COUNTY GOVERNMENT OF MERU
DEPARTMENT OF WATER AND IRRIGATION

OPEN TENDER FOR
CONSTRUCTIONS OF MASONRY TANKS, INTAKE WORKS, AND LAYING OF PIPES

TENDER NUMBER: CGM/ONT/076/2019-2010
NEGOTIATION NUMBER: 758998

(NOVEMBER, 2019)

The Engineer
CHIEF OFFICER
WATER AND IRRIGATION
COUNTY GOVERNMENT OF MERU
P.O. BOX 120 - 60200,
MERU.

The Employer
THE GOVERNOR,
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P.O. BOX 120 - 60200,
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Contents

SECTION I: INVITATION FOR TENDERS ................................................................. 4

SECTION II – INSTRUCTIONS TO TENDERERS ........................................... 5

2.1 Eligible Tenderers.......................................................................................... 5
2.2 Cost of Tendering.......................................................................................... 5
2.3 Contents of Tender Document....................................................................... 5
2.4 Clarification of Tender Documents................................................................ 6
2.5 Amendment of Tender Documents............................................................... 7
2.6 Language of Tender...................................................................................... 7
2.7 Documents Comprising the Tender.............................................................. 7
2.8 Form of Tender............................................................................................. 7
2.9 Tender Prices............................................................................................... 8
2.10 Tender Currencies....................................................................................... 8
2.11 Tenderers Eligibility and Qualifications..................................................... 8
2.12 Tender Security........................................................................................... 8
2.13 Validity of Tender....................................................................................... 9
2.14 Format and Signing of Tender.................................................................... 10
2.14.4 Payment terms........................................................................................ 10
2.15 Sealing and Marking of Tenders................................................................. 11
2.15.4 Deadline for Submission of Tenders....................................................... 11
2.16 Modification and withdrawal of tenders.................................................... 11
2.17 Opening of Tenders.................................................................................... 12
2.18 Clarification of tenders............................................................................... 12
2.19 Preliminary Examination and Responsiveness.......................................... 13
2.19.6 Conversion to a single currency............................................................ 13
2.20 Evaluation and comparison of tenders......................................................... 13
2.21 Contacting the procuring entity................................................................. 15
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.22</td>
<td>Award of Contract</td>
<td>15</td>
</tr>
<tr>
<td>2.23</td>
<td>Notification of award</td>
<td>16</td>
</tr>
<tr>
<td>2.24</td>
<td>Signing of Contract</td>
<td>16</td>
</tr>
<tr>
<td>2.25</td>
<td>Performance Security</td>
<td>17</td>
</tr>
<tr>
<td>2.26</td>
<td>Corrupt or Fraudulent Practices</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td><strong>APPENDIX TO INSTRUCTIONS TO TENDERERS</strong></td>
<td>18</td>
</tr>
<tr>
<td>3.14</td>
<td>Termination for default</td>
<td>27</td>
</tr>
<tr>
<td>3.17</td>
<td>Resolution of disputes</td>
<td>28</td>
</tr>
<tr>
<td>3.20</td>
<td>Applicable law</td>
<td>28</td>
</tr>
<tr>
<td>3.21</td>
<td>Notices</td>
<td>28</td>
</tr>
<tr>
<td>3.22</td>
<td>Confidentiality</td>
<td>29</td>
</tr>
<tr>
<td>3.23</td>
<td>Corrupt gifts and payments of commission</td>
<td>29</td>
</tr>
<tr>
<td>3.24</td>
<td>Expiration of contract</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td><strong>SPECIAL IV – SPECIAL CONDITIONS OF CONTRACT</strong></td>
<td>30</td>
</tr>
<tr>
<td></td>
<td><strong>SECTION V – TECHNICAL SPECIFICATIONS</strong></td>
<td>31</td>
</tr>
<tr>
<td></td>
<td><strong>SECTION VI – DRAWINGS</strong></td>
<td>107</td>
</tr>
<tr>
<td></td>
<td><strong>SECTION VII - BILL OF BILL OF QUANTITIES</strong></td>
<td>108</td>
</tr>
<tr>
<td></td>
<td><strong>CONFIDENTIAL BUSINESS QUESTIONNAIRE FORM</strong></td>
<td>120</td>
</tr>
<tr>
<td></td>
<td><strong>TENDER SECURITY FORM</strong></td>
<td>121</td>
</tr>
<tr>
<td></td>
<td><strong>CONTRACT FORM</strong></td>
<td>122</td>
</tr>
<tr>
<td></td>
<td><strong>PERFORMANCE SECURITY FORM</strong></td>
<td>123</td>
</tr>
<tr>
<td></td>
<td><strong>BANK GUARANTEE FOR ADVANCE PAYMENT</strong></td>
<td>124</td>
</tr>
<tr>
<td></td>
<td><strong>MANUFACTURER’S AUTHORIZATION FORM</strong></td>
<td>125</td>
</tr>
<tr>
<td></td>
<td><strong>BIDDER’S DECLARATION AND INTEGRITY PACT</strong></td>
<td>126</td>
</tr>
<tr>
<td></td>
<td><strong>LETTER OF NOTIFICATION OF AWARD</strong></td>
<td>127</td>
</tr>
<tr>
<td></td>
<td><strong>FORM OF WRITTEN POWER-OF-ATTORNEY</strong></td>
<td>128</td>
</tr>
<tr>
<td></td>
<td><strong>FORM SD1</strong></td>
<td>129</td>
</tr>
<tr>
<td></td>
<td><strong>FORM SD2</strong></td>
<td>130</td>
</tr>
<tr>
<td></td>
<td><strong>FORM RB 1</strong></td>
<td>131</td>
</tr>
</tbody>
</table>
SECTION I: INVITATION FOR TENDERS
CONSTRUCTIONS OF MASONRY TANKS, INTAKE WORKS, AND LAYING OF PIPES (NEGOTIATION NO. 758998)

The County Government of Meru (CGM), under Department of water and irrigation (hereafter called “The Client”) now invites sealed bids from eligible contractors/suppliers, for the stated works/supplies. Interested candidates may obtain further information from and inspect the tender document from CGM website: www.meru.go.ke or supplier.treasury.go.ke.

1.1 Interested bidders shall download the tender document from the website freely, and MUST forward their particulars immediately for recording and further clarification and addenda to procurement.finance@meru.go.ke.

1.2 Completed tender documents shall be submitted through the IFMIS Supplier Portal: supplier.treasury.go.ke as per the requirements contained in the tender document so as to be received on or before the date and time indicated in IFMIS-(11th December, 2019 at 10.00AM)

1.3 Tenderers shall furnish, as part of their application a tender security as per the tender instructions appendix.

1.4 Bidders who may experience any challenges in accessing or uploading the tender documents in the IFMIS tender portal should contact IFMIS help desk Tel (0800721477) at the National Treasury

NOTE: The system will automatically lock out at the date & time of tender closing indicated in the IFMIS portal. Manual Submissions shall not be acceptable in this e-tendering and therefore no physical opening of the tenders

CHIEF OFFICER,
WATER AND IRRIGATION
COUNTY GOVERNMENT OF MERU,
P. O. BOX 120-MERU.
SECTION II – INSTRUCTIONS TO TENDERERS

2.1 Eligible Tenderers

2.1.1. This Invitation to tender is open to all tenderers eligible as described in the instructions to tenderers. Successful tenderers shall provide the services for the stipulated duration from the date of commencement (hereinafter referred to as the term) specified in the tender documents.

2.1.2. The mandatory documentation as given under the Appendix to Instructions to Tenderers – clause 2.29 must be submitted as they will be used for confirmation of eligibility of the tenders.

2.1.3. The procuring entity’s employees, committee members, board members and their relative (spouse and children) are not eligible to participate in the tender unless where specially allowed under section 131 of the Act.

2.1.4. Tenderers shall provide the qualification information statement that the tenderer (including all members, of a joint venture and subcontractors) is not associated, or have been associated in the past, directly or indirectly, with a firm or any of its affiliates which have been engaged by the Procuring entity to provide consulting services for the preparation of the design, specifications, and other documents to be used for the procurement of the services under this Invitation for tenders.

2.1.5. Tenderers involved in corrupt or fraudulent practices or debarred from participating in public procurement shall not be eligible.

2.2 Cost of Tendering

2.2.1 The Tenderer shall bear all costs associated with the preparation and submission of its tender, and the procuring entity, will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the tendering process.

2.2.2 This tender document is not chargeable and is given to the tenderer selected by the Procuring entity.

2.3 Contents of Tender Document

2.3.1 The tender document comprises the documents listed below and addenda issued in accordance with clause 2.6 of these instructions to tenderers.

i) Invitation to Tender
ii) Instructions to Tenderers
iii) General Conditions of Contract
iv) Special Conditions of Contract
v) Schedule of requirements
vi) Technical Specifications
vii) Tender Form and Price Schedules
viii) Tender Security Form ix) Contract Form
x) Performance Security Form
xi) Bank Guarantee for Advance Payment Form
xii) Manufacturer’s Authorization Form
xiii) Confidential Business Questionnaire Form xiv) Declaration form

2.3.2 The Tenderer is expected to examine all instructions, forms, terms, and specifications in the tender documents. Failure to furnish all information required by the tender documents or to submit a tender not substantially responsive to the tender documents in every respect will be at the tenderers risk and may result in the rejection of its tender.

