min. WT (mm)	**Tolerance (mm)**	**Min. WT (mm)**	**Tolerance (mm)**
16.0	0.3	1.2	-	-	-	-
20.0	0.3	1.2	-	-	**2.0**	0.3
25.0	0.3	1.2	-	-	**2.3**	0.4
32.0	0.3	1.3	**2.0**	0.3	**3.0**	0.4
40.0	0.4	1.4	**2.4**	0.4	**3.7**	0.5
50.0	0.4	1.4	**3.0**	0.4	**4.6**	0.6
63.0	0.4	1.5	**3.8**	0.5	**5.8**	0.7
75.0	0.5	1.6	**4.5**	0.6	**6.8**	0.8
90.0	0.6	1.8	**5.4**	0.7	**8.2**	1.0
110.0	0.7	2.2	**6.6**	0.8	**10.0**	1.1
125.0	0.8	2.5	**7.4**	0.9	**11.4**	1.3
140.0	0.9	2.8	**8.3**	1.0	**12.7**	1.4
160.0	1.0	3.2	**9.5**	1.1	**14.6**	1.6
180.0	1.1	3.6	**10.7**	1.2	**16.4**	1.8
200.0	1.2	4.0	**11.9**	1.3	**18.2**	2.0
225.0	1.4	4.5	**13.4**	1.5	**20.5**	2.2
250.0	1.5	5.0	**14.8**	1.6	**22.7**	2.4
280.0	1.7	9.8	**16.6**	1.8	**25.4**	2.7
315.0	1.9	11.1	**18.7**	2.0	**28.6**	3.0
355.0	2.2	12.5	**21.1**	2.3	**32.2**	3.4
400.0	2.4	14.0	**23.7**	2.5	**36.3**	3.8
450.0	2.7	15.6	**26.7**	2.8	**40.9**	4.2
500.0	3.0	17.5	**29.7**	3.1	**45.4**	4.7
560.0	3.4	19.6	**33.2**	3.5	**50.8**	5.2

PE 100 (MRS10), σ_{all} = 8.0 MPa			**PN 10.0**		**PN 16.0**	
Outside Diameter (d) (mm)	**Tolerance on OD (mm)**	**Maximum Ovality (mm)**	**SDR 17 Series 8**		**SDR 11 Series 5**	
			Min. WT (mm)	**Tolerance (mm)**	**Min. WT (mm)**	**Tolerance (mm)**
630.0	3.8	22.1	**37.4**	3.9	**57.2**	5.9
710.0	6.4	24.9	**42.1**	4.4	**64.5**	6.6
800.0	7.2	28.0	**47.4**	4.9	**72.6**	7.4

Performance Characteristics

The pipes shall have the following basic minimum performance characteristics:

Parameter	Unit	Value
Average Density as per ISO 1183	Gm/cm^3	≥ 0.95
Melt Flow Index MFI 190°C / 50N as per ISO 1133	Gm/10 min.	0.4-0.55
Minimum Tensile Strength	N/mm^2	25
Elongation at Break	%	$\geq 600\%$
E-Modulus (Modulus of Elasticity)	N/mm^2	1200
Minimum Radius of Curvature at 20°C		25 x OD
Linear Coefficient of Thermal Expansion (VDE 0304)	$°K^{-1}$	1.3×10^{-4}

Marking and Identification

Pipes shall be clearly and indelibly marked to show the following:

- Name of Manufacturer / Brand
- Nominal Diameter x Minimum Wall Thickness
- Material Classification (i.e. PE100)
- Standard Dimension Ratio and Pressure Rating (SDR17 PN10 or SDR11 PN16)
- Reference Standard of Manufacture (e.g. EN 12201)
- Date of Manufacture

Transportation, Storage and Laying of Pipes and Fittings

Before transporting HDPE pressure pipes the loading surface of the vehicle must be cleaned and free from projecting nails, screws or other sharp objects. The bottom layer of all pipes must as far as possible be in contact with the loading surface throughout their entire length and not project beyond it. The pipes must be secured from slipping and shall not be pulled over sharp edges when loading and offloading. Pipes shall not be dragged along the ground.

Pipes, fittings and coils shall be stored in such a way that they are completely protected from direct sunlight. When covered, they must be well ventilated to avoid accumulation of heat and resultant deformation. Transparent coverings shall not be used. The storage location shall be flat and shall, for pipes, support the pipes throughout their length. Stones and sharp objects shall not be present. Pipes shall not be stacked to a height exceeding 1m. The pipes must be

secured at the sides to prevent them from rolling. Contact with harmful materials shall be avoided. As far as possible, coils shall be stored in a horizontal position. The area shall be free of stones and sharp objects. If stored upright they must be secured to avoid tilting.

Prior to laying in trench the bed of the trench must provide support throughout the entire length of the pipe. The pipe shall not be laid directly on cohesive, rocky or stoney soil. Such material shall be over excavated to a depth of not less than 0.1m and shall be removed and replaced by non-cohesive soil or a special pipe support. This shall initially be recompacted and then the surface loosened on the day of and prior to laying.

Pipes supplied in coils and of up to 63mm diameter may be unrolled with the coil in the vertical position. For larger diameters an unwinding device shall be used. A turnstile can be used with the coil laid in a horizontal position on it or with the coil mounted vertically on a slow-moving lorry. The pipe shall never be removed from a coil in a spiral manner as this may cause kinking. Should kinking nevertheless occur the Contractor shall cut the pipe on either side of the kink, prepare the ends, and then use an approved joint after laying. All costs of dealing with kinking shall be to the Contractor's expense. A minimum bending radius of 35 x the diameter shall be observed.

Joining Methods

A. Butt Fusion: The pipe shall be joined by the butt fusion procedure outlined in ASTM F 2620. All fusion joints shall be made in compliance with the pipe or fitting manufacturer's recommendations. Fusion joints shall be made by qualified fusion technicians.

B. Saddle Fusion: Saddle fusion shall be done in accordance with ASTM F 2620 or TR-41 or the fitting manufacturer's recommendations. Saddle fusion joints shall be made by qualified fusion technicians. Qualification of the fusion technician shall be demonstrated by evidence of fusion training within the past year on the equipment to be utilized on this project. *[Saddle fusion is used to fuse branch saddles, tapping tees, and other HDPE constructs onto the wall of the main pipe]* (ASTM F905).

C. Socket Fusion: Molded socket fusion fittings are only to be used for joining of HDPE pipe from 1/2 inch to 2" in size. Socket fusion shall be done in accordance with ASTM F 2620 or the fitting manufacturer's recommendations. Socket fusion is the process of fusing pipe to pipe, or pipe to fitting by the use of a male and female end that are heated simultaneously, and pressed together so the outside wall of the male end is fused to the inside wall of the female end. Qualification of the fusion technician shall be demonstrated by evidence of socket fusion training within the past year on the equipment to be utilized on this project. [*Socket fusion is not widely used, and the specifier may decide to prohibit its use*]

D. Electrofusion: Electrofusion joining shall be done in accordance with the manufacturers recommended procedure. Other sources of electrofusion joining information are ASTM F 1290. The process of electrofusion requires an electric source, a transformer, commonly called an electrofusion box that has wire leads, a method to read electronically (by laser) or otherwise input the barcode of the fitting, and a fitting that is compatible with the type of electrofusion box used. The electrofusion box must be capable of reading and storing the input parameters and the fusion results for later download to a record file. Qualification of the fusion technician shall be demonstrated

by evidence of electrofusion training within the past year on the equipment to be utilized for this project.

E. Mechanical:

- Mechanical connection of HDPE to auxiliary equipment such as valves, pumps, and fittings shall use mechanical joint adapters and other devices in conformance with AWWA Manual of Practice M55, Chapter 6.
- Mechanical connections on small pipe under 3" are available to connect HDPE pipe to other HDPE pipe, or a fitting, or to a transition to another material. The use of stab-fit style couplings is allowed, along with the use of metallic couplings of brass and other materials. All mechanical and compression fittings shall be recommended by the manufacturer for potable water use. When a compression type or mechanical type of coupling is used, the use of a rigid tubular insert stiffener inside the end of the pipe is recommended.
- Mechanical couplings that wrap around the pipe and act as saddles are made by several manufacturers specifically for HDPE pipe. All such saddles, tapping saddles, couplings, clamps etc. shall be recommended by the manufacturer as being designed for use with HDPE pipe at the pressure class listed in this section.
- Unless specified by the fitting manufacturer, a restraint harness or concrete anchor is recommended with mechanical couplings to prevent pullout.
- Mechanical coupling shall be made by qualified technicians. Qualification of the field technician shall be demonstrated by evidence of mechanical coupling training within the past year. This training shall be on the equipment and pipe components to be utilized for this project.

F. Joint Recording: The critical parameters of each fusion joint, as required by the manufacturer and these specifications, shall be recorded either manually or by an electronic data logging device. All fusion joint data shall be included in the Fusion Technician's joint report.

Testing

A. Hydrostatic leakage testing is recommended and shall comply with ASTM F 2164, ASTM F 1412, AWWA Manual of Practice M55 Chapter 9.

B. If the test section fails this test, the Contractor shall repair or replace all defective materials and/or workmanship at no additional cost to the Owner.

C. Pneumatic (compressed air) leakage testing of HDPE pressure piping is prohibited for safety reasons.

Cleaning and Disinfecting

A. Cleaning and disinfecting of potable water systems shall be in accordance with AWWA C651 and AWWA Manual of Practice M55 Chapter 10.

B. After installation and pressure testing, new water mains should be disinfected according to AWWA C651.

C. The disinfection chemicals should be limited to less than 12% active chlorine. The duration of the disinfection should not exceed 24 hours.

D. Upon completion, the system should be thoroughly flushed with fresh water, and retested to verify the disinfectant chlorine level has been reduced to potable drinking water concentrations in all service water tubing and branch lateral pipes.

756. BUTT-WELDED FUSION JOINTING MACHINE

The fusion jointing machine shall be self-aligning, suitable for welding under-pressure pipes for water, gas and other fluids up to 250mm diameter. The machine body shall be able to assume two working positions; inclined or horizontal and have a supporting frame, four clamps and two hydraulic cylinders with fast non-drip coupling connections.

The machine shall have the possibility to choose the best configuration for the working conditions by adjusting only 4 screws on the machine frame. Fast-locking adapters shall speed up the welding preparation time without using any additional equipment. The automatic detaching of the heating plate from the pipes / fittings shall be applicable on every welding configuration. This shall enable two rollers to be lodged very quickly on the sides of the machine body, allowing lifting of the welded pipes to make them roll and prepare a new weld.

The fusion machine shall include a Teflon-coated (PTFE) heating plate with a built-in independent thermometer, to check the working temperature, and a high-precision electrical thermoregulator (±1°C) with digital display and regulating buttons. This system shall include Led indicators to check if the machine is working normally (live tension and working temperature), contingent probe's failures and/or temperature anomalies.

The machine shall include an extractable electric milling cutter to face the heads of the pipes and/or fittings. It includes a safety micro-switch and a thermal circuit breaker. The machine shall include an electro-hydraulic gearcase protected from crashes and atmospheric corrosion by a plastic box. The gearcase shall consist of a control lever, to open and close the clamps, maximum pressure and discharge valves (useful also for the "Dual Pressure" welding process), hydraulic connection hoses with non-drip fast couplings and timer (to check the warming and welding time). The machine shall be preset for the connection of the electronic controller.

A milling cutter / heating plate support which shall come include a high-temperature-proof bag shall be included in the components of the fusion machine as it shall be required to protect the heating element from being scratched

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, KP&L cables etc. were 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 then, 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 centers 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 beveled 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 dependent 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 kilometer of pipeline per 24 hour per bar of applied pressure head.

The 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 ut the test for water tightness the Employer only shall authorize the operation of all valves, but the Contractor shall provide all the necessary labor 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 sterilized by being filled with a suitable solution containing not less than 20 ppm of free available chlorine or such other sterilizing agent as the Engineer shall approve. After standing for 24 hours the main shall again be washed out and refilled with mains water prior to the taking of bacteriological samples. The Contractor shall provide all necessary stop-ends, fittings and chemicals for this work.

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. Sterilization 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 liter) 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 centimeters. During the filling operation, a chlorine water mixture shall be injected by means of a solution feed chlorinating device. The dosage applied to the water shall be sufficient to give a chlorine residual of at least 50 milligrams per liter 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 heavy chlorinated 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 liter. All valves shall be operated while the lines are filled with the heavily chlorinated water.

9. TESTING OF MATERIALS AND WORKMANSHIP

901. ENGINEER'S LABORATORY

The Contractor shall provide and maintain for the duration of the contract the Engineer's laboratory as shown in the Book of Drawings and provide all the laboratory equipment and reagents as required by the Engineer. The Contractor shall be paid under appropriate bill items in the Bills of Quantities or as required by the Engineer.

The laboratory shall be sited adjacent to the Resident Engineer's main office and shall revert to the Employer at the end of the contract.

The laboratory shall have piped potable water supply and a continuous electricity supply adequate for lighting and operating the laboratory equipment.

The laboratory shall have a height from floor to ceiling of not less than 2.75 metres and all rooms shall be fitted with electric lighting and power points as instructed by the Engineer's Representative, and each door shall be fitted with a good quality mortise lock and provide with two keys.

Concrete cube curing tanks of adequate size shall also be provided. The concrete cube curing shall have drainage pipes built-in.

The following rooms and facilities shall be provided in the Laboratory: -

(i) Office

This room shall have a total floor area of not less than 9 square metres and a total window area of not less than 2 square meters. The door and windows shall be fitted with fly screens covered with mosquito gauze. The floor shall be of concrete with a float finish. The walls shall be lined and ceiling provided.

A display board of soft board or similar approved material, with a minimum surface area of 3 square metres shall be provided and securely fixed to the wall.

(ii) Main Laboratory

This room shall have a total area of not less than 40 square meters and a total window area of not less than 7 square metres. The external entrance shall be a double door and single doors shall be provided for access to the adjacent offices. The external door and all windows shall be fitted with fly screens covered with mosquito gauze.

The floor shall be of concrete and float finished. Two display boards of soft board or similar approved material, each with minimum area of 3 square metres, shall be securely affixed to the walls as directed by the Engineer's Representative.

The contractor may be directed to pay for stationery or equipment that are foresaid and also pay for servicing and repair of the laboratory equipment being used on the project.

The equipment shall be of approved manufacture, and shall be made available to the Engineer for the Engineer's exclusive use throughout the Contract, not later than three (3)

weeks after the Engineer's order to supply. All equipment shall be ready to use and complete to perform the tests. The equipment shall revert to the Employer on completion of the Contract

Failure by the Contractor to provide or maintain the equipment shall make him responsible to bear all costs that may be incurred as a result of the Engineer's staff using alternative means of testing, including delays in supervision and approval of Works by the Engineer.

Any delays to the Contractor or the Contractor's activities caused by the Engineer being unable to perform laboratory tests due to the contractor's failure to supply and/or maintain the said equipment shall be deemed to have been caused entirely by the Contractor's own actions, and any consequences of such delays shall be interpreted as such.

The payment to comply with this requirement is provided in the Bill of Quantities and ownership of all equipment shall revert to the Employer after the completion of the Works.

902. APPARATUS REQUIRED FOR TESTING ON SITE

Apparatus for testing shall be, if directed by the Engineer, made available on site of the works, for as long a period as required by the Engineer, and regarded as constructional plant. The Contractor to allow for this provision in his rates. The following may be required: -

a) A set of sieves complying with British Standard 410: Test Sieves, or the following nominal sizes: -

Fine mesh wire cloth 200, 100, 72, 52, 36, 25, 18, 14, 10 and 7.

Medium mesh wire cloth 3mm.

Perforated plate 5mm, 6mm, 9mm, 12mm, 20mm, 38mm, 50mm, 65mm and 75mm.

b) A suitable balance, a pycnometer and a stove or other approved apparatus for determining the moisture content of the aggregate. The methods of test shall be as described in Part Four of British Standard 812: Sampling and Testing of Mineral Aggregates, Sands and Fillers.

c) A 200-ml. graduated cylinder in accordance with British Standard 604: Graduate Measuring Cylinders, for the use in the field settling test for clay and fine silt in aggregates.

d) Two 0.34 kg. graduated clear glass medicine bottles for use in the test of organic impurities in sand.

e) Apparatus required for testing soils in accordance with British Standard 1377: Methods of Test for Soil Classification and Compaction, and British Standard 1924: Methods of Test for Stabilized Soils.

f) Apparatus for testing concrete in accordance with British Standard 1881: Methods of Testing Concrete, Parts 1 to 7.

g) A straight edge 3 metres long and measuring wedge or other approved apparatus for testing the accuracy of surfaces.

h) Additional testing equipment as stated in the Bill of Quantities or as required by the Engineer.

903. LOAD TESTING OF PIPES

The Engineer may instruct the Contractor to make a Loading Test (Three-Edge Bearing or Sand Bearing) on pipes to be used to construct the sewer. Payment for Load Tests will be entirely in accordance with the General Conditions of Contract.

10. DRAINS, SEWERS AND MANHOLES

1001. 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 authorized 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.

1002. 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.

1003. 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.

1004. 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, labor and materials required for such work and all costs incurred shall be deemed to be included in his rates for excavation.

1005. 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 centered 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 707 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 707 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.

1006. PIPES LAID WITH OPEN JOINTS

O.G. porous concrete pipes as specified in Clause 742 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.

1007. 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.

1008. 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.

1009. 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.

1010. 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.

1011. 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 affected by topping the side walls with concrete integral with the slab.

If required, half channel pipes, bends and junctions as specified in Clause 749 and Clause 742 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.

1012. PRECAST CONCRETE MANHOLES

Precast concrete manholes as specified in Clause 749 shall be supplied and laid generally in accordance with Clause 1011 and the drawings.

1013. GULLY CONNECTIONS

Connections from gullies to sewers and surface water drains or ditches shall consist of concrete pipes and fittings as specified in Clause 750 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.

1014. 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.

1015. 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 were leading into foul sewers or into combined foul and surface water sewers.

1016. COMPLETION OF DRAINAGE WORKS

All sub-soil and surface water drains shall be completed in advance of the construction.

1017. 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 labelled.

1018. 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.

1019. 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.

1020. 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 murram. 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 murram and be neatly jointed with cement mortar 1 to 3 as the work proceeds. The excavation, murram 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.

1021. 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 meter. 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 liter per hour per linear meter of nominal internal diameter.

The Contractor shall provide all labor and apparatus for the above tests.

All testing will be done in accordance with the procedure of the British Standard Code.

1022. 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.

1023. 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 grove. 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. Moulded 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.

1024. WEEP HOLES

Where shown on the Drawings or directed by the Engineer, the Contractor shall cast weep holes into concrete walls. The Contractor shall provide and place plastic pipes of the diameter shown on the Drawings to form weep holes 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 weep hole between the concrete wall and backfill material.

1025. 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 galvanized 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.

11. MISCELLANEOUS

1101. 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.

1102. BONDING TIES

Bonding ties shall be 75mm wide x 250mm long galvanized 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.

1103. 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.

1104. 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 perpends 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 blockwork shall be well filled with gauged mortar and shall not exceed 10mm in width.

1105. 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 meter. Damp-proof course shall be bedded horizontally in mortar as for blockwork with 115mm laps in length and full laps at angles.

1106. 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%).

1107. 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.

1108. 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%).

1109. FRAMES AND LININGS

Door frames and linings shall be Class 1 Mvuli mortice and tenon jointed at angles. Sub-frames for internal doors shall be Class 1 Mvuli tongued at angles.

1110. ARCHITRAVES AND STOPS

Architraves and stops shall be Class 1 Mvuli matching to the frames and linings.

1111. 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.

1112. 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.

1113. 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 pellating to sub-frames with matching hardwood pellates. Architraves and stops shall be pinned on, heads punched and filled with tinted filler.

1114. 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.

1115. 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.

1116. 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.

1117. GALVANISED WORK

Iron and steel, where galvanized, 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.

1118. 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 s.

b) Electric Power Act.

c) The K.P.&L. Co.'s 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

1119. 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.

1120. RAINWATER INSTALLATIONS

Rainwater installation shall be in grey PVC pipework with 'O' ring joints.

1121. 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.

1122. SETTING OUT

The positions of all pipe runs, including joints and connections, shall be agreed with the Engineer's Representative before work is commenced.

1123. 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.

1124. 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 unplasticized polyvinyl chloride (MuPVC). Waste traps shall comply with B.S. 3943. Balloon gratings shall be plastic coated steel wire.

1125. SLEEVES

Where sleeves are required for pipes passing through concrete or blockwork they shall be of galvanized steel heavy gauge tube of sufficient diameter to give a space of 3mm all-round the pipe.

1126. PIPEWORK GENERALLY

DOMESTIC MECHANICAL INSTALLATIONS FOR BUILDINGS

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.

i) Pipes

Galvanized Pipes

Galvanized mild steel tubing shall be in accordance with BS EN 10255:2004 as specified in the Bills of Quantities, with screwed and socketed joints.

Fittings for the same shall be galvanized malleable iron to BS EN 10241:2000 joints shall be made with P.T.F.E. tape.

Copper Pipework

Capillary type connectors may be used for copper pipework where installed in continuous runs, and elsewhere approved compression fittings to BS EN 1057:1996 shall be used.

Short right-angle bends are to be avoided and normal elbows and bends are to be used where practicable. Sets and bends in copper pipe shall be made by heating and sand filling where necessary. Kinked or flattened bends will be rejected.

PPR Pipework

The pipes and fittings shall comply in all respect with the BS EN 1329 and BS EN 1401 and PPR installation to BS EN 12056 or equivalent DIN 8077 and 8078 and with the Engineer's approval. Pipe jointing shall be by poly-fusion or use of electric coupling at PN 20.

Unplasticized PVC Pipework Above Ground
Unplasticized PVC drainpipes shall comply with BS EN 1329 -1:2000 and bear the BS Kitemark. Jointing of pipes shall be carried out by means of solvent welding or with ring seal expansion joints. The manufacturer's recommended method of joint preparation and fixing shall be followed.

Unplasticized PVC Pipework Below Ground
The pipes and fittings shall comply in all respects with BS 1401:2009 and bear the BS Kitemark. The base of soil and vent stack connection to each of these drains shall be made using a bend with a minimum center line radius of 150mm.

Black Vulcathene Pipework
The pipes and fittings shall comply in all respects with British Standards (BS EN ISO:9001) and jointing of pipes and fittings shall be carried out in accordance with the manufacturer's instructions and to the approval of the Engineer.

ii) Valves

Valves Generally

- All valves required to be stamped by the appropriate authority.
- Easy clean patterns are to be supplied. Where visible, and where easily accessible, a locking shield type is to be provided.
- Valves should be installed to control each section of the work and as indicated on the Drawings.
- The pattern of all valves to be used must be approved by the Engineer before any orders are placed.
- Stopcocks shall be fitted on all water supplies up to and including 50mm diameter unless otherwise specified. For pipe sizes over 50mm in diameter gate valves shall be installed.
- Drain cocks shall be fitted to all water mains entering the building after the isolating valve, where indicated on the drawings and where necessary for draining of services.
- All must fully conform to the relevant British Standard. Valves of Chinese or Taiwanese origin will not **be considered as acceptable for this Contract.**

a) Stop Cocks
Stopcocks shall comply with BS 1010 and shall be manufactured from bronze or gunmetal.

b) Gate Valves
Bronze-bodied valves shall be cast to BS EN 1982:1999. The bodies shall be of the even thickness throughout, clean and free from scale and flaws.
The gate valves up to and including 80mm shall be as Crane No. D 151 non-rising stem and wedge disc to BS 5154: 1991 with screwed threads to BS 21 taper thread.
Gate valves exceeding 80mm up to 300mm shall be as Glenfield R.S. Gate Valve 3500 series to BS 5163:1986(1991) with flanges to BS 4504:1989 PN 16. The valve is a double flanged cast iron wedge gate valve for water works purposes with Meehanite cast iron body to BS 1561:1997 GR. 14 with rubber covered Meehanite cast iron gate. The stem is to be of forged stainless steel to BS 970 with Meehanite cast iron hand wheel.

c) Drain Cocks

Drain cocks shall be of the packed gland type. Bodies shall be of cast bronze. Plugs shall be tapered and ground into the body to form a tight seal under pressure. Gland flanges shall be bolted to the valve body with steel stud bolts.
Screwed connections shall be BS 21:1985 taper threads; flanged connections shall be BS 10:1962. Cocks shall be suitable for operation by hand switch.

d) Ball Valves

Ball valves supplied for WC Cisterns shall be the plastic diaphragm type with seating to suit the working pressure with plastic float to BS 2456:1990 and suitable for internal overflow unless otherwise specified.

e) Foot Valves

The foot valves shall be as Glenfield check valve no. 5803 to BS 5153: 1974 (1991) incorporating strainer, with flanges to BS 4504:1989 PS 16. The strainer shall be of Meehanite cast iron and the strainer area shall be not less than twice the suction pipe area.

f) Non-Return Valves (Check Valves)

The non-return valves up to and including 80mm diameter shall be as Glenfield no. 5703 conforming to BS 5153: 1974 with flanges to BS 4504:1989 PN 16.
Non -return valves exceeding 80mm diameter and up to 300m diameter shall be as Glenfield no. 5103 conforming to BS 5153:1974 (1991) with flanges to BS 4504:1989 PN 16.

iii) LP G Gas Supplies

General

The gas installation shall be made in accordance with CP 339 and relevant Kenyan Code of Practice and regulations.

a) Pipework and fitting

The gas supply shall be installed in black mild steel pipework to BS 1387. Fittings shall be constructed of a similar material and shall conform to BS 1740.

b) Fittings

Control valves shall be provided where indicated on the Drawings and where required to isolate the gas supplies and shall be manufactured in accordance with BS 1552. Gas governors shall comply with BS EN 88: 1991 and shall be sized to suit the particular items of equipment they are supplying.

c) Testing

The gas pipework and fittings shall be subjected to an air pressure test of twice the working pressure for a period of two hours or for whatever longer time is necessary to complete the section under test. During this time there shall be no fall in pressure.

iv) External Pipe Works, Pipe Laying, Backfilling and Associated Items

Where pipes are laid below ground, the main contractor shall carry out all excavation, back-filling, removal of spoil, and making good as specified and as necessary to complete the installation to the satisfaction of the Engineer.

- The sub-contractor shall include for providing all information and marking out as necessary in good time, so that the main contractor can provide the necessary attendance.
- All pipework shall be installed in a neat and workmanlike manner and be properly aligned throughout.
- Depth of crown of pipe shall not be less than 0.7m and pipes shall be installed with due regard to clearances from other services installed in the area.
- Pipes shall be so arranged as to avoid air pockets, and shall be graded such that the system will vent normally through the installation, or by other approved means.
- Trenches shall be of ample dimensions to permit laying and jointing, and pipes shall be bedded in not less than 75mm of sand or other approved material. Filling of the same material shall be hand packed around the pipe a further 75mm above the crown of the pipe, and the whole shall be wall rammed before completion of back-filling, consolidating and making good.

All drainage pipes shall be laid to continuous and even falls and in accordance with the manufacturer's recommendations. The pipe trenches shall not be back-filled before the pipes have been tested and approved by the Architect and the Engineer.

- Following the final back-filling of all trenches, headings and manhole surrounds, the surface of the excavated areas shall be fully reinstated to the approval of the Engineer and Architect.
- All drains below buildings and small roads shall be encased in 150mm thick concrete (1:3:6). On completion, all drains, manholes, etc shall be flushed from end to end with water and left clean and free from obstructions.

v) <u>Construction of Manholes</u>

- Manholes shall be watertight and constructed of blockwork 200mm thick on a concrete foundation as shown on the Drawings. Where manholes are likely to receive heavy loads such as roads and access areas, or where they are classed as deep manholes then the blockwork walls shall be reinforced and filled in accordance to the structural engineers Specification. The top of the chamber shall be covered by a reinforced concrete slab with an opening to suit the cover and frame.
- Branch connections to the main drain line shall be made with three-quarter section bends, which will be mounted on top of the half section channel of the main drain line and shall be swept in the direction of the flow.
- The manhole shall be benched up, sloping at 1 in 10 and rendered and trowelled smooth.
- Manhole covers to BS EN 124: 1994 shall be of suitable size to allow complete access, or as indicated on the Drawings.
- Manhole covers should be capable of supporting the traffic indicated by the area in which they are situated, or as shown on Drawings.
- The underside of all foul drainage manhole covers and frames exposed to crude sewage vapours shall be suitably protected at the place of manufacture.
- Keys for the purpose of lifting and locking these covers shall be provided, three sets under this contract.
- Before manhole covers are supplied to site, details of all covers are to be submitted to the Engineer for approval.
- Step irons to BS 1247 shall be provided wherever the depth of the access pit requires, and as shown on Drawings.

- In manholes that may in the future carry liquid containing acid, the trenches/channels shall be formed by uPVC pipe cut in half horizontally and embedded in the manhole benches.
- The neutralizing chamber shall be constructed as specified above and as shown on the Drawings full details being agreed.

vi) Gullies

Gullies shall be 100mm PVC trapped type with a 150mm Belfast framed in concrete (1:3:6) of a 100mm minimum thickness, forming a box approximately 300 x 300mm x 100mm above ground. The gullies shall be provided with a light duty cover, to fit in the recess made for this purpose.

vii) Installation of Internal Pipework

All pipework shall be installed in a neat and workmanlike manner, properly supported and aligned throughout.

Prior to erection, all piping, plant and equipment shall be cleaned throughout or blown through with compressed air. Where falls are not shown on the Drawings or stated otherwise in the Specification, pipework shall be installed parallel to the lines of the buildings and as close to the walls, ceilings, columns etc. as is practicable. All details shall be approved and shall be clearly indicated on the contractor's detailed Working Drawings.

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

All pipes shall be installed with due regard to other services within the ducts, ceiling spaces, or other spaces provided. Branches shall be fitted so as to avoid stresses at the take off point, and to minimize as far as practicable sharp changes in the direction of flow. Pipe ends are to be cut square, be free from burrs and well reamed or filed inside to ensure full bore. The contractor shall ensure that access to all pipework, rodding eyes, etc. is readily maintained particularly where such items are installed above false ceilings and similar areas. Full details shall be included in the sub-contractor's detailed Working Drawings.

Screwed piping shall be installed with a sufficient number of unions to facilitate easy removal of valves and fittings and to enable alterations of pipework to be carried out without the need to cut the pipe. It is the sub-contractor duty to suggest the positions and number of unions to be fitted, but the final decision rests with the Engineer.

Full allowance shall be made for the expansion and contraction of pipework, precautions being taken to ensure that any forces produced by pipe movements are not transmitted to valves, equipment or plant.

The sub-contractor shall pay particular care when supporting all pipework, particularly cast-iron pipes, in order to ensure that settlement and building movement do not break the pipe joints.

If nothing else is specified, all pipe supports shall be of robust metal construction galvanized or painted. They shall be so arranged as to permit longitudinal expansion and contraction of the pipework as necessary. Hangers, where used, shall be of the adjustable type, and anchor points shall be installed where necessary. All to be in accordance with

manufacturer's recommendations or where this is not specified then the following maximum spacing will be permitted.

Pipe Nominal Bore (mm)	Horizontal Rums (m)			
	Iron	Copper	uPVC	PPR
15	1.80	1.20	0.30	0.70
20	2.40	1.80	0.35	0.75
32	2.40	1.80	0.38	0.85
40	2.75	2.40	0.43	1.10
50	3.00	2.40	0.45	1.25
65	3.65	3.00	0.65	1.35
80	4.00	3.00	0.67	1.55
100	4.00	3.00	0.75	1.70
150	4.00	3.00	1.00	2.00

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

Where more than one size of pipe is carried on the same supports, spacing of supports shall be that required for the smallest pipe.

Attachment of supports to masonry shall be by means of approved metal expansion devices. Use of explosive tools will be subject to Site approval by the Architect and Engineer in each case.

Unless otherwise directed, the pipework shall be generally concealed throughout, and no pipework may be exposed without prior approval unless so indicated on the Drawings.

The sub-contractor shall provide all necessary rodding and inspection facilities within the draining system. In positions where stacks pass through the roof, a weather apron shall be provided. The sub-contractor is to fix stacks before roofing is completed, to ensure that stacks do not allow ingress of water to building or duct. Full details shall be agreed with the Architect prior to the commencement of the installation as the Architect must agree details at roof level.

The open end of each stack shall be fitted with a plastic-coated or galvanized steel wire guard.

Where pipes pass through walls and floors, sleeves shall be fitted to allow free axial movement of the pipes. Sleeves shall be of a material compatible with the pipe they protect. Where fitted in visual position the sleeve should be fitted with an end plate, the details to be agreed upon by the Architect and Engineer. In all other cases they shall finish flush with the wall and the open space filled up with approved fire and sound proofed material. Sleeves passing through wetted floors, or walls, and floors below ground shall be of stainless steel and extend 6mm above floor and fitted with approved puddle flanges, or similar type arrangements, to prevent the ingress of moisture. Details shall be agreed.