2.4 Clarification of Tender Documents

2.4.1 A prospective tenderer making inquiries of the tender documents may notify the Procuring entity in writing or by post at the entity’s address indicated in the invitation for tenders. The Procuring entity will respond in writing to any request for clarification of the tender documents, which it receives not later than seven (7) days prior to the deadline for the submission of tenders, prescribed by the procuring entity. Written copies of the Procuring entities response (including an explanation of the query but without identifying the source of inquiry) will be sent to all prospective tenderers that have received the tender document.

2.4.2 The procuring entity shall reply to any clarifications sought by the tenderer within 3 days of receiving the request to enable the tenderer to make timely submission of its tender.
2.5 Amendment of Tender Documents

2.5.1 At any time prior to the deadline for submission of tender, the procuring entity, for any reason, whether at its own initiative or in response to a clarification requested by a prospective tenderer, may modify the tender documents by issuing an addendum.

2.5.2 All prospective tenderers that have obtained the tender documents will be notified of the amendment in writing or by post and will be binding on them.

2.5.3 In order to allow prospective tenderers reasonable time in which to take the amendment into account in preparing their tenders, the Procuring entity, at its discretion, may extend the deadline for the submission of tenders.

2.6 Language of Tender

2.6.1 The tender prepared by the tenderer, as well as all correspondence and documents relating to the tender exchange by the tenderer and the Procuring entity, shall be written in English language, provided that any printed literature furnished by the tenderer may be written in another language provided they are accompanied by an accurate English translation of the relevant passages in which case, for purposes of interpretation of the tender, the English translation shall govern.

2.7 Documents Comprising the Tender

2.7.1 The tender prepared by the tenderers shall comprise the following components.

   a) A Tender Form and a Price Schedule completed in accordance with clauses 2.8, 2.9 and 2.10 below.
   b) Documentary evidence established in accordance with Clause 2.11 that the tenderer is eligible to tender and is qualified to perform the contract if its tender is accepted.
   c) Tender security furnished is in accordance with Clause 2.12. d) Confidential business questionnaire.

2.8 Form of Tender
2.8.1 The tenderer shall complete the Form of Tender and the appropriate Price Schedule furnished in the tender documents, indicating the equipment to be supplied, installed and commissioned and a brief description of the equipment, their country of origin, quantity, and prices.

2.9 Tender Prices

2.9.1 The tenderer shall indicate on the Price schedule the unit prices where applicable and total tender prices of the services it proposes to provide under the contract.

2.9.2 Prices indicated on the Price Schedule shall be the cost of the services quoted including all customs duties and VAT and other taxes payable.

2.9.3 Prices quoted by the tenderer shall remain fixed during the term of the contract unless otherwise agreed by the parties. A tender submitted with an adjustable price quotation will be treated as non-responsive and will be rejected, pursuant to clause 2.22.

2.9.4 Contract price variations shall not be allowed for contracts not exceeding one year (12 months)

2.9.5 Where contract price variation is allowed, the variation shall not exceed 10% of the original contract price.

2.9.6 Price variation requests shall be processed by the procuring entity within 30 days of receiving the request.

2.10 Tender Currencies

2.10.1 Prices shall be quoted in the either in Kenya Shillings or which will be converted to Kenya Shillings according to Clause 2.23.

2.11 Tenderers Eligibility and Qualifications

2.11.1 Pursuant to Clause 2.1 the tenderer shall furnish, as part of its tender, documents establishing the tenderers eligibility to tender and its qualifications to perform the contract if its tender is accepted.

2.11.2 The documentary evidence of the tenderers qualifications to perform the contract if its tender is accepted shall establish to the Procuring entity’s satisfaction that the tenderer has the financial and technical capability necessary to perform the contract.

2.12 Tender Security
2.12.1 The tenderer shall furnish, as part of its tender, a tender security for the amount and form specified in the instruction to tender.

2.12.2 The tender security shall be as indicated in the appendix to instruction to tenders.

2.12.3 The tender security is required to protect the Procuring entity against the risk of Tenderer’s conduct which would warrant the security’s forfeiture, pursuant to clause 2.12.7.

2.12.4 The tender security shall be denominated in a Kenya Shillings or in another freely convertible currency and shall be in the form of:
   a) A bank guarantee.
   b) Cash.
   c) Such insurance guarantee approved by the Authority.

2.12.5 Any tender not secured in accordance with clause 2.12.1 and 2.12.3 will be rejected by the Procuring entity as non-responsive, pursuant to clause 2.20.

2.12.6 Unsuccessful tenderer’s security will be discharged or returned as promptly as possible as but not later than thirty (30) days after the expiration of the period of tender validity prescribed by the procuring entity.

2.12.7 The successful tenderer’s tender security will be discharged upon the tenderer signing the contract, pursuant to clause 2.26, and furnishing the performance security, pursuant to clause 2.27.

2.12.8 The tender security may be forfeited:
   a) If a tenderer withdraws its tender during the period of tender validity specified by the procuring entity on the Tender Form; or
   b) In the case of a successful tenderer, if the tenderer fails:
      i) to sign the contract in accordance with clause 2.26; or
      ii) to furnish performance security in accordance with clause 2.27.
   c) If the tenderer rejects, correction of an error in the tender.

2.13 Validity of Tender
2.13.1 The tender shall remain valid for 120 days or as specified in the tender documents after date of tender opening prescribed by the Procuring entity, pursuant to clause 2.20. A tender valid for a shorter period shall be rejected by the Procuring entity as non-responsive.

2.13.2 In exceptional circumstances, the Procuring entity may solicit the Tenderer’s consent to an extension of the period of validity. The request and the responses thereto shall be made in writing. The tender security provided under clause 2.14 shall also be suitably extended. A tenderer may refuse the request without forfeiting its tender security. A tenderer granting the request will not be required nor permitted to modify its tender.

2.14 Format and Signing of Tender

2.14.1 The tenderer shall prepare two copies of the tender, clearly marking each “ORIGINAL TENDER” and “COPY OF TENDER,” as appropriate. In the event of any discrepancy between them, the original shall govern.

2.14.2 The original and all copies of the tender shall be typed or written in indelible ink and shall be signed by the tenderer or a person or persons duly authorized to bind the tenderer to the contract. All pages of the tender, except for un amended printed literature, shall be initialed by the person or persons signing the tender.

2.14.3 The tender shall have no interlineations, erasures, or overwriting except as necessary to correct errors made by the tenderer, in which case such corrections shall be initialed by the person or persons signing the tender.

2.14.4 Payment terms

The payment terms for this tender are for a credit period of thirty (30) days from the date when monthly invoices have been received at CGM, and after confirmation of satisfactory receipt of services. The tenderer should clearly indicate the payment terms in their proposal if different.

2.14.5 The original and all copies of the tender shall be typed or written in indelible ink and shall be signed by the tenderer or a person(s) duly authorized to bind the tenderer to the contract. All pages of the tender, except for un amended printed literature, shall be initialed by the person(s) signing the tender.

2.14.6 The tender shall have no interlineations, erasures, or overwriting except as necessary to correct errors made by the tenderer, in which
case such corrections shall be initialed by the person(s) signing the tender.

2.15 Sealing and Marking of Tenders

2.15.1 The tenderer shall seal the original and each copy of the tender in separate envelopes, duly marking the envelopes as “ORIGINAL” and “COPY.” The envelopes shall then be sealed in an outer envelope.

The inner and outer envelopes shall:

a) be addressed to the Procuring entity at the address given in the invitation to tender;

b) bear, tender number and name in the invitation to tender and the words: “DO NOT OPEN BEFORE date and time indicated in the invitation to tenderers.

2.15.2 The inner envelopes shall also indicate the name and address of the tenderer to enable the tender to be returned unopened in case it is declared “late”.

2.15.3 If the outer envelope is not sealed and marked as required by clause 2.15.2, the Procuring entity will assume no responsibility for the tender’s misplacement or premature opening.

2.15.4 Deadline for Submission of Tenders

2.15.5 Tenders must be received by the Procuring entity at the address specified in the Invitation to Tender no later than, date and time indicated in the invitation to tenderers.

2.15.6 The procuring entity may, at its discretion, extend this deadline for the submission of tenders by amending the tender documents in accordance with clause 2.5, in which case all rights and obligations of the procuring entity and candidates previously subject to the deadline will thereafter be subject to the deadline as extended.

2.15.7 Bulky tenders which will not fit in the tender box shall be received by the procuring entity as provided for in the appendix.

2.16 Modification and withdrawal of tenders

2.16.1 The tenderer may modify or withdraw its tender after the tender’s submission, provided that written notice of the modification, including substitution or withdrawal of the tender’s is received by the procuring entity prior to the deadline prescribed for the submission of tenders.
2.16.2 The Tenderer’s modification or withdrawal notice shall be prepared, sealed, marked, and dispatched in accordance with the provisions of clause 2.15. A withdrawal notice may also be sent by cable, but followed by a signed confirmation copy, postmarked not later than the deadline for submission of tenders.

2.16.3 No tender may be modified after the deadline for submission of tenders.

2.16.4 No tender may be withdrawn 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 Tender Form. Withdrawal of a tender during this interval may result in the Tenderer’s forfeiture of its tender security, pursuant to clause 2.12.7.

2.16.5 The procuring entity may at any time terminate procurement proceedings before contract award and shall not be liable to any person for the termination.

2.16.6 The procuring entity shall give prompt notice of the termination to the tenderers and on request give its reasons for termination within 14 days of receiving the request from any tenderer.

2.17 Opening of Tenders

2.17.1 The Procuring entity will open all tenders in the presence of tenderers’ representatives who choose to attend in the location specified in the invitation to tender. The tenderers’ representatives who are present shall sign a register evidencing their attendance.