Note that testing and sterilizing of pipework is required as referred to later herein.

viii) Pipe Entry into Buildings

Service pipes shall enter the buildings in the positions shown on the Drawings. Entry shall be by means of sleeves built into the building structure, of ample dimension to permit the installation of the service pipes to move freely. On installation of the pipes, the sleeves shall be sealed both within the building and at the point of entry below ground level for distances of not less than 150mm, to prevent ingress of moisture or vermin. Sealing material shall be by use of bitumen, and the protruding sleeve, must be fitted as specified herein.

ix) Sleeves

Where pipework passes through walls, floors or ceilings a sleeve shall be provided one diameter larger than the diameter of the pipe. The space between is to be packed with mineral wool, to the Engineer's approval.
Where sleeves pass through structural elements (beams, columns structural slabs etc.) permission from the structural engineer must be obtained.
All sleeves associated with the same lengths of pipework must align and run true. Particular attention is required on this matter, and failure by the contractor to achieve this will render himself liable to the total costs involved in correcting the position of the sleeves.

x) Floor and Ceiling Plates

Where pipework passes through walls, floors or ceilings, plates shall be secured around the pipe. The plates shall be of stainless-steel construction and will serve no other purpose other than to present a neat finish to the exposed installation.

xi) Connections

The sub-contractor shall connect the water supply to all outlets and equipment as scheduled in the Bill of Quantities or shown on the Drawings. Tee's and short radius bends will be permitted in 20mm and 15mm copper were associated with such final connections to equipment and outlets.

Unless otherwise directed, final connections to outlets and sanitary fixtures shall be carried out using copper pipework. Connections to W.C. pans shall be affected by the use of a W.C. connector, gasket and cover, sized to suit pan outlet.

xii) Pipework Lagging

All hot water pipework, except exposed final connections, shall be lagged with an approved mineral or glass fiber sectional insulation. The final lagging thickness shall be commensurate with the pipework and existing installation details.
The required minimum thickness of insulation should be as follows:

Pipe I.D.	Min. Insulation Thickness
15 mm	12.50 mm
20 mm	19.00 mm
25 mm	25.00 mm
32 mm	38.00 mm
40 mm	38.00 mm
50 mm to 150 mm	50.00 mm

All insulation to be covered with aluminum foil, American Cloth and painted with three coats of waterproof paint. Pipework and equipment within boiler house, calorifier room or

external to buildings to be clad with galvanized mild steel or aluminum sheets of minimum 22-gauge thickness.

The insulation shall be fixed to the pipes by means of metal clips at intervals not exceeding 400mm and at bends by continuous binding with copper wire to the extent necessary to provide a neatly formed finish.

xiii) Painting

The sub-contractor shall allow for priming, undercoating, and finishing of all exposed ferrous pipework and equipment to architectural requirements.

Exposed brass work shall be left polished and all supporting brackets, handles and similar items chromium plated or provided with a permanent bright finish to approval.

xiv) Pressure Tests

a) General

As the installation of pipework proceeds, the various sections shall be tested before they are built in, concealed, or finally connected. The sub-contractor shall advise the Architect and Engineer in writing at least three days in advance of the carrying out of such tests, and such tests shall, if considered necessary by the Engineer, be carried out in his presence.
All tests shall be at the expense of the sub-contractor and it shall be the responsibility of the sub-contractor to make all necessary records of the tests and results and submit these to the Architect and Engineer in the final form agreed.

b) Pressure Pipes

All pipe systems shall be tested hydraulically for a period of one hour to not less than one and a half times the design working pressure.

If preferred, the sub-contractor may test the pipelines in sections. Any such section found to be satisfactory need not be the subject of a further test when the system has been completed, unless specifically requested by the Engineer.

During the test, each branch and joint shall be examined carefully for leaks and any defects revealed shall be made good by the sub-contractor and the section re-tested.

c) Drainage Pipes

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

xv) Sanitary Appliances

The sub-contractor is required supply, install, test and commission the appliances specified elsewhere in accordance with C.P. 305 (1974).

The appliances shall be fixed in the position shown on the drawings or as directed by the Architect or the Engineer.
For all sanitary appliances, the necessary number of supports, brackets, plugs, screws, washers, jointing material, etc. shall be provided by the sub-contractor.

Where supports, brackets, etc. are screwed to wall or structure raw-plugs or similar shall be used.
No trap for any appliances whatsoever shall be with less seal than 75 mm.
Fixing shall, if required by the Architect or the Engineer, include for temporarily erecting appliances in the required position of service and discharge pipes, taking down, storing and permanently fixing after completion of wall finishing and connecting to service and discharge pipes.
Care shall be taken at all times, and particularly after fixing, to protect appliances from damage.
Upon completion of the work, all appliances shall be cleaned for plaster, paint, etc. and carefully examined for defects.

xvi) Cleaning

The inside of all pipes, valves, tanks and fittings shall be clean, smooth, and free from blisters, loose scale and dirt, when erected.
All lines shall be cleaned after installation and before placing in service.
When pipes are installed all ends shall be suitable plugged until final fixing of fixtures can be carried out. No pieces of cloth or stones will be permitted.

xvii) Sterilization of Water Supply Systems

All underground water mains and above ground water distribution systems, cisterns, tanks, pumps, etc. shall be thoroughly sterilized and flushed out after the completion of all tests and before being fully commissioned for handover.

The sterilization procedure shall be carried out in accordance with the requirements of BS Code of Practice 310, Clause 409, to the approval of the Architect and Engineer.

xviii) Testing and Commissioning

Before handing over, the sub-contractor shall confirm that the installation has been examined, tested, accepted and approved by the relevant local authorities, is ready for use, that it will operate and can be maintained efficiently.

When handing over, the sub-contractor shall demonstrate to the Employer the methods of operation, limitations, the maintenance requirements and the safety precautions to be observed.

xix) Air Conditioning Installations

The air conditioning units shall be split air-cooled unitary air conditioners comprising outdoor units and indoor units. They indoor units shall mostly be of the cassette type but some floor mounted units, ceiling console units and window type units shall be included.

Each unit shall have centrifugal fans in both the indoor (evaporator) and the outdoor (condensing) units.

Each outdoor unit shall include the compressor, condenser, centrifugal fan and controls. Each indoor unit shall include the evaporator coil, filter and fan. Cassette type indoor units shall include a provision for fresh air intake.

The units shall be capable of inducing a continuous flow of clean fresh air and exhausting stale air at the same time. Other features shall be as follows:

- Efficient draft free cooling and humidity control;
- Whisper quiet in operation;
- Fully automatic microprocessor thermostatic temperature control;
- Robust, protective and corrosion-free construction to ensure long life;
- Finished appearance blending with both internal and external environment.
- Permanent, reliable and cleanable air filter conveniently positioned for easy withdrawal/cleaning;
- Sturdy, reliable controls marked and designed for easy reading and operation.

Each system shall be fully equipped and factory tested and certification shall be produced to this effect. Each of the systems shall be installed as a working unit complete with diffusers/grilles, dampers, silencers, controls and all necessary accessories.

All the air conditioning equipment shall be mounted on suitable anti-vibration mountings with the noise level of the system being kept as low as possible.

The air conditioner shall use a non-ODS refrigerant easily available in the country.

Electrical Works

It shall be the responsibility of others to provide electrical power, including a fused isolator in the vicinity of the air conditioners/fans.

The air conditioning/fan Sub-Contractor shall then be responsible for carrying out all control and electrical wiring between his equipment and in connecting power from the local isolator to his equipment and fittings. The wiring shall be carried out neatly in conduit or trucking to the requirements of IEE regulations.

xx) <u>Fire Hose reel and Portable Extinguishers</u>

The Fire Hose Reels and Portable Fire Extinguishers, shall conform to BS EN 3-10:2009, BS 7863:2009 and BS 5306-8:2001. The Sub-Contractor shall include for all appurtenances and appliances not necessarily called for in this specification or shown on the Contract Drawings, but which are necessary for the successful completion and satisfactory functioning of the equipment.

(i) Water / CO_2 Portable Fire Extinguishers

Portable 9-litre water filled CO_2 cartridge operated portable fire extinguishers shall comply with BS EN 3-7:2007 and BS 7863:2009. Unless manufactured with stainless steel, bodies shall have all internal surfaces completely coated with either lead tin, lead alloy or zinc applied by hot dipping. There shall be no visibly uncoated areas.

The extinguishers shall be clearly marked with the following:

- Method of operation;
- The words 'WATER TYPE' (GAS PRESSURE) in prominent letters;
- Name and address of the manufacturer;
- The nominal charge for the liquid in imperial gallons and litres;
- The liquid level to which the extinguisher is to be charged;
- Instructions for periodical checking;
- The year of manufacture;
- A declaration to the effect that the extinguisher has been tested to a pressure of 350 p.s.i. (24.1 Bar); and
- The number of the British Standard or NFPA/UL-listing/FM-approval;
- The manufacturer's name and identification markings.

(ii) CO2 Gas Portable Fire Extinguishers

Portable carbon dioxide fire extinguishers shall comply with BS EN 3-7:2007 and BS 7863: 2009. The body shall be a seamless steel cylinder manufactured to the latest editions of BS 401, BS 1287 or BS 1288.

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

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

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

The extinguishers shall be clearly marked with the following:

- Method of operation;
- The words 'CARBON DIOXIDE FIRE EXTINGUISHER' in prominent letters;
- Name and address of the manufacturer;
- The nominal gas content in kg;
- The words 'Recharge immediately after use';
- Instructions for periodical checking;
- The year of manufacture;
- A declaration to the effect that the extinguisher has been tested to a pressure of 350 p.s.i. (24.1 Bar); and
- The number of the British Standard or NFPA/UL-listing/FM-approval;
- The manufacturer's name and identification markings.

(iii) Dry Powder Portable Fire Extinguishers (9kg ABCE Cartridge)

The portable dry powder fire extinguishers shall comply with the latest editions of BS EN 3-7:2007, and BS 7863: 2009. The body shall be constructed of steel not less than the requirements of the latest editions of BS 1446 or Aluminum to BS EN 485, BS EN 515: 1993 BS EN 573, and shall be suitably protected against corrosion.

The dry powder charge shall be non-toxic and retain its free-flowing properties under normal storage conditions. Any pressurizing agent used as an expellant shall be in dry state, in particular compressed air.

The discharge tube and gas tube if either is fitted shall be made of steel, brass, copper or other not less suitable materials. Where a hose is provided it shall not exceed 1,060mm and shall be acid and alkali resistant. Provision shall be made for securing the nozzle when not in use.
The extinguishers shall be clearly marked with the following information:

- The words "Dry Powder Fire Extinguishers";
- Method of operation in prominent letters;
- The working pressure and the weight of the powder charge in kilogram's;
- Manufacturer's name or identification mark;
- The words "RECHARGE AFTER USE" if rechargeable type;
- Instructions to regularly check the weight of the pressure container (gas cartridge) or inspect the pressure indicator on stored pressure types when fitted, and remedy any loss indicated by either;
- The year of manufacture;
- The pressure to which the extinguisher was tested;
- The number of the British Standard or NFPA/UL-listed/FM-approval; and
- Appropriate complete instructions for charging the extinguisher shall be clearly marked on the extinguisher or otherwise be supplied with the refill.

(iv) Air Foam Fire Extinguisher

The portable air foam fire extinguishers shall comply with BS 7863:2000, B.S. EN 3-7:2007 and B.S. 381 C .1. The body shall be constructed of steel not less than the requirements of the latest editions of BS 1449 or Aluminum to BS EN 485, BS EN 515: 1993 BS EN 573, and shall be suitably protected against corrosion.
The portable air foam fire extinguishers shall be of 9 litres capacity complete with refills

cartridges and wall fixing brackets.

- The words "Air Foam Fire Extinguishers";
- Method of operation in prominent letters;
- The working pressure and the weight of the powder charge in kilogram's;
- Manufacturer's name or identification mark;
- The words "RECHARGE AFTER USE" if rechargeable type;
- Instructions to regularly check the weight of the pressure container (gas cartridge) or inspect the pressure indicator on stored pressure types when fitted, and remedy any loss indicated by either;
- The year of manufacture;
- The pressure to which the extinguisher was tested;
- The number of the British Standard or NFPA/UL-listed/FM-approval; and
- Appropriate complete instructions for charging the extinguisher shall be clearly marked on the extinguisher or otherwise be supplied with the refill.

(v) Fire Blanket

The fire blanket shall be made from cloth woven with fiberglass or any other fire proof material and to measure 1800 x 1800 mm and shall be fitted with special tapes folded so as to offer instantaneous single action release blanket from storing jacket. It shall be UL/FM approved.

1127. 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 color coded for hot and cold.

Pillar valves shall comply with B.S. 1010 and shall be of brass with fixed jumpers, chromium plated and color coded for hot and cold.

Stop valves shall comply with B.S. 1010 and shall be of brass with crutch handles.

1128. CISTERNS

Storage cisterns and break feed cisterns shall be galvanized steel cisterns complying with B.S. 417, Grade A.

1129. 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

1130. 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.

1131. METAL LATHING

Metal lathing shall be light galvanized expanded metal weighing not less than 1.2 kg. per square meter and complying in all other respects with B.S. 1369.

1132. 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.

1133. 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.

1134. 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.

1135. PLASTICISERS

Plasticizers 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.

1136. WATER PROOFERS

Water proofers shall be approved integral water proofers and shall be used in accordance with the manufacturer's instructions.

1137. 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

1138. GLAZED CERAMIC WALL TILES

Glazed and eggshell ceramic wall tiles shall comply with B.S. 1218 and shall be of the colors described. Samples of tiles shall be submitted to the Engineer's Representative for approval.

1139. ADHESIVE

Adhesive for fixing wall tiles shall be approved adhesive.

1140. 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.

1141. 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%.

1142. 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.

1143. 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, centered on the joint.

1144. 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.

1145. 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.

1146. 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 another 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.

1147. 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.

1148. 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

1149. 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.

1150. 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.

1151. 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.

1152. 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.

1153. IRONMONGERY FURNITURE

The rates for painting shall include for taking down and refixing ironmongery furniture, kicking plates etc., as necessary.

ROADS AND FOOTPATHS

1154. 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.

1155. MURRAM SUB-BASE

The murram sub-base will be constructed only in poor soil conditions were directed by the Engineer. The murram 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 murram, 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 murram 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.

1156. 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: -

B.S. Sieve Size	% by Weight Passing
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.

1157. ROLLED ASPHALT HOT PROCESS WEARING COURSE

Rolled asphalt wearing course shall be made and laid in accordance with British Standard594: 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.

1158. 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 bitumen the mixing temperature shall be as determined by the Engineer.

1159. COMPACTION AND SURFACE FINISH

As soon as rolling can be affected 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.

1160. 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 murram 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.

1161. 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.

1162. 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 superelevated 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.

1163. 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.

1164. LAYING KERBS, CHANNELS AND EDGING BLOCKS

Krebs, 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.

1165. 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.

1166. 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 center 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.

1167. 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 coarse 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 minimize the risk of disturbance, it is advisable to avoid screeding sand long distances in front of the block laying face.

1168. 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.

1169. 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.

1170. 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.

1171. 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.

1172. 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.

1173. 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.

1174. 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.

1175. 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.

1176. 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.

1177. 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.

1178. 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 "Snow Crete" 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.

1179. OPERATION AND MAINTAINANCE EQUIPMENT AND LABORATORY INSTRUMENTS

The Contractor will provide the following list of laboratory instruments and equipment for use by the Employer during the operation phase of the project:

LAB EQUIPMENT			
Item	**Item Description**	**Quantity**	**Unit**
1	Portable Multi parameter water Quality Meter	1	No.
2	Analytical Balance (max. cap. 400g)	1	No.
3	Autoclave, Electric	1	No.
4	Industrial Blender, stainless steel	1	No.
5	BOD Incubator Thermostatic cabinet	1	No.
6	BOD Bottles, Amber	12	No.
7	BOD Measurement system 6 place	1	No.
8	COD Photometer	1	No.

9	COD Digester/Thermoreactor	1	No.
10	COD Reagent vials, 0-1,500mg/L Pack	1	No.
11	Colon counter	1	No.
12	Chlorine portable colorimeter	1	No.
13	Lovibond Comparator, complete with cells	2	No.
14	Portable Conductivity meter	1	No.
15	Dissolved oxygen meter	1	No.
16	Digital Thermometer, with stainless steel probe	1	No.
17	Digital weighing balance, 50Kg Capacity	1	No.
18	Floc tester/Jar tester, 6 Paddle	1	No.
19	Hot plate with magnetic stirrer	1	No.
20	Microbiological incubator	1	No.
21	Magnetic rod retrievers	2	No.
22	Stirring rods	10	No.
23	Laboratory Oven	1	No.
24	pH Meter	1	No.
25	Turbidity Meter	1	No.
26	Palintest photometer 7500	1	No.
27	Vacuum diaphragm pump	1	No.
28	Refrigerator, 140L	1	No.
29	Sample cool box, 10L	1	No.
30	VIS Spectrophotometer	1	No.
31	Stop watch, digital	1	No.
32	Laboratory Water bath	1	No.
33	Water Hardness test meter	1	No.
34	Water Still	1	No.
35	First Aid kit complete	1	No.
36	Bench top Fume extractor (Hood)	1	No.

LAB GLASSWARE & ACCESSORIES			
Item	**Item Description**	Quantity	Unit
1	Evaporating dishes, aluminum	8	No.
2	Autoclave tapes, roll	2	No.
3	Beakers, heat resistant glass, 1L	10	No.
4	Beakers, glass,500ml	10	No.
5	Beakers, glass, 250ml	10	No.
6	Beakers, glass, 100ml	10	No.
7	Buffer solution PH4.00	1	No.
8	Buffer solution PH7.00	1	No.
9	Buffer solution PH10.00	1	No.
10	Burette, 50ml	5	No.
11	Chlorine disc low range	4	No.
12	Burette clamp,2 sided	3	No.

13	Conical flask, 50ml	10	No.
14	Conical flask, 100ml	10	No.
15	Conical flask, 250ml	10	No.
16	Conical flask, 500ml	10	No.
17	MacConkey broth, 500g	2	No.
18	Brilliant green, 500g	2	No.
19	Desiccator, with Knob, 12"	1	No.
20	Distiller water, 20L	4	No.
21	DPD No.1 of 500 Tablets per box	20	No.
22	Durham tubes, small size -3cm	200	No.
23	Whitman Filter papers, 185mmØ 100 papers per box	100	No.
24	Ceramic funnel, 125mm	6	No.
25	Gloves, disposable, pk/100	6	No.
26	pH Low Range Disc	2	No.
27	pH High Range Disc	2	No.
28	McCartney Bottles	200	No.
29	Aspirator Bottle, 20L For distilled water	1	No.
30	Industrial Gloves chemical resistant	200	No.
31	100ml Mixing Bottles	12	No.
32	Measuring cylinder, 25ml	6	No.
33	Measuring cylinder, 50ml	6	No.
34	Measuring cylinder, 100ml	6	No.
35	Measuring cylinder, 250ml	6	No.
36	Measuring cylinder, 500ml	2	No.
37	Petri dish, autoclavable, 90mm Pack of 20	1	pack
38	Graduated pipette, 10ml	24	No.
39	Pipette Filler	5	No.
40	Plastic sampling bottles, HDPE, Wide mouth	20	No.
41	Silver nitrate M.W 169.87, 25g	5	Bottles
42	Potassium Chromate M.W 194.19, 500g	1	bottle
43	Ethylenediamine tetra acetic acid disodium salt 99%, 500g	2	bottles
44	Eriochrome black t indicator, 25g	2	bottles
45	Sodium chloride m.w 58-44, 500g	2	bottles
46	Magnesium sulphate m.w 246.47, 500g	2	bottles
47	Ammonium chloride m.w 53.49, 500g	2	bottles
48	Sodium hydroxide pellets 97% extra pure, 500g	2	bottles
49	Murexide (ammonium purpurate m.w 284.19) indicator, 25g	2	bottles
50	Sulphuric acid 65%v/v, 2.5ltr	2	bottles
51	Methyl orange indicator, 500ml	2	bottles
52	Wide range pH indicator solution, 500ml	2	bottles
53	Alkaline Azide, 500ml	2	Bottles

54	Sodium thiosulphate, 500ml	2	bottles
55	Starch solution, 500ml	2	Bottles
56	Mercury sulphate,500ml	1	bottles
57	Silver sulphate, 500g	2	bottles
58	Phenetroline indicator, 500ml	2	bottles
59	Iron (II) sulphate, 500ml	2	bottles
60	Spatula, 6"	5	No.
61	Spatula, 8"	5	No.
62	Burette stand, complete	1	No.
63	Tripod stand	1	No.
64	swivel probe stand with steel base	1	No.
65	Volumetric flasks, 250ml, with stopper	6	No.
66	Volumetric flasks, 500ml, with stopper	6	No.
67	Volumetric flasks, 1000ml, with stopper	2	No.
68	Wash Bottles,500ml	4	No.

1180. 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.

12. ELECTRICAL INSTALLATION

PART I: GENERAL SPECIFICATIONS

1201. 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 & Regional Development of the Republic of Kenya.

1202. 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 (17th Edition) issued by the Institution of Electrical s 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 Standards, European Norms (EN), International Standards Organization 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 of Ministry of Public Works.

Regulations of 17th Edition of I.E.E. The Regulations are to be observed in conjunction with other related local Bye-Laws and Acts.

1203. 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, labor, 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 Telkom Kenya Ltd. 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.

1204. 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 Aluminum-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 fuse gear, 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.

The entire 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 galvanized 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.

1205. 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 literature, technical brochures and samples of materials he proposes to install for test and approval before installation. For major equipment they shall be approved / inspected by the engineer and the Client representative at the place of manufacture / source prior shipment to site for 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.

1206. 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.

1207. 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.

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.

Drawings, and, where relevant, calculations in respect of the following shall be prepared by the Contractor and submitted to the Engineer for his approval commencing within ten (10) days from acceptance of the tender.

(a) Cabling and external cable routes;
(b) Details of all conduit and trunking runs in respect of different services;
(c) Details of lighting and power circuits, routes etc.;
(d) Details of sub-main switchgear and distribution boards;
(e) Fire alarm layouts and all circuit diagrams;
(f) Lightning and surge protection details;
(g) Technical literature for all the services;
(h) Layouts of all ducts, chases, holes, trenches and all other services throughout the whole of the building and associated external works.

All drawings shall be to scale and fully detailed with all the important dimensions shown and the construction of key components indicated.

During progress of the building works, the Contractor shall make all necessary checks on site to ascertain that the various services can be installed as specified and shown on the approved Drawings.

Where such works cannot be so installed, this must be immediately brought to the notice of the Engineer prior to the progress of such works.

The Engineer, in conjunction with the Employer, will check and return the Drawings submitted for approval within a reasonable period, but in any case not exceeding fourteen (14) days from receipt of the Drawings.

The layouts of plant and equipment are for general guidance only. The Contractor shall assess the requirements and prepare a plant layout for approval within twenty-one (21) days, the required liaison being maintained with other specialists, such that an agreed layout is submitted for approval.

1208. 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.

1209. 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 Test

Any other test 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.

1210. MAINTENANCE MANUALS

At the start of the defects liability period, the Contractor shall hand over to the Engineer, four sets of maintenance and operations manuals for each plant and equipment installed. These manuals shall be in English and shall be fully illustrated.

1211. BUILDER'S WORK AND CIVIL WORLKS

Builder's Work and Civil Works that are incidental to this section of the Contract such as cutting of holes in walls and floors, provisions of foundations for the plant and machinery, shall

be the responsibility of the Main Contractor. The Contractor shall be fully responsible for the preparation of all such details that relate to such works, the details being subject to approval by the Architect and Engineer prior to submission to the Main Contractor for action. Other items such as fixing of brackets, cables and ductwork and trenching, making good etc. shall be carried out by the Contractor to suit the installation of all the services.

It is the Contractor's sole responsibility to ensure that all holes and chases are in the required position and that any additional ducts, holes and chases necessary for erection of the installations in situ concrete walls, floor slabs etc., are included in the early stages of construction as appropriate.

The Contractor shall furnish the Engineer, Architect and Main Contractor with all the necessary information including position of foundations, brackets and fixings and shall ensure that such works are performed in accordance with available information.

The Contractor shall include in his tender all supports, fixings, plugging of holes in walls, ceilings and floors to facilitate the fixing of the pipe work, accessories, and all other portions of installations. Any purpose-made fixing brackets shall also be provided and installed by the Contractor, including escutcheon plates and the like.

The Contractor shall supply and install approved pipe work support brackets and hangers. It shall be deemed that prices include for any special requirements and that the Contractor has visited the site during the tender period to ascertain all details.

The Contractor shall pay particular attention to the fixing and alignment of items. All items shall be installed square, true and perpendicular to floors i.e. as shown on Drawings and as may be required at site to the Engineers approval.

1212. COMMISSIONING OF THE ELECTRICAL INSTALLATION

The Contractor shall instruct the Employer’s Maintenance Engineer or his representative on the operation and maintenance of the various components forming the electrical installation and shall provide drawings, diagrams and manuals to ensure the Maintenance Engineer or his representative is completely conversant with such installations.

The Contractor shall ensure that the services installations are left in complete safe working order and operating to the satisfaction of the Engineer.

1213. SITE PERFORMANCE AND ACCEPTANCE TESTS

The Contractor shall give notice of the date of the specified tests to be performed on completion of installation. The notice shall be made in writing to the Engineer at least five days to the date of the specified tests. Unless otherwise agreed the tests shall take place within seven days of the stated date or on such day or days as the Engineer shall in writing notify the Contractor in writing. The tests shall be carried out under normal working conditions to the satisfaction of the Engineer and shall extend over such continuous periods as he may direct.

All skilled labor, supervision, apparatus, fuel and instruments required for carrying out the tests will be the responsibility and at the expense of the Contractor. The accuracy of the instruments

shall be demonstrated if required. The Contractor shall ensure that test instruments are in good working condition and have been calibrated by an authorized agent.

If any part of the plant or equipment fails to pass the specified tests, further tests of the said part shall, if required by the Engineer, be repeated. The Contractor shall, without delay, put in hand such modifications as found necessary so as to meet the requirements of the Contract and any expense which the Client may have incurred by reason of such further tests shall be deducted from the Contractor's Contract price.

Each completed system within the installation shall be tested as a whole under operating conditions to ensure that each component functions correctly in conjunction with the rest of the system.

1214. PAINTING AND FINISHING

All mechanical and electrical plant and equipment installed under this Contract shall be painted or otherwise finished to approval in accordance with appropriate international code for standard colours to be furnished by the Contractor prior to the shipment or manufacture of the plant or equipment including all pipe work, ductwork, etc. Such finish shall be entirely compatible with the conditions of heat, humidity, exposure to the weather, and other relevant factors arising from the materials, location and condition of operation of the equipment.

Paintwork will be measured in the builder's work in connection with the Engineering Element. Any additional work will be measured in accordance with the conditions of the Contract.

The Engineer may request samples of paint finishes, the cost of which shall be deemed to have been included within the tendered prices for all works.

All final painting of equipment, fixtures, and accessories shall be carried out by the Contractor, except where it is the usual practice of the manufacturer of items of plant and equipment to apply a high standard of protective finishing paintwork in the shop before dispatch. This will be acceptable provided the Contractor at his own costs makes good any damage to paintwork, occurring in shipment, transportation and installation.

The interiors of electrical switchboards control panels, and similar items, shall be finished in an approved enamel colour and shall comply with the appropriate international standards for enamel finish which shall be furnished by the Contractor prior to shipment or manufacture of the plant or equipment. The exteriors of such panels and enclosures shall be of international standards specification colour as specified by the Engineer.

1215. LABELS

All items of electrical plant, Sub-main distribution boards, etc. shall be neatly and clearly labelled externally with identification marks corresponding with those on Drawings or in Technical Specifications. Final details shall be agreed upon by the Contractor and the Engineer.

Identification labels shall be of laminated plastic material engraved, white on black or white on blue, with no less than 6mm "Lino" style letters and shall be fixed on or adjacent to all items by means of at least two brass screws or to the approval of the Engineer. Self-adhesive labels shall not be permitted.

All main switches, circuit breakers, isolators, valves, motors, switch-fuse, consumer service units, and distribution boards etc. shall be neatly and clearly labelled externally with identification marks corresponding with those on the Drawings or Technical Specifications. Final details shall be agreed upon by the Contractor and the Engineer. All labels / plates shall be in English.

1216. SPECIALIST MANUFACTURERS

Where specialists are not nominated by the Employer, the Contractor shall appoint specialist manufacturers and suitable specialists for any sections of the Works described herein in which he is not himself an experienced, recognized and approved specialist.

The Tenderer shall, on submission of his tender, indicate the names of all proposed specialist manufacturers and specialists, together with the precise sections of the Works for which each will be responsible. The Contractor may be required to seek alternative manufacturers or Contractors or to accept specialists nominated by the Employer; it shall be deemed that the prices entered in the tender include for this requirement. For plant and equipment supplied by suppliers other than the Contractor, the Contractor will be required to furnish an agreement between himself and the supplier stating that he is authorized by the supplier to deal in the plant and equipment and that he is authorized to stock the necessary spare parts or that the Employer will be authorized to revert to the supplier in the event of breakdown of the plant or equipment.

The Contractor shall allow in his prices for phasing his work to meet the requirements of the other specialists, and for varying his programme or otherwise, to comply with the erection programme of such specialist. No additional costs will be allowed to the Contractor for any disruptions to his programme, or otherwise, in his compliance with the above requirements.

1217. SUNDRIES

The necessary holding down bolts, supporting brackets and templates, guards and screens, locks, piping, conduits, lamps and other requisite sundries whether specified in detail or not shall be provided, under the Contract and it shall be deemed that the Contractor's prices, rates and the like include for all such items.

PART II: PARTICULAR SPECIFICATIONS

1218. EXTENT OF INSTALLATION

The Contractor shall carry out all the necessary works for successful installation of the electrical services as described and set out in this section of the Technical Specification, Bills of Quantities and accompanying Drawings in accordance with the General Electrical Specification herewith.

The Works, the major elements of which are scheduled below, includes the supply of all labour, material, equipment, plant and components necessary for complete installation and setting out work in respect of the entire electrical services requirements within the proposed development and rendering it in complete working condition in respect of but not limited to the following installations:

(i) Low voltages switchboard;
(ii) Electrical distribution system;
(iii) Lighting and power installations;
(iv) Fire detection and alarm system;
(v) IT structured cabling system;
(vi) Grounding / earthing, lightning protection and transient over-voltage protection;
(vii) External and streets lighting.

In general, the installations shall be concealed in conduits except in areas where surface installation is necessary. In such cases, installation will be carried out in trunking, conduit or cable tray as indicated on the Drawings.

1219. L.V. SWITCHBOARD

A new LV Switchboard shall be supplied, installed, tested and commissioned by a specialist switchboard manufacturer complete with MCCB (moulded case circuit breakers), instruments etc. and all relays, metering, and items necessary for the complete installation and setting to work.

The LV Switchboard shall be of the industrial / enclosed cubicle type, constructed and installed as described below.

The LV switchboard, suitable for floor mounting, comprising of a sheet steel cubicle with front access, complete with interior busbars, incoming main switch, VT's, CT's programmable digital meter, surge protector units, LED's lamp indictors, fuse switches, MCCB's etc. The switchgear shall be heavy duty, cast metal, enclosed type, dust proof to IP 44 Form – 4B type tested, and capable of operating on load at the rated current. Contacts shall be heavy duty silver surfaced type. The MCCB's shall have short circuit capacity of not less than 35 kA unless otherwise stated.

The cubicles shall be rigidly constructed and shall be provided with an angle iron or heavy gauge folded steel framework, panelled in zinc anneal or galvanneal of not less than 1.6 mm gauge.

The doors shall be of similar rigid construction free from twists and warps. The hinges and locks or latches shall be brass, and attached by brass screws. The locks shall be spring types, provided with two keys, and unless otherwise specified, all locks on the installation shall have identical keys.

The exposed unpainted metal shall be chrome plated, and removable panels where used, shall be attached by chrome plated captive milled headed brass screws and felt washers.

The Contractor should ensure that entry of cables, ducts, and conduits shall be neatly made and head boxes provided as required. All entries and openings shall be vermin-proof.

The floor mounted panel shall be erected on a 150 mm raised built-in base treated to be impervious to corrosion by rust.

All mounting brackets and additional items shall be supplied and installed to suitably support the switchboard in the position in which it is to be erected. In general mounting height to the top shall be 2000 mm.

Adequate ventilation shall be provided as necessary, and bronze mesh and suitable trim fitted to prevent entry of insects.

Dust tight enclosures shall have ample volume to dissipate heat, which may be generated in service, and doors shall be provided with a neoprene seal fitted with a channel and closing against a suitable folded edge or ridge. Moulded sealing strips may be submitted as alternative.