2.17.2 The tenderers’ names, tender modifications or withdrawals, tender prices, discounts, and the presence or absence of requisite tender security and such other details as the Procuring Entity, at its discretion, may consider appropriate, will be announced at the opening.

2.17.3 The procuring entity will prepare minutes of the tender opening which will be submitted to the tenderers that signed the tender opening register and will have made the request.

2.18 Clarification of tenders

2.18.1 To assist in the examination, evaluation and comparison of tenders the procuring entity may at its discretion, ask the tenderer for a clarification of its tender. The request for clarification and the response shall be in writing, and no change in the prices or substance shall be sought, offered, or permitted.

2.18.2 Any effort by the tenderer to influence the procuring entity in the procuring entity’s tender evaluation, tender comparison or contract award decisions may result in the rejection of the tenderers tender.
2.18.3 Comparison or contract award decisions may result in the rejection of the tenderers’ tender.

2.19 Preliminary Examination and Responsiveness

2.19.1 The Procuring entity will examine the tenders to determine whether they are complete, whether any computational errors have been made, whether required securities have been furnished whether the documents have been properly signed, and whether the tenders are generally in order.

2.19.2 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail, and the total price shall be corrected. If the candidate does not accept the correction of the errors, its tender will be rejected, and its tender security may be forfeited. If there is a discrepancy between words and figures, the amount in words will prevail.

2.19.3 The Procuring entity may waive any minor informality or nonconformity or irregularity in a tender which does not constitute material deviation, provided such waiver does not prejudice or affect the relative ranking of any tenderer.

2.19.4 Prior to the detailed evaluation, pursuant to clause 2.22, the Procuring entity will determine the substantial responsiveness of each tender to the tender documents. For purposes of these clauses, a substantially responsive tender is one which conforms to all the terms and conditions of the tender documents without material deviations. The Procuring entity’s determination of a tender’s responsiveness is to be based on the contents of the tender itself without recourse to extrinsic evidence.

2.19.5 If a tender is not substantially responsive, it will be rejected by the Procuring entity and may not subsequently be made responsive by the tenderer by correction of the nonconformity.

2.19.6 Conversion to a single currency

2.19.7 Where other currencies are used, the procuring entity will convert those currencies to Kenya shillings using the selling exchange rate on the date of tender closing provided by the Central Bank of Kenya.

2.20 Evaluation and comparison of tenders
2.20.1 The procuring entity will evaluate and compare the tenders which have been determined to be substantially responsive, pursuant to clause 2.20.

2.20.2 The comparison shall be of the price including all costs as well as duties and taxes payable on all the materials to be used in the provision of the services.

2.20.3 The Procuring entity’s evaluation of a tender will take into account, in addition to the tender price, the following factors, in the manner and to the extent indicated in clause 2.22.4 and in the technical specifications:

a) operational plan proposed in the tender; and

b) deviations in payment schedule from that specified in the Special Conditions of Contract;

2.20.4 Pursuant to clause 2.22.3 the following evaluation methods will be applied:

a) **Operational Plan.**

   The Procuring entity requires that the services under the Invitation for Tenders shall be performed at the time specified in the Schedule of Requirements. Tenderers offering to perform longer than the procuring entity’s required delivery time will be treated as non-responsive and rejected.

b) **Deviation in payment schedule.**

   Tenderers shall state their tender price for the payment on a schedule outlined in the special conditions of contract. Tenders will be evaluated on the basis of this base price. Tenderers are, however, permitted to state an alternative payment schedule and indicate the reduction in tender price they wish to offer for such alternative payment schedule. The Procuring entity may consider the alternative payment schedule offered by the selected tenderer.

2.20.5 The tender evaluation committee shall evaluate the tender within 30 days from the date of opening the tender.

2.20.6 To qualify for contract awards, the tenderer shall have the following:-

a) Pass the preliminary evaluation having submitted all the mandatory documentation

b) Score the minimum technical evaluation score as given in the evaluation criteria under the appendix to instructions to tenderers – clause 2.29.
c) Necessary qualifications, capability experience, services, equipment and facilities to provide what is being procured.
d) Legal capacity to enter into a contract for procurement
e) Shall not be insolvent, in receivership, bankrupt or in the process of being wound up and is not the subject of legal proceedings relating to the foregoing
f) Shall not be debarred from participating in public procurement.

2.21 Contacting the procuring entity

2.21.1 Subject to clause 2.19, no tenderer shall contact the procuring entity on any matter relating to its tender, from the time of the tender opening to the time the contract is awarded.

2.21.2 Any effort by a tenderer to influence the procuring entity in its decisions on tender evaluation tender comparison or contract award may result in the rejection of the tenderers tender.

2.22 Award of Contract

a) Post qualification

2.22.1 In the absence of pre-qualification, the Procuring entity will determine to its satisfaction whether the tenderer that is selected as having submitted the lowest evaluated responsive tender is qualified to perform the contract satisfactorily.

2.22.2 The determination will take into account the tenderer’s financial and technical capabilities. It will be based upon an examination of the documentary evidence of the tenderers qualifications submitted by the tenderer, pursuant to clause 2.1.2, as well as such other information as the Procuring entity deems necessary and appropriate.

2.22.3 An affirmative determination will be a prerequisite for award of the contract to the tenderer. A negative determination will result in rejection of the Tenderer’s tender, in which event the Procuring entity will proceed to the next lowest evaluated tender to make a similar determination of that Tenderer’s capabilities to perform satisfactorily.

b) Award Criteria

2.22.4 Subject to clause 2.27 the Procuring entity will award the contract to the successful tenderer whose tender has been determined to be substantially responsive and has been determined to be the lowest
evaluated tender, provided further that the tenderer is determined to be qualified to perform the contract satisfactorily.

2.22.5 The procuring entity reserves the right to accept or reject any tender and to annul the tendering process and reject all tenders at any time prior to contract award, without thereby incurring any liability to the affected tenderer or tenderers or any obligation to inform the affected tenderer or tenderers of the grounds for the procuring entity’s action. If the procuring entity determines that none of the tenderers is responsive; the procuring entity shall notify each tenderer who submitted a tender.

2.22.6 A tenderer who gives false information in the tender document about its qualification or who refuses to enter into a contract after notification of contract award shall be considered for debarment from participating in future public procurement.

2.23 Notification of award

2.23.1 Prior to the expiration of the period of tender validity, the Procuring entity will notify the successful tenderer in writing that its tender has been accepted.

2.23.2 The notification of award will signify the formation of the Contract subject to the signing of the contract between the tenderer and the procuring entity pursuant to clause 2.26. Simultaneously the other tenderers shall be notified that their tenders have not been successful.

2.23.3 Upon the successful Tenderer’s furnishing of the performance security pursuant to clause 2.27, the Procuring entity will promptly notify each unsuccessful Tenderer and will discharge its tender security, pursuant to clause 2.12.

2.24 Signing of Contract

2.24.1 At the same time as the Procuring entity notifies the successful tenderer that its tender has been accepted, the Procuring entity will simultaneously inform the other tenderers that their tenders have not been successful.

2.24.2 Within fourteen (14) days of receipt of the Contract Form, the successful tenderer shall sign and date the contract and return it to the Procuring entity.
2.24.3 The parties to the contract shall have it signed within 30 days from the date of notification of contract award unless there is an administrative review request.

2.25 Performance Security

2.25.1 Within fourteen (14) days of the receipt of notification of award from the Procuring entity, the successful tenderer shall furnish the performance security in accordance with the Conditions of Contract, in the Performance Security Form provided in the tender documents, or in another form acceptable to the Procuring entity.

2.25.2 Failure of the successful tenderer to comply with the requirement of clause 2.26 or clause 2.27.1 shall constitute sufficient grounds for the annulment of the award and forfeiture of the tender security, in which event the Procuring entity may make the award to the next lowest evaluated or call for new tenders.

2.26 Corrupt or Fraudulent Practices

2.26.1 The Procuring entity requires that tenderers observe the highest standard of ethics during the procurement process and execution of contracts. A tenderer shall sign a declaration that he has not and will not be involved in corrupt or fraudulent practices.

2.26.2 The procuring entity will reject a proposal for award if it determines that the tenderer recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

2.26.3 Further, a tenderer who is found to have indulged in corrupt or fraudulent practices runs the risk of being debarred from participating in public procurement in Kenya.
## APPENDIX TO INSTRUCTIONS TO TENDERERS

<table>
<thead>
<tr>
<th>Instructions</th>
<th>Particulars of appendix to instructions to tenders</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.12</td>
<td>Bidders must upload copy of ORIGINAL bid security to the IFMIS Portal &amp; deliver the ORIGINAL bid security to the office of Director Supply Chain Management Services, in the Head-Quarter building of the CGM. A bidder will demand an acknowledged copy of the bid bond.</td>
</tr>
<tr>
<td>2.12.2</td>
<td>Bidders shall provide a bid security as per mandatory conditions, valid for 120 days from the date of tender opening. Tender security shall be from a reputable bank or an insurance company approved PPRA.</td>
</tr>
<tr>
<td>2.14.1</td>
<td>ORIGINAL Tender documents shall be scanned and sent through IFMIS portal only. No manual submissions shall be allowed.</td>
</tr>
<tr>
<td>2.14.4</td>
<td>Payment terms shall be as agreed between both partied on contract signed by both parties.</td>
</tr>
<tr>
<td>2.15.1</td>
<td>Manual Submissions shall not be acceptable in this e-tendering and therefore no physical opening of the tenders.</td>
</tr>
<tr>
<td>2.15.4</td>
<td>The system will automatically lock out at the date &amp; time of tender closing indicated in the IFMIS portal.</td>
</tr>
<tr>
<td>2.15.7</td>
<td>ORIGINAL Tender documents shall be scanned and sent through IFMIS portal only. No manual submissions shall be allowed.</td>
</tr>
<tr>
<td>2.17</td>
<td>Opening &amp; Evaluation of tenders will be conducted online through IFMIS by unsealing and scoring. Therefore, No tenders shall be announced and notifications will be sent through IFMIS Portal.</td>
</tr>
<tr>
<td>2.18</td>
<td>Tenderers can make inquiries through email: <a href="mailto:procurement.finance@meru.go.ke">procurement.finance@meru.go.ke</a></td>
</tr>
</tbody>
</table>
### Instructions vs. Particulars of appendix to instructions to tenders