All bolts, nuts, screws, hinges, handles, etc. shall be corrosion resistant.

Enclosures shall be type tested according to IEC 60439-1 / BS EN 60439 – 4 and comply with IEC publication 144 IP 44 for indoor equipment and IP 54 for outdoor equipment. The busbars and connections shall be completely screened within the switchboard and the bus bar shall comply to BS EN 13601. The LV switchgear and control gear shall comply to BS EN 60947 and BS EN 60439 or any other approved equivalent standards.

All cables and piping entries shall be made through glands in a plate covering the base of the cubicle.

Cases shall be rubbed down, undercoat with suitable primer and finished in not less than 2 coats of hard enamel, oven baked where practicable.

1219.1 Moulded Case Circuit Breakers

(a) General

Moulded Case Circuit Breakers (MCCB's) shall as a minimum requirement comply with BS EN 60947 – 2 / IEC 60947 - 2 or any other approved equivalent Standard.

The breaking capacities of the circuit breakers shall be at least equal to the prospective fault level at the point of the distribution system where the breakers are installed.

All MCCB's shall be designed for horizontal or upright mounting without any adverse effect on electrical performance.

(b) Construction

Operating mechanism shall be of the quick make quick break type, with the speed of operation independent of the operator, and mechanically trip free from the operating handle so as to prevent the contacts from being held closed against short-circuit and overload conditions. The operating mechanisms shall be constructed to operate all poles in a multi-pole breaker simultaneously during opening, closing and tripped conditions.

The breakers shall be operated by a toggle, which shall clearly indicate the three fundamental positions ON, OFF and TRIPPED. If required, rotary handles shall be supplied.

The breaking and extinction of the electrical arc shall be achieved by means of non-welding contacts and an arc chute surrounding these contacts.

The current limiting MCCB's with very high capacity shall be made of two parts:

(a) A standard circuit breaker for small and medium fault current;

(b) A current limiter block to break and limit large short-circuit current.

The current limiter blocks shall be of fuse free type and the one opening mechanism type and factory fitted to the standard breakers.

All accessories and electrical auxiliaries such as shunt trip or under-voltage release auxiliary contact or motor mechanism shall be manufactured in such a way that they can be easily adapted on the installation premises.

(c) Operation

Each pole of the MCCB is provided with bimetallic thermal element for inverse time delay protection and magnetic element short-circuit protection. The thermal releases shall be of the adjustable type and could be equipped with sealing facility. Above 250 Amps the trip unit could be of the solid state energized by internally mounted current transformer.

It shall not require any external power supply to operate the tripping mechanism. All MCCB's shall be provided with interchangeable trip unit.

Current discrimination tables showing overload and short-circuit discrimination shall be provided for each rating.

1219.2 Busbar

The busbars shall be copper on insulated supports rated as shown on the drawings and capable of withstanding the fault level on the system at that point.

The busbar shall not be exposed when any access doors or plates other than those provided for busbar access of the panel shall be removed for maintenance or other work. The bus bar shall comply with BS EN 13601 or any other approved equivalent Standard.

1219.3 Under Voltage and Over Voltage Protection

To safeguard against voltage spikes suitable under voltage and over voltage protection relays shall be supplied and installed under this quotation. The relay units shall be of adjustable type and are suitable for operation under all voltage conditions anticipated. The unit shall be housed in the LV switchboard in the switch room.

The Contractor shall include for one under-voltage protection relay unit of -15% and over voltage protection relay unit +15%. Details shall be submitted with the tender and are fully discussed and agreed by all parties prior to placing the order.

1219.4 Phase Failure Relays

An alarm system, to indicate when there has been a loss of one or more phases on the incoming supply and the automatic tripping of the main circuit breaker, under these fault conditions shall be supplied and installed under this contract. The indicator shall be of LED's type installed in front face of the switchboard.

1219.5 LV Switchboard Wiring

Ample wiring space shall be provided within the LV switchboard.

Internal power connections shall be by means of copper bus bars of ample current rating and not less than 3.0 mm thick, and incoming and outgoing cables are attached to terminals by means of approved cable lugs. All live copper parts shall be insulated by PVC tape except at terminals, which may need to be disconnected.

No live metal shall be exposed except by removal of normally fixed panels.

Internal control wiring shall be through PVC insulated stranded conductors not smaller than 10-amp rating. Conductors shall be neatly laid and fixed in cable trays, or bunched to approval. No loose wiring shall be accepted.

All wiring shall be terminated using approved cable lugs. The ends of each wire shall be labelled with engraved numbered or lettered plastic ferrules, matching the identification used in the wiring diagrams.

Colour coding of the separate phases, neutral and earth, shall be provided and maintained throughout the installation. Where necessary, further identification of wiring shall be provided to the extent necessary to permit any conductor to be located and traced. All colour coding of the control and local control wiring shall be provided and their voltages of control system shall be stated clearly.

1219.6 Instruments and Relays

All wiring, space and connections and other items shall be provided for digital programmable meter, ammeter, voltmeter, selector switches and the like as applicable. Meters shall be supplied and installed and shall be of the appropriate range, and complete with CT's where required. In case of voltage selector switches shall give phase to phase, phase to neutral readings. Ammeter selector switches shall provide readings in all three phases and an off position. The accuracy of all meters VT's and CT's shall be class 1 or class 0.5. These

measuring instruments shall comply to BS EN 60044 or any other approved equivalent Standard

Ammeters and voltmeters shall be moving iron, self-contained instruments complying with BS 89 or BS EN 60051-2 and IEC 60051-2 to Class 1 or better.

Instruments and relays shall be removed from the switchboard for delivery and shall be packed in cases and delivered with the associated switchboard.

All current operated instruments and relays shall be suitable for operating on 5-amp secondary windings of current transformers.

1219.7 Labels

All switchgear shall be individually labelled showing the circuits controlled by means of laminated Formica labels and showing white letters on a black background. Wiring diagram of the LV switchboard hall be printed on the approved type of paper, size A3 and shall be folded and inserted in a suitably designed slot inside the switchgear door.

1219.8 Earthing

The Contractor shall provide earthing terminal block within the LV switchboard in accordance with the KENYA POWER / IEE Regulations. The earth terminal block shall have provision for connections to other equipment such as the transformer, PABX cabinets, UPS earth terminal block and to metal ducts steel works, building steel work, metal cable ladders and galvanized sheet steel cable trays.

1219.9 Interlocks

Provision shall be made in the LV Switchboard to make it possible in future for inter-locking the incoming supply from a diesel generator such that paralleling cannot take place under any circumstances.

Interlocks of a substantial mechanical type shall be provided on each cubicle between the door and the circuit breaker such that the door cannot be opened unless the circuit breaker is in the `OFF' position, and all live parts, which can be accidentally touched have been disconnected.

When the door is open it shall not be possible to readily turn the circuit breaker to the `ON' position.

1219.10 Switchboard Equipment Rupturing Capacity

All switchboard equipment shall be entirely suited to the application and adequate space shall be provided for all items as required.

Switchboards shall be capable of withstanding the maximum fault level which may occur in the installation and shall have a short circuit rating of not less than 35 kA and capable of sustaining the maximum short circuit for a period of three seconds.

1219.11 Layout of LV Switchboard

The general layout of the LV Switchboard is to be submitted by the contractor to the Engineer before commencing the manufacture of the new LV Switchboard. The final layout of the switchboard is to suit the proposed loads and mode of operation.

1220. 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 galvanized.

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 metres 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.

1221. 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^2 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^2 (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 Armored Cables (with Aluminum Conductors)

These cables shall be 600/1000-volt grade, conforming to SRN 063 having cores of solid Aluminum conductors, insulated with PVC, armored with aluminum 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 rawlplags. 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 armored 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 galvanized 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.

1222. 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 cover plates and switch dolies. They shall be as manufactured by "M.K. Electric Limited", grid switch 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 dolly-operated or Rocker-operated or any other equal and approved to SRN 058.

1223. SOCKETS AND SWITCH SOCKETS

These shall be 13 amps, flush pattern in steel box complete with overlapping ivory or BMA or Matt Chrome cover plates.

They shall be 13 amps, 3 pins, 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 o59. All sockets or switch sockets shall be with fused plug top containing a fuse whose rating shall be suitable for the load connected to it. The plug top 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 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.

1224. FUSED CONNECTION UNIT

These shall be flush, D.P. switched or unswitched in a steel box with ivory or BMA or Matt Chrome overlapping cover plate with or without pilot light as manufactured by "M.K. Electric Limited" or other equal and approved and as per SRN 059.

Surface fused spur boxes shall be in a steel box, D.P. switched or unswitched with metal clad steel cover plates as manufactured by "M.K. Electric Limited" or other equal and approved and as per SRN 060.

1225. 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.

1226. 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.

1227. 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.

1228. WATER-TIGHT SWITCHES

These shall be of the rating specified 5 ampere OR 15 ampere single pole as manufactured b 'THORN' Cat. No. PD 145. The Protection class shall be IP65, or other approved equivalent.

1229. 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.

1230. 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.

1231. COOKER CONTROL UNIT

These shall be white flush type with pilot lamp, installed in an aluminum stove enameled 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 $6mm^2$ 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 $6mm^2$ PVC twin with earth cable.

1232. 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.

1233. FIRE DETECTION AND ALARM SYSTEM

1233.1 Scope of work

The Contractor shall be responsible for supplying, installing, wiring and commissioning the Addressable Fire detection and alarm system. The system shall consist of manual call points (break-glass), electronic bells, smoke detectors, heat detectors and indicator panels. All items shall be installed in the positions shown on the Drawings and as finally recommended by the fire alarm specialist. The Employer shall require entering into a longer-term maintenance contract for the fire detection and alarm system and in this respect the electrical Contractor shall therefore consider the use of a fire alarm specialist to supply all equipment and carry out the complete installation.

1233.2 Operation

The fire detection and alarm system shall operate in the event of a signal being initiated from any of the break-glass units, heat detectors or smoke detectors.

The signal representing the zone in which the alarm has been initiated will be indicated on the main indicator panel such that staff can easily and clearly see the affected area. All electronic bells shall continue to ring until they are manually reset at the indicator panel. On silencing the bells, the supervising buzzer within the indicator shall remain operational until such time that the glass for the break-glass contact has been replaced or the smoke/heat detector de-energized and returned to its normal operational or monitoring condition.

1233.3 Fire Detection and Alarm Equipment

The fire detection and alarm equipment shall be of the addressable type and latest version and to final approval of the Employer or the Engineer. The unit shall be manufactured by a renowned company and installation shall be carried out in conjunction with a fire alarm specialist.

All equipment provided and installed under this section of the Specification shall comply with BS 5445, BS 5839-1 / BS EN 54-2 and BS EN 54-23 or approved equivalent standard and relevant local by-laws. The fire detection and alarm system to be provided shall be category L where the sensors are installed throughout the building.

The fire alarm indicator panel shall be installed in the location shown on the Drawings. The alarm indicator panel shall be of modular construction housed in one or more enclosures of sheet steel with scratch resistant baked enamel finish. Panel doors shall be provided with

piano type hinges with key operated locks. The Fire detection and alarm System shall operate on 24 volts DC supply and the main alarm panel shall house complete the integral charger and sealed maintenance-free batteries. Solid state components shall be utilized wherever possible. All relays shall be of the plug-in sealed type. Terminal strips and enclosures shall be provided and coded to match the zone input and output functions. Fuses shall be provided for each alarm input and output circuit. Blown fuses shall operate a "fault" signal lamp, which shall be labelled "Replace Fuse". The failure of any one circuit shall not interfere with the proper operation of other circuits. The alarm device circuit wiring shall be supervised for open circuit, shorts and earth faults on each side of the line.

Due account shall be taken of voltage drops when sizing the cables, details of sizes, types of cable etc. shall be provided for approval.

The wiring shall be carried out in PVC cables enclosed in surface heavy gauge PVC conduit. A separate and independent conduit system shall be used for wiring to fire alarm equipment.

Manual alarm points and fire detectors shall be connected to the various zone points as shown on the drawings.

Manual contacts shall be of the break-glass type. Breaking the glass shall release a spring-loaded switch that breaks the electrical monitoring circuit and results in an alarm being indicated on the fire alarm control.

Fire detectors shall consist of the heat or photocell smoke type. Detectors circuit design shall be suitable for the type and number of detectors to be installed and shall limit detector circuit current to not more than the current ratings of the detectors and associated relays.

1234. STRUCTURED CABLING FOR VOICE AND DATA SYSTEMS

1234.1 Scope of Work

The tenderer shall include in his tender for the shop design, supply, installation, testing and commissioning of multi- outlet points for the telephone and data systems including the related structured cabling. The telephone block wiring and data networks wiring shall be carried out by licensed block wiring sub-contractors. Proof of such license issued by Authority Communication of Kenya (ACK) Regulatory Body is mandatory. The supply and installation of the telephone switchboard, subscriber and terminal equipment as well as data server and computer equipment are not part of this tender. The contractor shall submit his designs and working drawings for the telephone and data network installations to the Engineer for approval before commencement of site works.

1234.2 Working Drawings

The provisional telephone and data outlet positions have been indicated on the drawings. These may be adjusted, increased or decreased to suit Employer's and final design requirements.

The Contractor shall liaise with the Engineer, ISP provide and Communication regulatory body and produce working drawings showing all external data and voice distribution and outlet points, conduit / trunking and structured cabling layouts and submit for approval by the Engineer and Employer.

1234.3 Telephone and Data Outlets

Flush telephone and data outlets shall be provided where shown on the drawings and complete with white finish plate with PVC sleeve cord with internal diameter of 5mm complete with steel clamp to retain sleeve cord on underside.

1234.4 Structured Cabling for Data and Telephone Network

This section of the Specification includes the inspection, delivery to site, unloading, complete installation, putting into commission and handing over in the approved working order, the whole of the data and telephone cables and wiring as detailed herein and in the tender.

The work includes the supply, delivery and erection of all data switches and hubs, termination blocks, fiber optic cable and its accessories, unshielded twisted pair (UTP) cable CAT 6 (multi-core), terminal outlets, racks, cable cleats, Unistrut and fittings required for the support and accommodation of the cables and wiring, grouting of rag bolts for the fixing of cable racks, supports, and setting to work. The work includes the installation of the data and telephone cables and related wiring within the ducts, conduit, trunking and the proper protection, marking and terminations of all such data and telephone cables.

Under this project short distances will be covered. In this case only complete stretches of UTP cables, optic fiber cable etc. will be used and jointing will not be permitted. However, where joints are permitted by the Engineer for any reason they shall be of an approved type and manufacture. The data and telephone cabling network installation shall be as manufactured

installed and tested in accordance with the international standards following and in particular the ones described herein shall apply:

(d) Fiber optic cables provided shall comply with BS 7718 (Code for practice for installation of fiber optic cabling) or approved equivalent standard and relevant local by-laws;

(e) Unshielded twisted pair (UTP) cables CAT 6 shall comply to BS EN 50173 (Information technology generic cabling), BS EN 50174-1 (Specification and quality assurance) and BS EN 50174-2, (installation planning and practices inside buildings), or approved equivalent standard;

(f) The data network accessories shall comply with IEE 802-3 and EN 50081/82-2 or approved equivalent standard;

(g) All cables and accessories shall be delivered to site in the same coils and packing as dispatched from the manufacturer and the labels showing size, type and length and shall be unpacked only in the presence of the Engineer or his representative and handed to him;

(h) The Contractor shall agree with the Engineer and the Employer route of all cables, conduit and cable trunking and shall not install such trunking or conduits until agreement and approval has been given.

The power supply shall be extended from the LV switchboard position in the service areas. It will be necessary for the Contractor to liaise with the Engineer when finalizing the cable routes.

3.1.2 Fibre Optic cable

The fibre optic cable shall be of the multimode type and with top quality ceramic connectors and to final approval of the Employer or the Engineer. The fibre optic cable shall be manufactured by a renowned company and installation shall be carried out by authorised specialist only.

All fibre optic cable and the related accessories provided and installed under this section of the Specification shall comply with BS EN 6701 or approved equivalent standard.

The fibre optic cable supplied shall be multimode type, 4-core and have a maximum attenuation of 3 dB / Km at 850 nanometre (nm) and maximum of 0.7 dB / Km at 1300 nm, Bandwidth 200 MHz / Km at 850 nm and 500 MHz / Km at 1300 nm, cable size (3 x 6.1 mm), core diameter 62.5 μm, minimum bending radius 75 mm, minimum proof test of 100 kpsi AND numerical aperture of 0.275 $\pm$ 0.015. The fibre optic cable shall also have the following environmental characteristics:

(a) Temperature dependence (- 60 to +85C) - 0.2 dB / Km;
(b) Temperature and humidity cycling (- 10 to +85C, 4 to 90% RH) – 0.2 dB / Km.