<table>
<thead>
<tr>
<th>Instructions</th>
<th>Particulars of appendix to instructions to tenders</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.19.2</td>
<td>No correction of errors pursuant to Section 82 of the PPADA 2015</td>
</tr>
<tr>
<td>2.20.3</td>
<td>To be qualified for award of Contract, the tenderer must meet all the conditions in the appendix.</td>
</tr>
<tr>
<td>2.25</td>
<td>Performance security shall be 5% of the bid amount.</td>
</tr>
<tr>
<td>2.7</td>
<td>The responsibility, risk and cost visiting the Site shall be at the Tenderer’s own expense &amp; times.</td>
</tr>
<tr>
<td>2.8</td>
<td>The evaluation criteria in this appendix shall be used</td>
</tr>
</tbody>
</table>

---

### Mandatory Evaluation Criteria

1. Copy of current business license from Authority of the principal place of business.
2. Provide a copy of Valid Tax Compliance Certificate from KRA(acknowledgement receipt not accepted)
3. Copy of certificate of business Incorporation/Registration and must have been in existence in the last 2 Years
4. Duly filled, signed and stamped Confidential Business Questionnaire as per standard forms;
5. Duly filled, signed and stamped Form SD1 & Form SD2 as per the Standard format provided in this tender.
6. Tender Security as per Appendix to instructions & standard forms, of Kshs 70,000 (Seventy Thousand Only)
7. Duly completed, signed and stamped Form of Tender as per the standard documents
## Mandatory Evaluation Criteria

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Scoring breakdown</th>
<th>Max-points</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.</td>
<td>Bills of Quantities duly Completed, Signed and Stamped by the Tenderer in the format provided.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Be registered by NCA for Water Works Category 6 and above (Attach copy of License and Practicing Certificate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Copy of recent CR12 issued within the last 12 months from the date of Tender Opening &amp; copies of National IDs/ Passports for the Directors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Joint Ventures shall provide all the information for the partners as per the standard form provided</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Undertaking certified by commissioner of oaths, that all mandatory &amp; technical information are a true reflection of reality</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Technical Evaluation Criteria

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Scoring breakdown</th>
<th>Max-points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Experience of the Contractor in works of a similar nature and size completed within the last five years</td>
<td>(Aggregate score)</td>
<td>25</td>
</tr>
</tbody>
</table>

**Similar works completed within the last five (5) years each with a value of at least Kshs. Five (5) Million, that have been successfully and substantially completed**

(Present in a table format and attach copies of completion certificates, handing over certificates & LSO/ Contracts)

- 5 projects and above successfully completed 25
- 4 projects and above successfully completed 20
- 3 projects and above successfully completed 15
- 2 projects and above successfully completed 10
- 1 project successfully completed 5
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Scoring breakdown</th>
<th>Max-points</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Technical Evaluation Criteria</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>None or no relevant project</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Names and addresses of clients who may be contacted for further information on the completed projects. (in a table format with the following details; Name of the contact person, Firm, Project/Assignment and Contact - Postal Address, E-mail Address, Tel: No. etc). Also attach reference letters from the clients. (Aggregate score)</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>5 Clients and above</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 Clients</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 Clients</td>
<td>3</td>
<td></td>
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<tr>
<td></td>
<td>2 Clients</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Client</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No Client</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td><strong>Qualifications and experience</strong> of key site management and technical personnel proposed for the Contract and an undertaking that they shall be available for the Contract i.e. Qualifications and experience of key personnel (Attach current signed original CVs and copy of relevant certificates). (Add individual item score)</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Project Engineer to have at least a degree in relevant engineering with at least Six (6) years relevant experience. <em>Academic Qualification (2 points) &amp; Experience for the Period Indicated (5 Points). Submission of detailed C.V (1 point)</em></td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Site Manager to have at least a relevant professional qualification with Five (5) years’ experience in the proposed position or works of a similar nature. <em>Academic Qualification (2 points) &amp; Experience for the Period Indicated (3 Points). Submission of detailed C.V (1 Points)</em></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td>Scoring breakdown</td>
<td>Max-points</td>
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<tr>
<td>------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------------------</td>
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</tr>
<tr>
<td></td>
<td><strong>Technical Evaluation Criteria</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supervisor to have at least a relevant professional qualification with Three (3) years’ experience in the proposed position or works of a similar nature. <em>Academic Qualification (1 points) &amp; Experience for the Period Indicated (2 Points), Submission of detailed C.V (1 Points)</em>&lt;br&gt;Any other qualified and relevant personnel proposed with adequate experience and with necessary documentation submitted as above will be awarded 1 marks each up to a maximum of 2 marks</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td><strong>Financial Situation:</strong> The current soundness of the applicant’s financial position and its respective long-term profitability. Submit Audited financial statements reported within the last three (3) years (2018, 2017, and 2016).&lt;br&gt;Turnover equal to 3 times the cost of the project&lt;br&gt;Turnover greater or equal to the cost of the project&lt;br&gt;Turnover below the cost of the project</td>
<td>(Aggregate score)</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>Litigation and arbitration history. Information regarding any litigation, current or during the last five years, in which the tenderer is involved, the parties concerned and disputed amount (Provide current affidavit)&lt;br&gt;Provided and satisfactory&lt;br&gt;Not explained</td>
<td>(Aggregate score)</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>Major items of Contractor’s Equipment proposed for carrying out the Works including but not limited to the listed items; back hole, water bowser, truck, transportation vehicles etc&lt;br&gt;a)List at least three available equipment for the work—provide Proof of ownership i.e log book or lease agreement</td>
<td>(Aggregate score)&lt;br&gt;4 each.</td>
<td>12</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td>Scoring breakdown</td>
<td>Max-points</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>------------</td>
</tr>
<tr>
<td>7</td>
<td><strong>Environmental Health and Safety Policy</strong></td>
<td></td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>a) Submit a signed draft work program chart, in preferably MS Project, starting from the date of receipt of order to completion of drilling works for one borehole.</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Work Safety Management - Bidder to submit the following</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Safety Policy</td>
<td>4 each</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Workers safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Accident prevention</td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td><strong>Comprehensive Organizational structure</strong></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>- Provided and satisfactory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Not explained</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Not explained</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td><strong>Physical facilities:</strong></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Details of physical address and contacts with copy of either title, lease documents or latest utility bill</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Provided and satisfactory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Not explained</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

| Total |                                           |                   | 100        |

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<table>
<thead>
<tr>
<th>Financial Evaluation Criteria</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prices quoted: should be net inclusive of all taxes,</td>
<td>Prices quoted: should be net inclusive of all taxes, must be in Kenya shillings and shall</td>
</tr>
<tr>
<td>remain valid for (120) days from the closing date of</td>
<td>remain valid for (120) days from the closing date of tender</td>
</tr>
<tr>
<td>tender</td>
<td></td>
</tr>
<tr>
<td>2. Only bidders who score 70% and above in the technical</td>
<td>Only bidders who score 70% and above in the technical criteria will be considered for</td>
</tr>
<tr>
<td>criteria will be considered for financial ranking</td>
<td>financial ranking</td>
</tr>
<tr>
<td>3. Award will be made to the lowest evaluated contractor</td>
<td>Award will be made to the lowest evaluated contractor subject to the following:-</td>
</tr>
<tr>
<td>subject to the following:-</td>
<td>i. Due diligence Record to confirm unsatisfactory or default in performance obligations in any contract. This shall include unresolved case(s) in performance obligations for more than two (2) months in any contract. The bidder shall be disqualified and the next lowest tenderer considered</td>
</tr>
<tr>
<td></td>
<td>ii. Negotiating &amp; harmonizing any cases of errors or/ and front loading significant</td>
</tr>
<tr>
<td></td>
<td>enough to cause distortion in a successful contractor’s cash flow or put the client in</td>
</tr>
<tr>
<td></td>
<td>a contractually unfavorable or risky position</td>
</tr>
<tr>
<td></td>
<td>iii. Any necessary negotiation and agreement as pertains the allocated budget vis a vis</td>
</tr>
<tr>
<td></td>
<td>the lowest quoted price</td>
</tr>
</tbody>
</table>
SECTION III : CONDITIONS OF CONTRACT (Including erection on site)

3.1 Definitions

3.1.1 In this Contract, the following terms shall be interpreted as indicated:

a) “The contract” means the agreement entered into between the Procuring entity and the tenderer as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.

b) “The Contract Price” means the price payable to the tenderer under the Contract for the full and proper performance of its contractual obligations.

c) “The services” means services to be provided by the contractor including materials and incidentals which the tenderer is required to provide to the Procuring entity under the Contract.

d) “The Procuring entity” means the organization sourcing for the services under this Contract.

e) “The contractor means the individual or firm providing the services under this Contract.

f) “GCC” means general conditions of contract contained in this section

g) “SCC” means the special conditions of contract

h) “Day” means calendar day

3.2 Application

These General Conditions shall apply to the extent that they are not superseded by provisions of other part of contract

3.3 Joint Drafting

The parties have participated jointly in the negotiation and drafting of this agreement. In the event an ambiguity or question of intent or interpretation arises, this agreement shall be construed as if drafted jointly by the parties and no presumption or burden of proof shall arise favoring or disfavoring any party by virtue of the authorship of any of the provisions of this agreement.
3.4 **Effectiveness of Contract**

This Contract shall come into effect on ……………………………

3.5 **Commencement of services**

The Tenderer shall begin carrying out the Services immediately the Contract becomes effective or at such other date as may be specified.

3.6 **Standards**

3.6.1 The services provided under this Contract shall conform to the 7 standards mentioned in the Schedule of requirements

3.7 **Patent right’s**

3.7.1 The tenderer shall indemnify the Procuring entity against all third-party claims of infringement of patent, trademark, or industrial design rights arising from use of the services under the contract or any part thereof.

3.8 **Performance Security**

3.8.1 Within twenty eight (30) days of receipt of the notification of Contract award, the successful tenderer shall furnish to the Procuring entity the performance security where applicable in the amount specified in Special Conditions of Contract.

3.8.2 The proceeds of the performance security shall be payable to the Procuring entity as compensation for any loss resulting from the Tenderer’s failure to complete its obligations under the Contract.

3.8.3 The performance security shall be denominated in the currency of the Contract, or in a freely convertible currency acceptable to the Procuring entity and shall be in the form of:

a) Cash.

b) A bank guarantee.

c) Such insurance guarantee

approved by the Authority. d) Letter of credit.

3.8.4 The performance security will be discharged by the procuring entity and returned to the candidate not later than thirty (30) days following the date of completion of the tenderer’s performance of obligations under the contract, including any warranty obligations under the contract.
3.9  **Inspections and tests**

3.9.1 The Procuring entity or its representative shall have the right to inspect and/or to test the services to confirm their conformity to the Contract specifications. The Procuring entity shall notify the tenderer in writing, in a timely manner, of the identity of any representatives retained for these purposes.

3.9.2 The inspections and tests may be conducted on the premises of the tenderer or its subcontractor(s). If conducted on the premises of the tenderer or its subcontractor(s), all reasonable facilities and assistance, including access to drawings and production data, shall be furnished to the inspectors at no charge to the Procuring entity.

3.9.3 Should any inspected or tested services fail to conform to the Specifications, the Procuring entity may reject the services, and the tenderer shall either replace the rejected services or make alterations necessary to meet specification requirements free of cost to the Procuring entity.

3.9.4 Nothing in clause 3.9 shall in any way release the tenderer from any warranty or other obligations under this Contract.

3.10  **Payment**

3.10.1 The method and conditions of payment to be made to the tenderer under this Contract shall be specified in SCC.

3.10.2 The payment terms are as agreed in the contact signed by both parties and after confirmation of satisfactory receipt of services.

3.11  **Monitoring & Evaluation**

The Tenderer’s and CGM representative shall meet as frequently as will be agreed to evaluate performance of the tenderer. The tenderer shall issue reports to CGM covering the the tenderer is to carry out.

3.12  **Prices**

Prices charged by the contractor for services performed under the Contract shall not, with the exception of any Price adjustments authorized in SCC, vary from the prices by the tenderer in its tender
or in the procuring entity’s request for tender validity extension as the case may be. No variation in or modification to the terms of the contract shall be made except by written amendment signed by the parties and shall be as prescribed by PPADA 2015

3.13 Assignment

The tenderer shall not assign, in whole or in part, its obligations to perform under this contract, except with the procuring entity’s prior written consent.

3.14 Termination for default

The Procuring entity may, without prejudice to any other remedy for breach of Contract, by written notice of default sent to the tenderer, terminate this Contract in whole or in part:

a) if the tenderer fails to provide any or all of the services within the period(s) specified in the Contract, or within any extension thereof granted by the Procuring entity;

b) if the tenderer fails to perform any other obligation(s) under the Contract; and

c) If the tenderer, in the judgment of the Procuring entity has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

In the event the Procuring entity terminates the Contract in whole or in part, it may procure, upon such terms and in such manner as it deems appropriate, services similar to those undelivered, and the tenderer shall be liable to the Procuring entity for any excess costs for such similar services.

3.15 Termination of insolvency

The procuring entity may at any time terminate the contract by giving written notice to the contractor if the contractor becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the contractor, provided that such termination will not produce or affect any right of action or remedy, which has accrued or will accrue thereafter to the procuring entity.

3.16 Termination for convenience

3.16.1 The procuring entity by written notice sent to the contractor may terminate the contract in whole or in part, at any time for its convenience. The notice of termination shall specify that the termination is for the procuring entity convenience, the extent to which performance of the contractor of the contract is terminated and the date on which such termination becomes effective.
3.16.2 For the remaining part of the contract after termination the procuring entity may elect to cancel the services and pay to the contractor on agreed amount for partially completed services.

3.17 Resolution of disputes

The procuring entity’s and the contractor shall make every effort to resolve amicably by direct informal negotiations any disagreement or dispute arising between them under or in connection with the contract.

If after thirty (30) days from the commencement of such informal negotiations both parties have been unable to resolve amicably a contract dispute either party may require that the dispute be referred for resolution to the formal mechanisms specified in the SCC.

3.18 Governing language

The contract shall be written in the English language. All correspondence and other documents pertaining to the contract, which are exchanged by the parties, shall be written in the same language.

3.19 Force Majeure

The contractor shall not be liable for forfeiture of its performance security, or termination for default if and to the extent that it’s delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.

3.20 Applicable law

The contract shall be interpreted in accordance with the laws of Kenya unless otherwise specified in the SCC.

3.21 Notices

Any notices given by one party to the other pursuant to this contract shall be sent to the other party by post or by fax or E-mail and confirmed in writing to the other party’s address specified in the SCC.

A notice shall be effective when delivered or on the notices effective date, whichever is later.
3.22 Confidentiality

i) "Confidential Information" shall, for the purposes of this Agreement, include without limitation any financial, strategic, technical, commercial, geological and scientific information, know-how, trade secrets and data in whatever form, communicated to the Tenderer or acquired by the CGM during the course of the tenderer carrying out his duties as contemplated in this Agreement.

ii) The Tenderer agrees that he will not, during the course of carrying out his duties as contemplated in this Agreement or thereafter into perpetuity, disclose the Confidential Information to any third party for any reason or purpose whatsoever without the prior written consent of the CGM, save in accordance with the provisions of this Agreement.

iii) The Tenderer agrees not to utilize, exploit or in any other manner whatsoever use the Confidential Information disclosed pursuant to the provisions of this Agreement and the terms of any subsequent Agreement made by parties, for any purpose whatsoever without the prior written consent of the CGM.

iv) The Tenderer undertakes not to use the Confidential Information for any purpose other than that for which it is disclosed; and in accordance with the provisions of this Agreement and any subsequent Agreement made by parties.

v) The Tenderer shall be held liable for disclosing confidential information unless he proves that:

a) Such information and data was in the public domain prior to such disclosure;

b) Such information and data has become part of the public domain through no fault of the Tenderer; or

c) Such disclosure was required by any written Kenyan law.

3.23 Corrupt gifts and payments of commission

i) The Client is an institution that fosters zero tolerance to fraud and corruption. The Tenderer hereby agrees to avoid fraud and corruption
and to report any suspected fraud, corruption, or any activity that jeopardizes the integrity of the Client and its staff to its – Corruption Prevention and Integrity Committee (COPIC).

ii) The Tenderer shall not;

a) Offer or give or agree to give to any person in the service of the Client any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of this or any other Contract with the Client or for showing or forbearing to show favour or disfavour to any person in relation to this or any other contract with the Client.

b) Enter into this or any other contract with the Client in connection with which commission or consideration has been paid or agreed to be paid by it or on his behalf or to his knowledge, unless before the Contract is made particulars of any such commission or consideration and of the terms and conditions of any agreement for the payment thereof have been disclosed in writing by the Client.

Any breach of this Condition by the Tenderer or by anyone employed by him or acting on his behalf (whether with or without the knowledge of the Tenderer) shall be an offence under the provisions of the Public Procurement and Disposal Act 2015 issued under The Exchequer and Audit Act Cap 412 of the Laws of Kenya, Anti-corruption & Economic Crimes Act (2003), Public officer Ethics Act (2003), Government Financial Management Act 2004, and the Performance Contract with the Government.

3.24 Expiration of contract

Unless terminated earlier pursuant to Clause ........................., this Contract shall terminate on ................................................ after satisfactory completion of services and submission of a report by the Tenderer as required by this contract.

SPECIAL IV – SPECIAL CONDITIONS OF CONTRACT

4.1 Special Conditions of Contract shall supplement the General Conditions of Contract. Whenever there is a conflict, between the GCC and the SCC, the provisions of the SCC herein shall prevail over these in the GCC.
### 4.2 Special conditions of contract as relates to the GCC

<table>
<thead>
<tr>
<th>General conditions of contra</th>
<th>Special conditions of contract</th>
</tr>
</thead>
</table>
| 3.5                         | **Particulars of performance security**  
The amount of Performance Security shall be 5% of the Contract Price in the format of the Performance Security Form provided in the tender document in the form of a bank guarantee drawn by a bank licensed and operating in Kenya. |
| 3.7                         | The payments will be done as agreed and signed by both parties in the contract upon receipt of invoice at CGM and confirmation of satisfactory receipt of services. |
| 3.13                        | The provisions of the arbitration act of the laws of Kenya |

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**SECTION V – TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>KALUI LAKUMUKUMU - KINURIA WATER PROJECT</th>
<th>ITEM DESCRIPTION</th>
</tr>
</thead>
</table>
**THE FOLLOWING WORKS IN SUB SURFACE MASONRY 50M³**

**STORAGE TANK INCLUDING SUPPLY OF ALL MATERIALS AND NECESSARY WORKS FOR PLACING, ERECTING, COMPLETION, TESTING AND COMMISSIONING. ALL WORKS PROVISIONAL AND SUBJECT TO MEASUREMENTS**

### Site clearance

1.1 Clear site of all bushes and shrubs and remove debris from site as directed by the Engineer.

1.2 Cut down trees over 1.5m girth measured 1m from ground level, grab out roots and dispose as directed.

### Excavation and Earthworks

2.1 Excavate pit for water tank n.e 1.5 m deep store onsite and backfill with selected material and spread surplus onsite; including all necessary works for side protection and for keeping site free from water, mud and fallen material.