3.1.3 Unshielded Twisted Pair

The Unshielded Twisted Pair (UTP) cables CAT 6 shall meet all standards and have snag-free boots prevent cable kinks and bent pins when removing from patch panels and they reduce cross talk and shall be subject to final approval of the Employer or the Engineer. The

Unshielded Twisted Pair (UTP) cables CAT 6 shall be manufactured by a renowned company and installation shall be carried out by authorized specialist only.

All Unshielded Twisted Pair (UTP) cables CAT 6 and the related accessories provided and installed under this section of the Specification shall comply with BS EN 50173 (Information technology generic cabling), BS EN 50174-1 (Specification and quality assurance) and BS EN 50174-2, (installation planning and practices inside buildings), ISO / IEC 11801 Category 6 Patch or approved equivalent standard.

The Unshielded Twisted Pair (UTP) cables CAT 6 supplied shall be 23 AWG, 4 pair stranded, tinned copper, PVC sheathed, and have a maximum attenuation of -29.2 dB / 100m up to 200 MHz frequency, impedance 100 ± 15 Ω mutual capacitance 46 pF / m and resistance of 20 ohms / 300m and RJ- 45 connectors.

1235. 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

1236. SCOPE OF WORK

Scope of work shall include the following: -

a) Various Buildings

Complete installation of lighting, power, voice and data points, lighting fittings, distribution board, meter board, etc. in all buildings constructed.

b) Security Lighting

Complete installation of security lighting with columns, cables, lanterns, distribution board, etc.

c) Supply and Installation of generator in the generator / switchroom.

13. MECHANICAL WORKS

1301. GENERAL

All materials and equipment shall be obtained from reputable manufacturers, who have well established agent(s) in Kenya. The local agent(s) shall be able to provide an efficient service for the equipment and shall have ample stocks of all expendable items such as packings, impellers, fuses, etc.

The Engineer reserves the right to reject manufacturer(s) or agent(s) not fulfilling the above requirements.

It is the responsibility of the Contractor to provide evidence that the equipment is in compliance with the Bills of Quantities, Specifications herein, and as shown on the drawings, and that the equipment will operate satisfactorily under the conditions under which it is installed. The work shall comprise complete installation such as anchor bolts, base plates, gaskets, painting, etc., all to the satisfaction of the Engineer.

1302. TRADE NAMES

Where trade names or manufacturers' catalogue numbers are mentioned in the Specification herein or shown on the drawings, the references are intended as a guide to the type of equipment or quality of materials required. The Contractor may propose any equipment or materials in type or quality to those described herein or shown on the drawings subject to prior approval of the Engineer and at his absolute discretion. The Contractor shall guarantee that the quality of the equipment he proposes are equal to or higher than that indicated herein or as shown on the drawings.

1303. SPARE PARTS

The Contractor shall supply sufficient number of spare parts to properly operate and maintain all the equipment furnished and installed under this Contract for over three (3) year's period. The Contractor shall, as recommended by the manufacturer supply the quantities of such spare parts, the list of which must be submitted with the Tender, and costs thereof shall be covered by the Contractor's rates.

1304. STORAGE OF MATERIALS

The Contractor shall provide weather-proof lock-up sheds for safe storage and custody of materials for the works. The sheds shall be removed upon completion of the works, and the site shall be restored to the original conditions to the satisfaction of the Engineer.

1305. TESTS ON MATERIALS / EQUIPMENT

The Engineer reserves the right to inspect, examine and test materials and workmanship, from time to time during the period of manufacturing, all equipment to be supplied under the Contract at manufacturer's factories. Such inspections and testing, however, will not in any way relieve the Contractor from any obligation under the Contract.

The Contractor shall carry out any tests on the quality of materials and workmanship of equipment as directed by the Engineer. Performance tests shall be carried out by the Contractor for all mechanical equipment to ensure that the equipment complies with the requirements of the Specification.

All tests shall be carried out in the presence of the Engineer or such personnel as appointed by the Engineer for this purpose.

The Contractor shall provide all necessary labour and instruments for carrying out these tests, and he shall be responsible for the use and discharge of any water and chemicals during these tests.

The Contractor shall give to the Engineer, a written notice of the date after which he will be ready to conduct the tests as required in the Contract. Unless otherwise agreed, the test shall take place within 14 days after the said date on such day or days as the Engineer shall notify the Contractor.

If the Engineer fails to appoint a time after having been asked to do so, or does not attend at the time and place appointed, the Contractor shall be entitled to proceed with the tests in his absence. The tests shall then be deemed to have been made in the presence of the Engineer and the results of the tests shall be accepted as accurate. The Engineer shall give the Contractor 7 days notice in writing of his intention to attend the tests.

1306. DRAWINGS

The works as shown on the drawings are prepared for tendering purposes only, and it is the Contractor's responsibility to provide promptly, detailed shop drawings of the equipment he proposes to use. It is also the Contractor's responsibility to see that all openings, recesses, channels, conduits, etc., in structures are so located and installed as to fit and function properly with mechanical and electrical works.

The Contractor shall prepare all necessary detailed or workshop drawings required for manufacturing and erecting the equipment. Such drawings shall be submitted to the Engineer for approval prior to the commencement of manufacture and installation of the equipment. Upon completion of the works, the Contractor shall prepare and submit information on as-built drawings to the Engineer for his retention.

The Contractor shall be responsible for any discrepancies, errors, or omissions in the Contractor's drawings unless they are due to incorrect drawings or other written information supplied by the Employer or the Engineer. Approval by the Engineer of the Contractor's drawings shall not relieve the Contractor from any responsibility under this section.

1307. DESCRIPTION OF SERVICES

The Contractor shall supply, transport, deliver, install, connect, commission and hand over all equipment and materials specified in the Specifications, Drawings, Bills of Quantities, in a clean complete and in every detail working condition. He shall carry out all tests specified herein to Kenyan or other International Standards together with any tests which might be requested by the Engineer with respect to the use of these materials or equipment.

All costs accruing due to preparation of the above drawings, manuals, tests and other obligations including all necessary labour, overheads and profits, duties, sales taxes, etc., shall be deemed to be included in the Contract Price.

1308. MAINTENANCE

The Contractor shall be liable for all defects and shall maintain all Mechanical and Electrical Equipment for a period of twelve (12) calendar months from the date the works are taken over by the Employer. All such expendable items necessary for the maintenance of the works as gaskets, filters, fuses, indicator lamps, relays, coils, switches, oils, etc., are to be supplied by the Contractor.

In case permanent power supply is not made available in time for testing equipment, the Contractor, if he intends to clear out of the site, shall make his own arrangement for testing equipment and again return to the site for final testing when permanent power supply is made available. No extra payment will be made for such arrangement.

The Contractor shall be responsible for making good any defect in or damage to any part of the works which may appear or occur during the Defects Liability Period. The Defects Liability Period for the works shall not end until all defects which occurred or appeared during the period have been satisfactorily rectified.

The Defects Liability Period for the works shall be extended by a period equal to the period during which the works cannot be used by reason of a defect or damage of equipment. If only part of the works is affected the Defects Liability Period shall be extended only for that part.

1309. INITIAL DEFECTS LIABILITY PERIOD

During the twelve months Defects Liability Period, the Contractor shall carry out all necessary adjustments and repairs, cleaning and lubricating, etc., required for maintaining the equipment in good working condition. A report of any work executed with respect to such maintenance shall be submitted to the Engineer and incorporated in Maintenance Records.

The Contractor shall inform the Employer his schedule of any routine maintenance inspection work before the work commences. Any items of materials found to be defective shall be replaced by the Contractor within seven (7) days after the receipt of such notice by the Employer or his representative. If the defect or damage is such that repairs cannot be expeditiously carried out on the site, the Contractor may with the consent of the Engineer remove from the site for the purposes of repair any part of the works which is defective or damaged.

The Contractor shall bear all the costs required for maintenance and inspection services of the equipment and provide for all labour, tools, instruments and plant, and the transportation thereof, as required for the satisfactory execution of these obligations and for the provision, use and installation of all materials such as fuses, expendable items, oils, greases, etc., and such parts which are periodically renewed as relay contacts or parts which are faulty for any reason.

1310. MAINTENANCE AND SERVICES AFTER COMPLETION OF INITIAL DEFECTS LIABILITY PERIOD

The Contractor shall, if required by the Employer, enter into a Maintenance and Service Agreement with the Employer for a period of up to five (5) years from the last day of the Initial Defects Liability Period. Such an Agreement shall offer the same services as specified under “Initial Defects Liability Period”. The Contractor shall be entitled to be paid the cost for such additional maintenance and services which will be determined by negotiation between the Employer and the Contractor.

1311. MANUFACTURER'S MAINTENANCE MANUALS

Upon completion of the works, the Contractor shall furnish to the Engineer six (6) copies of Manufacturer's Maintenance Manuals for the equipment installed in A-4 size loose leaf type binding containing information on the following items:

a) Description of Equipment
b) Full Operation and Maintenance Instructions
c) Valve Operations
d) Fault-finding Charts
e) Emergency Procedures
f) Maintenance and Service Periods
g) Lubricating Instructions
h) Colour Code Legend
i) Spares List
j) Record Drawings in size A-4 / A-3
k) Any other relevant information.

The Manual shall be specifically written for this Contract and not be the manufacturer's standard manual unless otherwise approved by the Engineer.

All instructions in the Manual shall be written with reference to the drawings. All valves, terminals and controls in the plant and other sites be labeled to correspond with the Operation and Maintenance Manual.

The Works will not be considered completed for the purpose of taking over until such Manual containing instructions and the drawings have been supplied to the Employer.

1312. PRESSURE GAUGES

Pressure gauges shall be wall mounted, in metric units complete with connection to delivery side of pumps, and copper pipe from pipe to gauge supplied with isolating cock. If proposed and instructed, the gauges can be directly mounted on the delivery pipework.

1313. PUMPS

General

The pumps shall be designed and constructed so as to be suitable for the particular liquid to be pumped. All pumps shall comply with the requirements of ISO 9905, Technical Specification for Centrifugal Pumps - Class I.

The pumps shall be designed to give the specified output against all losses including those relating to the pump. The Contractor shall match his pump characteristics to achieve the highest pump efficiency, reliability and low life cycle costs.

The pumps shall have a non-overloading characteristic over the complete range of head and quantity delivered and the drive shall be capable of starting centrifugal pumps against maximum run out conditions.

Each set must be capable of running satisfactorily in parallel with other sets in the system without throttling and by itself, without cavitation or overload under all operating conditions within the system characteristics given.

The whole pumping unit shall be capable of withstanding without detriment, reverse rotation to a speed that would occur if the pump were to stop when the differential head was at a maximum and the delivery and/or non-return valve failed to close.

The head/flow characteristic of any pump shall be stable under all possible operating conditions including parallel operation and with maximum surcharge.

The design of the influent path to the sump and the configuration of the sump shall avoid risk of ingesting entrapped air or other condition likely to result in cavitation. The NPSH of the installation has to be calculated by the Contractor. It must suit the required NPSH from the pumps constructor.

Velocities in the suction and delivery branches shall be sufficiently low to prevent hydraulic turbulence and cavitation within the pump and the pipe-work and sufficiently high to prevent settlement of any suspended solids.

The pump and its drive motor shall be suitably rated and the characteristic curve selected as appropriate to allow for any increased head, due to sliming, etc., of the rising main, without unacceptable loss of delivery during the lifetime of the pump.

The centrifugal pumps switchgear and control gear quality shall be as defined by IEC 60947 for electronics applications encompassing all electrical components and devices that are used to activate, deactivate, and protect electrical consumers and include switches, contactors, residual current devices and motor protection devices. Pump control units shall safeguard proper operation of the connected pumps.

The application-specific switching and control functions include the following:

- Equal distribution of operating hours;
- Automatic pump changeover after a specified number of operating hours has been reached or after every start;
- Pump starting and stopping in response to service demand;
- Pump changeover in the case of a pump fault;
- Functional check run via battery-backed real-time clock (as a function of fluid level);
- Sequenced soft start / stop if pumps have to be started or stopped, to prevent pressure surges and minimize starting currents;
- Freely selectable automatic re-start after a fault;
- Adjustable after-run time;
- Variable stop delays to prevent deposits in the tank

Pumps monitoring functions shall include:

- High water alert;
- Operational availability;
- Mains-independent alarm;
- Programmable general fault / "in operation" message;
- Phase monitoring;
- Voltage monitoring and display;
- Overload detection per pump;
- Thermal monitoring of pump motors.

Impellers

Impellers and guide vanes (if any) shall be of stainless steel, accurately machined and smoothly finished to minimise hydraulic losses. The rotating elements shall be balanced to

achieve minimum vibration and shall be statically and dynamically balanced before final assembly.

The impeller shall be readily withdrawable from the pump casing without the need to disconnect pipe-work. The impeller shall be provided with means of preventing abrasive matter getting to the glands. Clearance at the eye rings and wear plates shall be kept to a minimum and where it is found necessary to cut back the impeller, this is to be done on the vanes only.

Where specified the impeller shall have renewable wear rings. Clearance at eye rings and wearing plates shall be kept to a minimum and, where it is found necessary to cut back the impeller, this shall be done on the vanes only. Eye rings and wear rings shall be bronze or other compatible materials and shall be replaceable without machining.

Impellers, as far as practicable, shall be hydraulically balanced to reduce end thrust on the bearings to the minimum possible. Machining of holes in the impeller shall not be used to balance hydraulic forces.

The suction arrangements shall be such as will avoid pre-rotation in the suction pipe-work and present a good flow pattern at the entrance to the impeller.

Pump Shafts

The pump shaft shall be of high tensile stainless steel adequately sized, with good fatigue, shock load and corrosion resistance. The duty speed range shall be well below the first critical speed of the shaft.

Bearings

All bearings shall be liberally rated to ensure cool running and meet the load factors specified. For vertically mounted pumps, the top bearing shall be a combined thrust and journal type, designed to prevent any thrust loads being imposed upon the drive motor.

A label made of non-deteriorating material shall be attached to each pump and motor in a place where it can be easily read and shall show the following information:

a) Manufacturers, serial numbers and types of both pump and motor
b) Nominal flow in m^3/h (Qopt)
c) Manometric head in m (Hman opt)
d) Efficiency eta opt in %
e) Net positive suction head (NPSH req opt) in m
f) Power consumption, voltage, start-up mode in kW, V
g) Speed of rotation 1/min

Pumps shall withstand continuous operation at full load (8000 hours/year).

1314. Motors

Characteristics

The motors will be continuous duty of squirrel cage type, designed with continuous duty. Motors will be equipped with PT 100 in the winding and the bearings. The speed of the motors shall be 1450rpm.

The motors will have "F" insulation class, "B" temperature rise class and IP54 protection degree.

Conditions of operation
The supply voltage of the motors may vary by plus or minus five percent.

Nominal motor capacity in continuous operation at a frequency of 50 Hz and with an effective ambient temperature of 55 °C will be at least 10 % greater than the maximum power intake of the pump throughout the range of lift height.

The service factor of the motors shall be 1.15.

Motors will be designed for at least six starts per hour.

Each set will be fitted with an hour-meter and an operation meter with no zero resetting devices in order to check the values above.

Name Plates on Motors
Manufacturer's name plates on electric motors shall contain at least the following information:

a) Manufacturer
b) Type, serial number
c) Year of manufacture
d) Rated power (kW)
e) Power factor
f) Efficiency (%)
g) Voltage (V), type of starting
h) No. of Phases
i) Degree of protection
j) Frequency (HZ)
k) Synchronous speed (rpm)
l) Rated current insulation class
m) Rated current
n) Insulation Class

STANDARD REFERENCE NUMBERS

1. Introduction

The Engineer has agreed to use a method of modifying the text of 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.

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.

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 ing.

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 Bidder shall at his discretion base his Bid 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 Bid, such an International Standard should as a minimum be compiled with. As the National Standards referred to in the table of comparison may expand on or strengthen further the requirements of ISO, Bidders 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 Bid a full and detailed description of the Standards they propose to attain.

Where a Bidder 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 Bidders in this respect and shall enclose a copy in English of the alternative National Standard offered with his Bid. Alternative National Standards or Bid's own detailed description of the Standards they propose shall be subject to the approval of the Engineer.