2.2 Ditto over 1.5 but n.e 3m deep

2.3 Extra over for excavation in decomposed/compacted murrum

2.4 Extra over for excavation in rock

### Hardcore filling

3.1 Lay and compact 200mm thick hand-packed hardcore laid in layers not exceeding 150mm thick.

**Mass concrete grade 15/20 in:-**

4.1 50mm thick blinding to to receive base slab and treat the surface with 'GLADIATOR' or other equal approved anti termite treatment

### Vibrated reinforced concrete 25/20 as described in:-

5.1 200mm thick floor slab

5.2 200mm thick suspended slab

5.3 Allow for finishing in cement plaster (1:3) on roof slab laid in 2.5% fall.

### Erect and strike sawn formwork to:

6.1 Edges of 200mm thick floor slab.

6.2 Soffit of suspended slab

6.3 Edges of suspended roof slab 200mm thick.

6.6 Allow for forming 600X600mm opening for access manhole in 200mm thick slab.

6.7 Allow for construction of 25mm X 25mm drip all around the roof slab

**Supply and fix steel reinforcements including bending, binding wire, cutting, apacers and supporting all in position as described. High tensile twisted bars to BS 4449**

7.1 16mm diameter
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.2</td>
<td>12mm diameter</td>
</tr>
<tr>
<td>7.3</td>
<td>10mm diameter</td>
</tr>
<tr>
<td>7.4</td>
<td>8mm diameter</td>
</tr>
<tr>
<td></td>
<td><strong>Natural stone walling jointed and pointed in cement and mortar (1:3) reinforced every course to Engineer's details.</strong></td>
</tr>
<tr>
<td>8.1</td>
<td>225mm thick</td>
</tr>
<tr>
<td><strong>Plaster</strong></td>
<td></td>
</tr>
<tr>
<td>9.1</td>
<td>25mm thick cement and sand (1:2) plaster to internal wall surface with water proof cement at ratio 1kg to 50kgs cement.</td>
</tr>
<tr>
<td>9.2</td>
<td>20mm thick cement/sand (1:3) plaster to external wall surface</td>
</tr>
<tr>
<td><strong>Screed</strong></td>
<td></td>
</tr>
<tr>
<td>9.4</td>
<td>40mm thick cement/sand ratio (1:3) screed to floor, smooth render laid to falls and brushed with water proof treatment as vandex, master seal, hyseal or any other equally approved to manufacturer's specification</td>
</tr>
<tr>
<td><strong>Ladder</strong></td>
<td></td>
</tr>
<tr>
<td>10.1</td>
<td>3000mm long X 800mm wide mild steel ladder stringers. 3000mmX50mmX10mm flat bars, ring 800mmX200mmX20mm round bars at 300mm centres externally anchored to wall lugs: one coat red oxide primer: three coats gloss oil finish: all to Engineer’s details.</td>
</tr>
<tr>
<td>10.2</td>
<td>3000mm long X 800mm wide mild steel ladder stringers. 3000mmX50mmX10mm flat bars, ring 800mmX200mmX20mm round bars at 300mm centres internally anchored to wall lugs: one coat red oxide primer: three coats gloss oil finish: all to Engineer’s details.</td>
</tr>
<tr>
<td><strong>Manhole cover</strong></td>
<td></td>
</tr>
<tr>
<td>11.1</td>
<td>Supply and fix steel prefabricated lockable cover 600mmX600mm complete with frames, steel gauge 16 and as directed by Engineer.</td>
</tr>
<tr>
<td><strong>Vents</strong></td>
<td></td>
</tr>
<tr>
<td>12.1</td>
<td>Supply and fix 100mm vent pipes (complete with G.I elbows, hexagonal nipple and wire gauze) and fittings to Engineer’s details. Supply, cut, thread, fabricate, lay, test and fix all pipes and fittings including jointing materials (bolts, nuts, washers gaskets and packings)</td>
</tr>
<tr>
<td><strong>Inlet</strong></td>
<td></td>
</tr>
<tr>
<td>13.1</td>
<td>100mm X 90 degrees diameter galvanized iron flanged bend</td>
</tr>
<tr>
<td>13.2</td>
<td>100mm galvanized steel flanged galvanized iron piece 500mm long</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>13.3</td>
<td>100mm diameter galvanized iron pipe 3m long</td>
</tr>
<tr>
<td>13.4</td>
<td>Standard valve chamber</td>
</tr>
<tr>
<td>13.5</td>
<td>100mm diameter flanged cast iron sluice valve</td>
</tr>
</tbody>
</table>

**Outlet**

- 14.1 100mm diameter galvanized steel pipe piece 3m long flanged
- 14.2 100mm diameter galvanized steel bend with puddle flange
- 14.3 150mm X 100mm diameter bell mouth
- 14.4 100mm diameter flanged cast iron sluice valve
- 14.5 Standard valve chamber

**Overflow**

- 15.1 50mm diameter flanged bend 90 degrees
- 15.2 50mm diameter galvanized steel socket
- 15.3 50mm diameter galvanized steel 3m long pipe
- 15.4 50mm threaded 300mm with puddle flange
- 15.5 50mm diameter nipple

**Scour**

- 16.1 150mm X 100mm diameter bell mouth
- 16.2 100mm X 90 degrees diameter galvanized flanged iron bend
- 16.3 100mm diameter galvanized steel pipe piece 6m long flanged
- 16.4 100mm diameter flanged cast iron sluice valve
- 16.5 Standard valve chamber

**Testing and Sterilization**

- 17.1 Allow for water tightness test as directed by the engineer
- 17.2 Allow for sterilization of the tank

### CONSTRUCTION WORKS - INTAKES AND MASONRY TANKS (2NO) IGEMBE CENTRAL

**A**

- Provide for conducting environmental management plan for the project

**B**

- Provide a total station at site for confirmation of survey levels

**1**

- Clear site of all bushes and shamba
- and remove debris from site directed by the engineer
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Excavate strip foundation for the intake weir including necessary works for side protection and for keeping site free from water, mud and fallen materials</td>
</tr>
<tr>
<td>3</td>
<td>Extra over for excavation in decomposed /compacted maruum</td>
</tr>
<tr>
<td>4</td>
<td>Extra over for excavation in rock</td>
</tr>
<tr>
<td>5</td>
<td>Concrete</td>
</tr>
<tr>
<td>6</td>
<td>Reinforced concrete class 25/20 for the weir wall</td>
</tr>
<tr>
<td>6</td>
<td>Vibrated reinforced concrete 15/20 in 200mm thick suspended slab</td>
</tr>
<tr>
<td>7</td>
<td>Supply and fix steel reinforcements including bending, binding, cutting and supporting all in position</td>
</tr>
<tr>
<td>7.1</td>
<td>12mm diameter</td>
</tr>
<tr>
<td>7.2</td>
<td>10mm diameter</td>
</tr>
<tr>
<td>8</td>
<td>Provide for collection chamber to offtake scour and second off take line</td>
</tr>
<tr>
<td>9</td>
<td>FORM WORK</td>
</tr>
<tr>
<td>10</td>
<td>Provide for erecting and striking off timber form work</td>
</tr>
<tr>
<td>11</td>
<td>Allow for fittings to intakes and connections to Pipeline</td>
</tr>
<tr>
<td>11</td>
<td>Supply and lay G.I flanged pipes ND 150</td>
</tr>
<tr>
<td>12</td>
<td>Supply and fix flanged Gate valve ND 150 (peglar)</td>
</tr>
<tr>
<td>13</td>
<td>Concrete support, thrust blocks and anchor blocks - Volume not exceeding 0.1m³</td>
</tr>
<tr>
<td>14</td>
<td>Allow for connection of water to existing pipeline and tanks</td>
</tr>
<tr>
<td>15</td>
<td>Allow for transportation of materials</td>
</tr>
<tr>
<td>Item No</td>
<td><strong>KALUI LAKUMUKUMU - KINURIA WATER PROJECT</strong></td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>THE FOLLOWING WORKS IN SUB SURFACE MASONRY 50M³</td>
</tr>
<tr>
<td></td>
<td>STORAGE TANK INCLUDING SUPPLY OF ALL MATERIALS AND</td>
</tr>
<tr>
<td></td>
<td>NECESSARY WORKS FOR PLACING, ERECTING, COMPLETION,</td>
</tr>
<tr>
<td></td>
<td>TESTING AND COMMISSIONING. ALL WORKS PROVISIONAL AND</td>
</tr>
<tr>
<td></td>
<td>SUBJECT TO MEASUREMENTS</td>
</tr>
<tr>
<td></td>
<td><strong>Site clearance</strong></td>
</tr>
<tr>
<td>1.1</td>
<td>Clear site of all bushes and shrubs and remove debris from site</td>
</tr>
<tr>
<td></td>
<td>as directed by the Engineer.</td>
</tr>
<tr>
<td>1.2</td>
<td>Cut down trees over 1.5m girth measured 1m from ground level,</td>
</tr>
<tr>
<td></td>
<td>grab out roots and dispose as directed.</td>
</tr>
<tr>
<td></td>
<td><strong>Excavation and Earthworks</strong></td>
</tr>
<tr>
<td>2.1</td>
<td>Excavate pit for water tank n.e 1.5 m deep store onsite and</td>
</tr>
<tr>
<td></td>
<td>backfill with selected material and spread surplus</td>
</tr>
<tr>
<td></td>
<td>onsite; including all necessary works for side protection and for</td>
</tr>
<tr>
<td></td>
<td>keeping site free from water, mud and fallen material.</td>
</tr>
<tr>
<td>2.2</td>
<td>Ditto over 1.5 but n.e 3m deep</td>
</tr>
<tr>
<td>2.3</td>
<td>Extra over for excavation in decomposed/compacted murrum</td>
</tr>
<tr>
<td>2.4</td>
<td>Extra over for excavation in rock</td>
</tr>
<tr>
<td></td>
<td><strong>Hardcore filling</strong></td>
</tr>
<tr>
<td>3.1</td>
<td>Lay and compact 200mm thick hand-packed hardcore laid in</td>
</tr>
<tr>
<td></td>
<td>layers not exceeding 150mm thick.</td>
</tr>
<tr>
<td></td>
<td><strong>Mass concrete grade 15/20 in:-</strong></td>
</tr>
<tr>
<td>4.1</td>
<td>50mm thick blinding to to receive base slab and treat the surface</td>
</tr>
<tr>
<td></td>
<td>with 'GLADIATOR' or other equal approved anti termite</td>
</tr>
<tr>
<td></td>
<td>treatment</td>
</tr>
<tr>
<td></td>
<td><strong>Vibrated reinforced concrete 25/20 as described in:-</strong></td>
</tr>
<tr>
<td>5.1</td>
<td>200mm thick floor slab</td>
</tr>
<tr>
<td>5.2</td>
<td>200mm thick suspended slab</td>
</tr>
<tr>
<td>5.3</td>
<td>Allow for finishing in cement plaster (1:3) on roof slab laid in 2.5% fall.</td>
</tr>
<tr>
<td></td>
<td><strong>Erect and strike sawn formwork to:-</strong></td>
</tr>
<tr>
<td>6.1</td>
<td>Edges of 200mm thick floor slab.</td>
</tr>
<tr>
<td>6.2</td>
<td>Soffit of suspended slab</td>
</tr>
<tr>
<td>6.3</td>
<td>Edges of suspended roof slab 200mm thick.</td>
</tr>
<tr>
<td>6.6</td>
<td>Allow for forming 600X600mm opening for access manhole in</td>
</tr>
<tr>
<td></td>
<td>200mm thick slab.</td>
</tr>
<tr>
<td>6.7</td>
<td>Allow for construction of 25mm X 25mm drip all around the roof</td>
</tr>
</tbody>
</table>
Supply and fix steel reinforcements including bending, binding wire, cutting, apacers and supporting all in position as described. High tensile twisted bars to BS 4449

7.1 16mm diameter
7.2 12mm diameter
7.3 10mm diameter
7.4 8mm diameter

Natural stone walling jointed and pointed in cement and mortar (1:3) reinforced every course to Engineer’s details.

8.1 225mm thick

Plaster

9.1 25mm thick cement and sand (1:2) plaster to internal wall surface with water proof cement at ratio 1kg to 50kgs cement.
9.2 20mm thick cement/sand (1:3) plaster to external wall surface

Screed

9.4 40mm thick cement/sand ratio (1:3) screed to floor, smooth render laid to falls and brushed with water proof treatment as vandex, master seal, hyseal or any other equally approved to manufacturer's specification

Ladder

10.1 3000mm long X 800mm wide mild steel ladder stringers.
3000mmX 50mmX 10mm flat bars, ring 800mmX200mmX20mm
round bars at 300mm centres externally anchored to wall lugs:
one coat red oxide primer: three coats gloss oil finish: all to Engineer's details.
10.2 3000mm long X 800mm wide mild steel ladder stringers.
3000mmX 50mmX 10mm flat bars, ring 800mmX200mmX20mm
round bars at 300mm centres internally anchored to wall lugs:
one coat red oxide primer: three coats gloss oil finish: all to Engineer's details.

Manhole cover

11.1 Supply and fix steel prefabricated lockable cover
600mmX600mm complete with frames, steel gauge 16 and as directed by Engineer.

Vents

12.1 Supply and fix 100mm vent pipes (complete with G.I elbows, hexagonal nipple and wire gauze) and fittings to Engineer’s details.
Supply, cut, thread, fabricate, lay, test and fix all pipes and fittings including jointing materials (bolts, nuts, washers, gaskets and packings)

Inlet
13.1 100mm X 90 degrees diameter galvanized iron flanged bend
13.2 100mm galvanized steel flanged galvanized iron piece 500mm long
13.3 100mm diameter galvanized iron pipe 3m long
13.4 Standard valve chamber
13.5 100mm diameter flanged cast iron sluice valve

Outlet
14.1 100mm diameter galvanized steel pipe piece 3m long flanged
14.2 100mm diameter galvanized steel bend with puddle flange
14.3 150mm X 100mm diameter bell mouth
14.4 100mm diameter flanged cast iron sluice valve
14.5 Standard valve chamber

Overflow
15.1 50mm diameter flanged bend 90 degrees
15.2 50mm diameter galvanized steel socket
15.3 50mm diameter galvanized steel 3m long pipe
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Scour
16.1 150mm X 100mm diameter bell mouth
16.2 100mm X 90 degrees diameter galvanized flanged iron bend
16.3 100mm diameter galvanized steel pipe piece 6m long flanged
16.4 100mm diameter flanged cast iron sluice valve
16.5 Standard valve chamber

Testing and Sterilization
17.1 Allow for water tightness test as directed by the engineer
17.2 Allow for sterilization of the tank

MINIMUM CEMENT CONTENT

<table>
<thead>
<tr>
<th>Class of Concrete</th>
<th>Minimum Cement Content kg/m3 of compacted concrete</th>
</tr>
</thead>
</table>
Note: The minimum cement contents shown in the above table are required in order to achieve impermeability and durability. In order to meet the strength requirements in the Specification higher contents may be required.

The categories applicable to the works are based broadly on the factors listed hereunder:

**Moderate Exposure:** Surface sheltered from sewer rain, Buried concrete, concrete continuously under water

**Intermediate Exposure:** Surface exposed to driving rain; alternate wetting and drying; corrosive fumes; heavy condensation

**Severe Exposure:** Surface exposed to sea water, moorland water having a pH of 4.5 or less, groundwater containing sulphates.

### 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 prepared 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 mixes proposed for full production.

Samples shall be taken from each batch and the following action taken, all in accordance with BS1881:– or Local Standards (KS EAS 18 – 1:2001(KEBS 2005) Cement Part 1

<table>
<thead>
<tr>
<th>Category</th>
<th>Moderate Exposure</th>
<th>Intermediate Exposure</th>
<th>Severe Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/75; 15/75</td>
<td>200</td>
<td>220</td>
<td>270</td>
</tr>
<tr>
<td>15/40; 20/40, 25/40</td>
<td>240</td>
<td>270</td>
<td>290</td>
</tr>
<tr>
<td>30/40</td>
<td>260</td>
<td>300</td>
<td>330</td>
</tr>
<tr>
<td>15/20; 20/20, 25/20</td>
<td>300</td>
<td>320</td>
<td>330</td>
</tr>
<tr>
<td>30/20</td>
<td>300</td>
<td>340</td>
<td>390</td>
</tr>
<tr>
<td>40/20</td>
<td></td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>20/10; 25/10, 30/10</td>
<td></td>
<td>340</td>
<td></td>
</tr>
<tr>
<td>40/10</td>
<td></td>
<td></td>
<td>390</td>
</tr>
</tbody>
</table>
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, 130mm 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 standard 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 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 or of deposition as instructed by the Engineer, all in accordance with the sampling procedures described in BS1881 and with the further requirements set out below.

Six 150mm or 200mm cubes and appropriate shall be made from each sample and shall be cured and tested all in accordance with BS1881./ (KS EAS 18 – 1:2001(KEBS 2005) Cement Part 1 two at seven days and the other four at 28 days.

Each sample is taken from one batch selected at random and at intervals such that each sample represents not more than 20 m³ 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.

36) **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 ration 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 (a) 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 results 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 (see below) 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:-
Minimum Current Margin for and above

<table>
<thead>
<tr>
<th>Batches</th>
<th>10N/mm 2</th>
<th>15N/mm 2</th>
<th>20N/mm² and above</th>
</tr>
</thead>
<tbody>
<tr>
<td>After 20 Batches</td>
<td>3.3</td>
<td>5</td>
<td>7.5</td>
</tr>
<tr>
<td>After 50 Batches</td>
<td>1.7</td>
<td>2.3</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Failure to comply with requirements if any one test cube result in a group of four consecutive results is less than 85% of the nominal strength but the average of the group of which it is part satisfies the strength requirement, then only the batch from which the failed cube was taken shall be deemed not to comply with the Specification.