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	Plastic Pipes and 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 & WORK - GENERAL	See	VOB	8110		VOB 2	
102	STANDARDS 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 932-1	BS 812 Part 1 Replaced 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	CL.4.1		
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 CONCRETE - GENERAL (CONT.)	1045					
111	COARSE AGGREGATES FOR CONCRETE - GRADING	4226		882	TBL.2		
111	COARSE AGGREGATES FOR CONCRETE - GRADING (CONT.)	1045					
112	COARSE AGGREGATES FOR CONCRETE - SHRINKAGE & 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 & 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, 4013	
118	CONCRETE BATCH MIXER			1305			BS 1305 Obsolescent
119	CONCRETE BATCH TYPE MIXERS	459		3963			BS 3963 Obsolescent
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	Grade NDI, CL. B		BS 4360 Withdrawn. Replaced by BS 7613, BS 7668, BS EN 10029 Parts 1 to 3 of BS EN 10113, 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 MORTAR	4226		1200			
136	SAND FOR RENDERING	4226		1199			
137	HOT APPLIED JOINT SEALER			2499			
138	WATER STOPS AND WATER BARS	7865	1, 2	8007			

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
139	TESTING CONCRETE STATIC MODULES (COMPARISON ELASTICITY)			1881	121		
140	TESTING CONCRETE - WATER ABSORPTION			1881	122		
141	TESTING CON-SAMPLING, TESTING FRESH CONCRETE, ETC.	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 DIAPHRAGM WALLS	4126					
146	TEST SIEVES FOR AGGREGATES			410			
147	LIGHT WEIGHT AGGREGATES FOR CONCRETE	4226	2, 3	3797	2		BS 3797 Partly Replaced by BS EN 1744-1: 1998
148	SUPERSULPHATED CEMENT			4248 (4550)			BS 4248 Partly 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			
152	FUSION BONDED EPOXY COATED CARBON STEEL BARS FOR THE REINFORCEMENT OF CONCRETE			7295	1 & 2		Part 1: Coated bars Part 2: Coatings

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		ASME/ANSI B16.1 - 1998	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 FITTINGS TO SSRN 203			1740	1	ISO 4145	
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 ETC.	2987	1, 2				
204	W. STEEL PIPE FITT. TO SSRN 203-BUSHINGS	2990					
204	W. STEEL PIPE FITT. TO SSRN 203-PLUGS & CAPS	2991					
204	TH. STEEL PIPE FITTINGS TO SSRN 203-SOCKETS	2986				ISO 7-2:1982	
204	W. STEEL PIPE FITT. 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 (CONT)	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. 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 B 16.5	
207	FLANGES FOR FERROUS PIPES - C.I. BY CLASS	2519	1	1560	3-3.2	ISO 7005-2	
207	FLANGES FOR FERROUS PIPES - C.I. 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	2526					
207	FLANGES FOR FERROUS PIPES-BLANK	2527					
SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS

208	GASKET DIMENSIONS TO SSRN 207 (a) & (d)				1	EN 1514	
208	GASKET DIMENSIONS TO SSRN 207 (a) & (d) (CONT)				2	EN 1514	
208	GASKET DIMENSIONS TO SSRN 207 (a) & (d) (CONT)				3	EN 1514	
208	GASKET DIMENSIONS TO SSRN 207 (a) & (d) (CONT)				4	EN 1514	
208	GASKETS-FOR GROOVED FLANGES	2693					
208	GASKETS-GROOVED O-RINGS	2697					
209	C.I. PIPE FITTINGS, MALLEABLE, SCREWED					ISO 49:1994	
210	STEEL PIPES & FITTINGS - GENERAL			534			
210	STEEL PIPES - WATER-GENERAL	2460		534		EN 10224, AWWA C200-97, NFA 49-150 JIS G 3460-88	
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 ASTM A333/A333M-99	
211	CEMENT MORTAR LINING - D.I. PIPES			EN 545		EN 545, AWWA C.104A, C602-95	
211	CEMENT MORTAR LINING - D.I. PIPES	2614					
211	CEMENT MORTAR LINING - D.I. PIPES (CONT)					DVGW W343 ISO 4179:1985, ISO 6600:1980,	
212	CEMENT MORTAR LINING - STEEL PIPES	2614		534		AWWA C 205, NFA 49-701 DVGW-W343/W346	
212	CEMENT MORTAR LINING - STEEL PIPES (CONT)	2614				AWWA C 602-95 ISO / DIS 8324	
213	S. PIPES & TUBES-MATERIAL, PROP., TESTS	1629		3600		AWWA C200-97	
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 TUBES-WELDED	2458					
214	BITUMEN PROTECTION TO IRON AND STEEL - HOT			4147		(BS 4147 type I, grade 'd')	
214	BITUMEN PROTECTION TO IRON AND STEEL- COLD			3416		(BS 3416 type II)	
214	BITUMEN PROTECTION TO STEEL PIPES ETC.	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. SHEATHS	30674	3	none			
221	IRON AND STEEL PIPES-ENAMEL-HOT APPLIED			7873		AWWA C203-97	
221	STEEL FLANGED PIPES & FITTINGS-ENAMELLED	2873					
222	ELASTOMERIC JOINTS RINGS-REQUIREMENTS			2494			Partly replaced by BS 7874 and BS EN 681-1
222	ELASTOMERIC JOINTS RINGS-VULCANISED RUBBER				1	EN 681	
222	ELASTOMERIC JOINTS RINGS-DRAINS & SEWERS	4060					
223	PIPE THREADS-TUBES & FITT. (WATERTIGHT	See ISO DIN		21		ISO 7/1:1982; ISO 7/2:1982	

SRN	**SUBJECT**	**DIN**	**PART**	**BSS**	**PART**	**OTHER**	**REMARKS**

224	CAST IRON S & S PIPES AND FITTINGS			78	2		BS 78 Withdrawn, replaced by BS 4622 Part 2 Obsolescent, partially replaced by BS 4772
225	STEEL PIPES-HOT DIP GALVANISING					EN 10240	
226	CARBON STEEL FITTINGS - BUTT-WELDING-GENERAL	2609		1965	1		BS 1965 Part 2 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	30674	5				
228	ST. PIPES-DIMENSION & MASSES-PRESS. PURPOSE	2413	1, 2	3600			
228	S. PIPES-DIMENSION & MASSES-PRESS. (CONT)	2460					
229	STAINLESS STEEL TUBES AND WIRES			1554			
229	STAINLESS STEEL TUBES AND WIRES (CONT)			4825	1	ISO 2037:1980	
229	STAINLESS STEEL TUBES AND WIRES (CONT)			6362		ISO 7598	
229	STAINLESS STEEL TUBES AND WIRES (CONT)	17457					
229	STAINLESS STEEL TUBES AND WIRES (CONT)	17440					
230	STEEL PIPES FOR WATER FLEXIBLE SOCKET & SPIGOT JOINTS	2460		CP2010-2		EN 10224, ISO 559	
230	STEEL PIPES FOR WATER FLEXIBLE SOCKET & 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 PETROLUEM 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 VULCANISED RUBBER			none		ISO 2230:1973	
239	BITUMINOUS VARNISH TO 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 LININGS 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 PROT. SLEEV'G FOR IRON PIPES	30674	5	6076		EN 534	
247	HOT ENAMEL COATING TO IRON & STEEL PIPES			7873			
248	EXTERNAL ZINC COATINGS ON DI 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	

SRN	**SUBJECT**	**DIN**	**PART**	**BSS**	**PART**	**OTHER**	**REMARKS**

251	STEEL PIPES - POLYPROPYLENE COATING	30678		none		EN 10286, NFA 49-711	
252	STEEL TUBES - ELECTROMAGNETIC TESTING - LEAKS				1	EN 10246	
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 POLYURETHANE COATINGS FOR STEEL PIPES	30671				AWWA C222	
257	LIQUID POLYURETHANE LININGS FOR STEEL PIPES					AWWA C222, NFA 49-709	
258	EXTRUDED POLYTHENE COATINGS FOR D.I. 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

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
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)					KEBS 06-149:2	
301	JOINTS AND FITTINGS FOR uPVC PRESSURE PIPES	8063	1, 12	4346	1-3	ISO 2035, 2044	
301	JOINTS AND FITTINGS FOR uPVC PRESSURE PIPES (CONT. 1)	16450				ISO 2045, 2048, 2536	
301	JOINTS AND 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 II method 1127P - 1997 but remains current
307	HDPE PIPES, JOINTS, FITTINGS	16963	1-3	3284 (6572) (6730)			Obsolescent - Partially replaced by BS 6572, BS 6730
308	RUBBER RINGS FOR MECHANICAL JOINTS			2494			
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	PLASTICS PIPES AND FITTINGS FOR USE AS SUB SOIL FIELD DRAINS			4962			
318	POLYPROPYLENE WASTE PIPE AND FITTINGS (EXTERNAL DIAMETER 34.6MM, 41.0MM AND 54.1MM)			5254			
319	THERMOPLASTICS WASTE PIPE AND FITTINGS			5255			
320	GLASS REINFORCED PLASTICS (GRP) PIPES, JOINTS AND FITTINGS FOR USE FOR WATER SUPPLY OR SEWERAGE			5480			
321	UNPLASTICIZED PVC PIPE AND FITTINGS FOR GRAVITY SEWERS			5481			
322	PLASTICS PIPEWORK (THERMOPLASTICS 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 POLYETHLENE PIPES UP TO NOMINAL SIZE 63 FOR ABOVE GROUND USE FOR COLD POTABLE WATER			6730			

3.4 OTHER PIPES AND FITTINGS

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
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 CONCRETE PRESSURE PIPES	4035		4625			
409	PRECAST CONCRETE PIPES - DRAINS & SEWERS	4032		5911	1, 3		
409	PRECAST CONCRETE PIPES - DRAINS & SEWERS (CONT.)	4035					
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 5911 Part I: 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

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
501	DOUBLE FLANGED C.I. GATE VALVES (WATER)			5163		AWWA C203-78	
501	DOUBLE FLANGED C.I. GATE VALVES (WATER) (CONT. 1)	3230	1-3				
501	DOUBLE FLANGED C.I. GATE VALVES (WATER) (CONT. 2)						
501	DOUBLE FLANGED C.I. GATE VALVES (WATER) (CONT. 3)	3352	1, 4				
502	C.I. GATE VALVES - GENERAL			5150			
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		BS 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 Part 1 Withdrawn Replaced by BS 5728: Part 7
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				
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 ING 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 TOPSOIL			3882			
608	METHODS OF TESTING MORTARS, SCREEDS AND PLASTERS			4551			
609	STRUCTURAL FIXINGS IN CONCRETE AND MASONRY			5080	1 & 2		Part 1: Method of test for tensile loading 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	OTHER	REMARKS
650	SITE INVESTIGATIONS	18196		5930			
650	SITE INVESTIGATIONS (CONT.)	18307					
651	WATER SUPPLY	2000	See BS	BS 6007		CP 310	CP 310 Withdrawn Replaced by BS 6007
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	GB 7101-91 SABS 1431	BS 449 Parts 1 and 2 Withdrawn Part 2: Addendum No. 1 (1975) Replaced by BS 5950 Part 5 (1987)
658	SEWERAGE			8005		BS EN 1610	
659	SMALL SEWAGE TREATMENT WORKS AND CESSPOOLS			6297			
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 BS 3680 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 Withdrawn Replaced by BS EN 287-2
672	LOGGING OF ROCK CORES					LOGGING OF ROCK CORES FOR ING PURPOSES, GEOL. SOC. OF LONDON	
673	TEST FOR STABILISED 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 1610	
676	IDENTIFICATION OF PIPELINES AND SERVICES			1710			
677	WELDING OF STEEL PIPELINES ON LAND AND OFFSHORE			4515			
678	PERFORMANCE REQUIREMENTS FOR JOINTS AND COMPRESSION 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 rafter roof Part 5: Preservative treatment of structural timber
680	STAIRS, LADDERS AND WALKWAYS			5395	1, 2 & 3		Part 1: Design of straight stairs Part 2: Design of helical and spiral stairs

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
							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 AGAINST WATER FROM THE GROUND			8102			
692	DESIGN AND INSTALLATION OF DAMP-PROOF COURSES IN THE MASONRY CONSTRUCTION			8215			
693	CODE OF PRACTICE 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 ING - PIPING SYSTEMS	2406		1553	1		
701	GRAPHICAL SYMBOLS FOR GENERAL ENGIINEERING - PIPING SYSTEMS (CONT.)	2429	1				
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	ING DRAWING PRACTICE			308	1	ISO 128, 2162, 2203	
706	DRAWING PRACTICE FOR ING DRAWINGS			5070	1-3	BS EN 61082	BS 5070 Part 1 Partially Replaced by BS EN 61082-1 BS 5070 Part 2 Withdrawn Replaced by BS EN 61082-2
707	BUILDING AND CIVIL ING TERMS			6100	1-6		
708	WATER SUPPLY - MAPS AND PLANS	2425	3, 5				
709	CARTOGRAPHIC REPRESENTATION OF CLIMATE	50019	1				
750	CONCRETE (INC. R/F) - GLOSSARY			6100	6.2, 6.3		
751	VALVES - GLOSSARY						
752	IRON AND STEEL - GLOSSARY FOR PIPES			6562	1-2		

3.9 BUILDING MATERIALS

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
801	LIME FOR MORTAR	1060	1, 2, 3	890	CL.B		DIN 1060 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 COURSE (BITUMINOUS FELT)			743 (6398: BS 6398, BS 6515 and BS 8215)			BS 743 Partially Replaced by
804	CONCRETE BLOCKS			6398		KENYA 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
806	BRICK WALLING (CONT.)	106	1, 2				
807	ASBESTOS ROOF SLATES AND SHEETING			690	3, 4		BS 690 Part 3 & 4 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 766/7/9, 818/19, 2695, 3340, 3546, 3729	BS 1142 Partially Replaced by BS EN 120, 310, 316-323, 324: 1 & 2, 325, 382-1 and BS EN 622: 1-5
809	INSULATION BOARD AND HARD BOARD (CONT.)						
810	BLOCKBOARD	68705	1, 3	3444		ISO 1096, 97, 98, 2074, 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 EN 634-2 & BS EN 1328 BS 5669 Part 5 Withdrawn Replaced by BS 7916
813	CHIPBOARD (CONT.1)	68763					
813	CHIPBOARD (CONT. 2)	68764					
814	LAMINATED PLASTIC SHEETING	16922		3794		BS EN 438	BS 3794 Withdrawn Replaced by BS EN 438 Parts 1 & 2
814	LAMINATED PLASTIC SHEETING (CONT. 1)						
814	LAMINATED PLASTIC SHEETING (CONT. 2)						
815	WOOD WOOL SLABS	1101		1105			BS 1105 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. 1)	18101					
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 7316, BS 7668, BS EN 10029 Parts 1 to 3 BS EN 10113, BS EN 10155 and BS EN 10210-1
819	STRUCTURAL STEEL & METALWORK (CONT. 1)					JIS G30101-87	
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)	2440		1387		ISO 65, 7/1, 7/2	
823	GALVANISED M.S. TUBING (MILD STEEL) (CONT. 1)	2441		21			
823	GALVANISED M.S. TUBING (MILD STEEL) (CONT. 2)	2442					
823	GALVANISED 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 10242	
824	FITTINGS TO M.S. TUBING MILD STEEL (CONT. 2)			1740	1		

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
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. 2)	8073					
825	POLYTHENE TUBING FOR COLD WATER SERVICES (CONT. 3)	8075					
825	POLYTHENE TUBING FOR COLD WATER SERVICES (CONT. 4)	8074					
826	BRASSWORK & FITTINGS FOR TAPS & STOP VALVES			1010	2		
827	BALL VALVES FOR CISTERNS			1212	3		
828	PLASTIC FLOATS FOR BALL VALVES			2456			
829	CAST IRON SOIL, WASTE & VENT PIPES			416			
829	CAST IRON SOIL, WASTE & VENT PIPES (CONT. 1)						
829	CAST IRON SOIL, WASTE & VENT PIPES (CONT. 2)						
829	CAST IRON SOIL, WASTE & VENT PIPES (CONT. 3)	19522	1, 2				
830	GALVANISED MILD STEEL COLD WATER TANKS			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					
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.)			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 PIPES	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					
842	CAST IRON DRAIN PIPES (CONT. 8)	19508					
842	CAST IRON DRAIN PIPES (CONT. 9)	19509					
842	CAST IRON DRAIN PIPES (CONT. 10)	195010					
842	CAST IRON DRAIN PIPES (CONT. 11)	195011					
842	CAST IRON DRAIN PIPES (CONT. 12)	195014					
842	CAST IRON DRAIN PIPES (CONT. 13)	195019					
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 & S FITTINGS FOR DRAINS	19519		437			
845	STEP-IRONS TO MANHOLES & SEPTIC TANKS	1211	1	1247			
845	STEP-IRONS TO MANHOLES & SEPTIC TANKS (CONT. 1)	1212	1				
845	STEP-IRONS TO MANHOLES & SEPTIC TANKS (CONT. 2)	1213					
845	STEP-IRONS TO MANHOLES & SEPTIC TANKS (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					

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
846	C.I. MANHOLE COVERS AND FRAMES (CONT. 5)	19597					
847	STEEL LADDERS FOR PERMANENT ACCESS	3620		4211			
848	HANDRAILING	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 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 (CONT. 5)	52130					
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, ETC.	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 & CIVIL ING			3690	1, 3		
867	SOLAR WATER HEATERS					AS 2813-85	
868	FLOORING - INITIAL TREAMENT MAINTENANCE			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 FLOAT OPERATED VALVES			1968			
875	VITREOUS CHINA SANITARY FITTINGS			3402			
876	PAINTS - LEAD BASED			2523 (5082, 5358)			BS 2523 Obsolescent, Partially Replaced by BS 5082 and BS 5358
877	READY MIXED OIL-BASED PRIMING PAINTS			2521/4 (See 2523)			
878	READY MIXIED OIL-BASED UNDERCOATING AND FINISHING PAINTS						
879	COLD POURED SEALING MATEIALS 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	AIR BRICKS AND GRATINGS FOR WALL VENTILATION			493			

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
887	EAVES GUTTERS AND FITTINGS MADE OF PVC-C					BS EN 607	
888	EAVES GUTTERS AND RAINWATER DOWN-PIPES OF METAL SHEET					BS EN 612	
889	PLYWOOD					BS EN 635	
890	TIMBER IN JOINERY					BS EN 942	
891	PRESSED STEEL GUTTERS, RAINWATER 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: Aluminum nails
893	FIXING ACCESSORIES FOR BUILDING PURPOSES			1494	1		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 POLYVINYL CHLRIDE (PVC-U) RAINWATER GOODS AND ACCESSORIES			4576			
899.2	INDUSTRIAL TYPE METAL FLOORING, WALKWAYS AND STAIRS TREADS			4592	1, 2, 3 & 4		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			4721			
899.4	INTERNAL AND EXTERNAL WOOD DOORSETS, DOOR LEAVES AND FRAMES			4787	1		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) admixtures Part 2: Set retarding admixtures
899.8	SOFTWOOD GRADES FOR STRUCTURAL USE			4978			
899.9	COATED MACADAM FOR ROADS AND OTHER PAVED AREAS			4987	1 & 2		Part 1: Constituent materials and mixtures Part 2: Transport, laying and compaction
899.10	WATER-BORNE PRIMING PAINTS FOR WOODWORK			5082			
899.11	MASONRY CEMENT			5224			
899.12	EXTERNAL RENDERINGS			5262			
899.13	SOLVENT-BORNE PRIMING PAINTS FOR WOODWORK			5358			
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 faience 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 A MINIMUM FLOW PRESSURE OF 0.01 MPa (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 dimensions
899.1	VITREOUS CHINA BOWL URINALS			5520			

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
8	(RIMLESS TYPE)						
899.19	PRESERVATION OF TIMBER			5589			
899.20	PLASTIC CONNECTORS FOR USE WITH HORIZONTAL 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 CHMICAL 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 surfaces

3.10 ELECTRICAL / MECHANICAL

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
001	FRACTIONAL HORSE-POWER MOTORS (DIMENSIONS)	42021		2048	1		
002	CURRENT FRANSFORMERS			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 BRAKE)			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 by BS EN 60947-4-1
014	ELECTRICITY METERS			37	1, 5, 8		BS 37 Withdrawn Replaced by Parts 1-4 of BS 5685
015	WATT-HOUR METERS			5685		IEC 521	BS 5685 Part 1 (1979) and Parts 2, 3 & 4 (1986) all Obsolescent
016	ACCEPTANCE TESTS FOR PUMPS (CLASS C)	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 (15TH 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 respectively
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 BS 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 V.A.C.	57207	4, 5	6346			
025	ROTATING 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. 1kV)	57660		5486 5727 7354			
028	SAFETY ISOLATING TRANSFORMERS			3535			
029	ROTATING ELECTRICAL MACHINES - RATING PLATES	42961		4999	4	IEC 60034-1	
030	ROTATING 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 ENCLOSURES (CLASS N OF DEG.)			5490		IEC 600529, BS EN 60529	BS 5490 Withdrawn 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	SWITCHGEAR 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			

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
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	COMMISSIONIING, OPERATION AND MAINTENANCE OF STORAGE PUMPS					IEC 600805	
047	RUBBER INSULATED CABLES					IEC 600245	
048	VOLTAGE FLUCTUATION LIMITS - GUIDE					IEC 600827	
049	ELECTRIC CABLES - ARMOURING - WIRE FOR					KS 04-290	
050	ROTATING ELECTRICAL MACHINES FOR HARZARDOUS AREAS ("N")			5000	16		
051	POWER TRANSFORMERS - GENERAL					BS EN 60076-1	
052	ELECTRIC CONDUIT - 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 MISCELLLANEOUS

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
900	ZINC SPRAY PROTECTION	55928	1-9	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 EN ISO 12944
901	METALLIC ZINC RICH PRIMER			4652			
902	COLOUR OF FINISH (BUILDING MATERIALS)	See VOB		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		See DVGW	3416	TYPE II	DVGW-GWS	
905	WELDABLE STRUCTURAL STEELS	1025	1-5	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	30673		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 IRON (CONT.)					ASTM A 47-77	
912	ROLLED STEEL			4360		ISO 630	BS 4360 Withdrawn - Replaced by BS 7613, BS 7668, BS EN 10113, BS EN 10155 & BS EN 10210
912	ROLLED STEEL (CONT.)						
913	STRUCTURAL STEEL SECTIONS	1025	1-5	4	1		BS 4 Part 2 (1969) Withdrawn Replaced by BS 4848 Part 2
914	ISO METRIC BLACK HEXAGONAL BOLTS, SCREWS AND NUTS	267	1, 2	4190		ISO 272, 4759-1, 3	BS 4160 Obsolescent
914	ISO METRIC BLACK HEXAGONAL BOLTS, SCREWS AND NUTS (CONT 1)					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 PROTECTION OF STEEL STRUCTURES - GENERAL	55928	1-9	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)	8528	1-2	5135	1		BS 5135 Partially Replaced by BS EN 1011-1 (1998)
919	WELDING OF STEELS (METAL ARC) (CONT 1)	8553		499	1		BS 499 Part Obsolescent / Withdrawn
919	WELDING OF STEELS (METAL ARC) (CONT 2)	8558	1				
919	WELDING OF STELLS (METAL ARC) (CONT 3)	50120	1				
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)	1614					
920	STEEL PLATE, SHEET AND STRIP (CONT 7)	1632	2				
920	STEEL PLATE, SHEET AND STRIP	1624					

SRN	SUBJECT	DIN	PART	BSS	PART	OTHER	REMARKS
	(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			3643	1-2	ISO 68, 261, 724, 965/1, 965/3, 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 ING			4320		ASS 2602: 83 2603: 83 - ISO/12 887	
926	STEEL STRUCTURES - PAINTS FOR POLYURETHANE						
927	SHEAR TEST FOR METALS	50141					
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 EN 499	BS 639 Withdrawn Replaced by BS EN 499
932	BLACK CUP COUNTERSUNK BOLTS, 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 COATINGS. HOT DIP GALVANISED COATINGS ON FERROUS MATERIALS					BS EN 1460	
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 flat 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 VIENTILATING PIPES AND FITTINGS (BS 416)			6087			
945	HOT ROLLED PRODUCTS OF NON-ALLOY STRUCTURAL STEELS			10025			
946	STAINLESS STEELS			10088	2		Part 2: Technical delivery conditions for sheet/plate and strip for general purposes

4.1 DIN

DIN	SRN	DIN	SRN	DIN	SRN	DIN	SRN	DIN	SRN
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	3221	509	8061	313	28601	217
1025	905	2440	823	3230	501	8062	300	28602	218
1025	913	2441	203	3352	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	3354	506	8073	825	30672	221
1045	120	2444	225	3356	504	8074	825	30673	214
1045	111	2448	213	3357	514	8075	825	30673	908
1045	113	2458	213	3441	515	8528	919	30674	220
1045	112	2460	210	3620	847	8553	919	40050	012
1048	116	2460	213	4030	114	855	919	40050	030
1048	117	2460	824	4032	407	8564	600	42021	001
1060	801	2500	207	4032	409	8565	220	42673	010
1084	115	2501	207	4033	655	1045	100	42673	011
1084	121	2505	216	4034	854	16450	301	42961	029
1084	133	2519	207	4035	409	16451	301	46062	008
1101	815	2526	207	4035	408	16922	814	46062	013
1102	815	2559	210	4046	651	16928	302	50019	709
1164	103	2566	207	4060	222	16963	307	50120	600
1164	106	2605	226	4078	811	16970	304	50120	919
1164	105	2615	226	4085	667	18101	817	50141	927
1164	104	2615	216	4124	654	18195	668	50976	903
1187	862	2616	226	4126	145	18196	601	52128	856
1199	849	2616	216	4226	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
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
952	822	2011	042	4293	006	5316	016	8007	102
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	828	4395	930	8007	138		
1186	816	2494	222	4449	126	5419	007		

4.3 OTHER STANDARDS

OTHER STANDARDS	SRN	OTHER STANDARDS	SRN
AAS 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
IEC 60072, 72A	010	ISO 881	402
IEC 600805	046	ISO 885, 888	914
IEC 600827	048	ISO 887	925
IEC 60085	023	ISO 898/2, 898/1	914
IEE W. REGS (15TH EDITION)	018	ISO 965/3, 262	923
ISO 1106-3, 7438	924	ISO DIS 4042	921
ISO 1167	306	KENYA M.O.W. 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		

3. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

ENVIRONMENTAL & SOCIAL MITIGATION AND MANAGEMENT PLAN (ESMMP)

SCHEDULE A- CONTRACTOR'S RESPONSIBILITIES

Environmental/ Social Impact	Mitigation Action Plan	Responsibility	Phase
Loss of flora and fauna	▪ Site clearance should be limited to the minimum area required for the execution of the works. ▪ The contractor to obtain permits for cutting down of trees within and around the site. ▪ Top soil should be stockpiled separately from the subsoil. After completion of works, the subsoil should be backfilled first then top soil should be restored on top to facilitate natural regeneration of those areas, particularly at the borrow sites/ Rehabilitation and restoration of quarries and borrow pits	Contractor Project Resident Engineer/ Supervisor KFS KWS	Construction Phase
Flooding, Siltation and failure of the pressure filters	▪ Planting of trees in the upstream to control any sources of erosion and siltation to the Dam by human activities ▪ Undertake monitoring of the upstream to control siltation and erosion ▪ Take necessary engineering measures to sustain the pressure projected ▪ Mitigate any impacts related to climate change from an engineering perspective.	Contractor Project Resident Engineer/ Supervisor KFS KWS	Pre-construction Phase Construction Phase
Quarries and borrow pits	▪ Contractor to obtain a separate ESIA license for quarries, his campsites, and borrow pits ▪ Comply with the NEMA Integrated National Land Use Guidelines (*Guidelines for Mining and Quarrying)*, 2011	Contractor Project Resident Engineer/ Supervisor KFS/ KWS	Construction Phase

Air pollution, Noise and Dust	▪ Comply with NEMA Air and Noise pollution control regulations ▪ Vehicles and other equipment emissions would be kept to a minimum by servicing and maintaining the equipment to manufacturer's specification. ▪ Use protective clothing like helmets and dust masks by construction crew and any other required Personal Protective Equipment (PPEs) ▪ Avoid night time construction when noise is loudest. ▪ Avoid night-time construction using heavy machinery ▪ Construction sites and transportation routes will be water-sprayed on dry and windy days up to three times a day, especially if these sites are near sensitive receptors, such as ecological sites, local villages, or institutions, especially during transportation of materials to the project site.	Contractor Project Resident Engineer/ Supervisor	Construction Phase
Generation of solid and liquid waste	▪ Compliance to NEMA Waste Management Regulations 2006 ▪ Provide adequate waste disposal facilities. Ensure collection of all solid waste from generation points, safe transportation to a central point where they are sorted out and safely disposed according to type to protect the environmental resources. ▪ Put in place adequate and efficient sanitary facilities for handling liquid waste especially waste water to protect the river from pollution. ▪ Wastewater from residential quarters and offices to be directed to constructed septic tanks for safe handling. ▪ Pit latrines can be used in areas where the other services are not available or feasible	Contractor Project Resident Engineer/ Supervisor	Construction Phase
Pollution of water resources	▪ Ensure proper measures are in place for collection and disposal of spilled oils and lubricants. ▪ Rehabilitation and restoration/	Contractor Project Resident Engineer/	Construction Phase Decommissio

	Decommissioning Plans for quarries and borrow pits	Supervisor	ning phase
Health and safety	▪ Full compliance with OSHA, 2007/ comply with operating occupational health and safety law requirements ▪ Provision of Personal Protective Equipment (ear muffs, gloves, dust masks and helmets) for the construction crew ▪ Employ a qualified (graduate level) Environment, Health and Safety officer on site. ▪ Provide First aid kit and appropriate procedures and safety measures ▪ Ensure that all construction machines and equipment are in good working conditions to prevent occupational hazards. ▪ Provide information, education and communication about safe uses of drinking water. ▪ Isolate construction sites from the general public through hoarding and other suitable methods ▪ Provide workers training on safety procedures and emergency response such as fire, oil and chemical spills, pipe bursts and other serious water loss risks. ▪ Develop and implement an HIV/ AIDs sensitization and awareness creation program. Sensitize workers and the surrounding communities on awareness, prevention and management of HIV/AIDS through staff training, quarterly awareness campaigns ▪ Provide condom dispensers at appropriate locations coupled with awareness campaigns to workers and surrounding communities on HIV/AIDS throughout the construction period ▪ Provide enough toilets and other sanitary facilities within the camp ▪ Work to minimize or altogether eliminate mosquito breeding sites.	Contractor Project Resident Engineer/ Supervisor	Construction Phase

Traffic Accidents and Management	▪ Develop and implement a Traffic Management Plan in the park ▪ Provide temporary road signs or notices to indicate ongoing works ▪ Strictly follow KWS Park traffic rules ▪ All transport staff (especially drivers) to undergo induction and abide to the traffic rules within the park ▪ Provide appropriate signage to warn motorists and other road users of the construction activities, diversion routes to ward off traffic accidents. ▪ Communicate any intended disruption of the services to enable the people to prepare, e.g. Power disruptions ▪ In the event that delivery trucks damage parts of the road, repair the spots in consultation with the local authorities.	Contractor Project Resident Engineer/ Supervisor KWS	Construction Phase
Gender balance and Mainstreaming	▪ Ensure equitable distribution of employment opportunities between men and women ▪ Provide toilets and bathrooms for both male and female workers on site	Contractor Project Resident Engineer/ Supervisor	Pre-Construction Phase Construction Phase
Increased spread of Sexually Transmitted Diseases (STD) and HIV/AIDs	▪ Develop and implement an STDs, HIV/ AIDs program throughout the project period to protect the workers and local communities from infections from migrant workers ▪ Contractor to create partnership with the County HIV/AIDs control department	Contractor Project Resident Engineer/ Supervisor	Construction Phase

SCHDULE B- EMPLOYER'S RESPONSIBILITIES

Environmental / Social Impact	Mitigation Action Plan	Responsibility	Phase
Low river flows during the dry season	▪ Set minimum abstraction rates for dry and wet months (based on hydrological studies) to avoid drying up of the Yamo River downstream especially during the dry seasons	NWWDA	Construction Phase
Flooding, Siltation and failure of the pressure filters	▪ Mitigate any impacts related to climate change from an engineering perspective.	NWWDA	Pre-Construction Phase Construction Phase
Quarries and borrow pits	▪ Comply to the NEMA Integrated National Land Use Guidelines (*Guidelines for Mining and Quarrying)*, 2011	NWWDA	Construction Phase
Gender balance	▪ Ensure equitable distribution of employment opportunities between men and women	NWWDA	Pre-Construction Phase Construction Phase
Increased spread of Sexually Transmitted Diseases (STD) and HIV/AIDs	▪ Develop an STDs, HIV/ AIDs program throughout the project period to protect the workers and local communities from infections from migrant workers	NWWDA	Pre-Construction Phase Construction Phase