If more than one cube result in a group of four consecutive results is less than 85% of the nominal strength or if the average strength of the group fails to satisfy the strength requirement then all the batches between those represented by the first and last cubes in the group shall be deemed not to comply with the Specification, and the Contractor shall immediately adjust the mix design subject to the agreement of the Engineer to restore compliance with the Specification. After adjustment of the mix design the Contractor will again be required to comply with sub-clauses 401 © 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 cubes from the concrete and testing in accordance with BS1881/ (KS EAS 18 – 1:2001(KEBS 2005)

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
### CONCRETE GRADES

<table>
<thead>
<tr>
<th>Grade of Concrete</th>
<th>Minimum works cube strength at 28days (MN/m²)</th>
<th>Maximum size of Aggregates (mm)</th>
<th>Minimum cement content (Kg/m³)</th>
<th>Maximum cement content (Kg/m³)</th>
<th>Maximum water cement ratio</th>
<th>Minimum preliminary cube strength at 28 days (MN/m²)</th>
<th>Minimum Target works cube strength at 7 days (MN/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30/40</td>
<td>30</td>
<td>40</td>
<td>300</td>
<td>540</td>
<td>0.46</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>30/20</td>
<td>30</td>
<td>20</td>
<td>310</td>
<td>540</td>
<td>0.46</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>30/10</td>
<td>30</td>
<td>10</td>
<td>340</td>
<td>540</td>
<td>0.46</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>25/40</td>
<td>25</td>
<td>40</td>
<td>280</td>
<td>540</td>
<td>0.53</td>
<td>33</td>
<td>17</td>
</tr>
<tr>
<td>25/20</td>
<td>25</td>
<td>20</td>
<td>295</td>
<td>540</td>
<td>0.53</td>
<td>33</td>
<td>17</td>
</tr>
<tr>
<td>25/10</td>
<td>25</td>
<td>10</td>
<td>325</td>
<td>540</td>
<td>0.53</td>
<td>33</td>
<td>17</td>
</tr>
<tr>
<td>20/40</td>
<td>20</td>
<td>40</td>
<td>260</td>
<td>540</td>
<td>0.6</td>
<td>28</td>
<td>14</td>
</tr>
<tr>
<td>20/20</td>
<td>20</td>
<td>20</td>
<td>280</td>
<td>540</td>
<td>0.6</td>
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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 arrangements he proposes to make.

Concrete for the Works shall be batched and mixed in one or more central plants unless the Engineer agrees to some other arrangement. 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 to 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.

Batching and mixing plants shall be modern efficient equipment complying with the requirements of BSS 1305 and capable of producing a uniform distribution of the ingredients throughout the mass. Truck mixes shall comply with the requirements of BSS 8110 / (KS EAS 18 – 1:2001(KEBS 2005) 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 (KS EAS 18 – 1:2001(KEBS 2005), it shall have been tested in accordance with BSS 3963 and shall have a mixing performance within the limits specified in BSS1305.

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 accumulation 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 BSS1305 and checked against accurate weights and volumes when required by the Engineer.

The weights of cement and of each size of aggregate as indicated by the mechanisms employed shall be 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 adjustment 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 fines 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 for one minute longer than the time applicable to a normal batch.

Mixers shall be cleaned out before changing to another type of cement.

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 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 meters 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.

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 at the point and time of placing. The loss of slump between discharge from the mixer and placing shall not exceed 25mm.

The time elapsing between mixing and placing a batch concrete shall be as short as practicable as 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 this period, the concrete shall not be placed in the Work.

PLACING OF CONCRETE

a) **Consent for Placing**

Concrete shall not be placing in any part of the works until the Engineer’s consent has been given in writing and the Contractor shall give the Engineer at least 1 full working day’s notice of his intention to place concrete.

If concrete placing is not commenced within 24 hours of the Engineer’s consent the Contractor shall again request consent as specified above.

b) **Preparation of surface to receive concrete**

Excavated surfaces on which concrete is to be deposited shall be prepared as set out in Section 3 of this Specification.

Existing concrete surfaces shall be prepared as set out in Clause 414. Before deposition of further concrete they shall be clean, hard and sound and shall be wet but without any freestanding 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 under drains 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 proportion similar to those of the fines portion in the concrete. The mortar shall be well worked into all parts of the excavated surface and shall be not 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 if does not dry out or set before being covered with concrete.

c) **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 300mm in compacted thickness unless otherwise permitted or directed by the Engineer, but the layer shall not be thinner than four times the maximum size of
aggregate.

Layers shall not be placed so that they from 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 as 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 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 accumulations 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, aggregation shall be prevented by the use of chutes, down pipes, trunking, baffles or other appropriate devices, as approved by the Engineer.

Forms for walls, columns and other thin sections of the significant height shall be provided with opening 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 termite pipes which are kept continuously full with concrete up to a 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 termite 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.

d) **Interruption 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 4.6. 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 encompassed 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 resumption, the new concrete shall be thoroughly worked in and compacted against the existing concrete so as to eliminate any cold joints.

e) **Dimensions of pours**

Unless otherwise agreed by the Engineer, pours shall not be more than two meters high and shall as far as possible have a uniform thickness over the plan area of the pour. Concrete shall be placed to the full planned height of all pours except in the circumstances described in sub-clause 4.5 (d)

The Contractor shall plan the dimension and sequence of pours in such a way that cracking of the concrete does not take place due to thermal or shrinkage stresses.

f) **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 not be 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 drawing 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.

**COMPACTION OF CONCRETE**

The concrete shall be fully compacted throughout the full extent of the placed layer. It shall be thoroughly worked against his 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 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 manufacture in order that the comp active 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.

Vibrators 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.

Vibrators 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 which shall not exceed the distance from the vibrator over which vibration is visibly effective.

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 it covered by later construction whichever is the shorter period.

The above objectives are dealt with in sub-clause 4.7 (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 during 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 per cent. Curing compounds shall contain a fugitive dye to enable the extent of the spread to be seen easily.

Curing compound used on surfaces exposed to the sky shall contain sufficient finely divided flake 50ulfils5050 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 4.7 (c)

Water used for curing shall be of the same quality as that used for mixing as stated in sub-clause 7.16 (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 4.9 (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
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 in the Works shall not be subjected to any loading until it has attained at least its nominal strength as defined in Clause 4.1.

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.

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 woks does not exceed 30 degrees centigrade and that the concrete does not loose 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 mist water spray on aggregate

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
commended 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.

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 52ulfils52 and screened to produce a uniform plain or ridged surface, surplus concrete being struck off by a straight edge immediately after compaction

**UF 2 Finish**

This is a floated finish to roof or floor slabs and other surfaces where a hard trowel led surface is not required.

The surfaces shall first be treated at 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 trowel led 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 trowel led under firm pressure to produce a dense, smooth uniform surface free from trowel marks.

**SURFACE TOLERANCES**

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<tr>
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**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 and correctly shaped template placed on the surface and the specified level or position or that surface.

Where dimensional tolerance is given on the Drawings or in this Special Specification they shall take precedence over those given in Table 4.4.

**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 7.18 I and ordinary Portland cement complying with BSS12. The mix elsewhere in this Specification or if not stated shall be one part of the cement to two parts of fine aggregate by weight.

Small quantities of mortar may be hand mixed but for amounts over 0.5 cubic meters 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.

**CONCRETE FOR SECONDARY PURPOSES**

a) Non-structural concrete (NS concrete) shall be used only for non-structural purposes where shown on the Drawings.

NS concrete shall be composed of ordinary Portland cement complying with BSS 12 and aggregates complying with BSS 882, DIN 1045 including all-in aggregate within the grading limits of BSS882 and DIN4226.

The weight of cement mixed with 0.3 cubic meters of combined or all-in aggregate shall not be less than 50kg. The mix shall be proportioned by weight or by volume. The maximum aggregate size shall be 40mm nominal.

The concrete shall be mixed by machine or by hand to a uniform colour and consistency before placing. The quantity of water used shall not exceed that required to produce a concrete with sufficient workability to be placed and compacted where required.

The concrete shall be compacted by hand or by mechanical vibration.

b) No fines concrete (NF concrete) is intended for use where a porous concrete is required and shall only be used where shown on the Drawings or instructed by the
The mix shall consist of ordinary Portland cement complying with BSS 5328. The aggregate size shall be 40.0mm to 10.0mm 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 which will coat evenly the whole of the aggregate.

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 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.

CONSTRUCTION JOINTS

Whenever concrete is to be bonded other concrete which the 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 the 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 joints 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 intersections 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 surfaces 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 4.11 all as set out in sub-clause 4.5 (b) immediately prior to the deposition of fresh concrete. The mortar shall be kept just ahead of the fresh 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.

EXPANSION AND CONTRACTION JOINTS

Expansion and contraction joints are discontinuities in concrete designed to allow for 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 of elsewhere in the Specifications.

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 onto site until the Contractor has submitted full details of the materials he proposes to use, including samples, and these have been approved by the Engineer. All samples shall be of adequate length for testing.

Water stops shall be made of material 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 per cent at 24 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 scraps PVC. PVC water stops shall have an elongation at breaking stress or at least 225 per cent 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 per cent at 25 degrees centigrade under a tensile stress of 6N/mm² 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 stops 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 wire 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 round 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.

**GROUTING OF POCKETS AND HOLES AND UNDERPINNING OF BASEPLATES**

Packets 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 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 base plates 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 be well rammed in horizontally below the base plate 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.

**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 honeycombing 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 surfaces 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 4.17 shall be ground down in the manner and to the extent instructed by the Engineer.

Defects other than those mentioned above shall be dealt with as instructed by the Engineer.

**BENDING REINFORCEMENT**

Unless otherwise shown on the drawings, bending and cutting shall comply with BSS4466

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.

Bars shall be bending 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 57ulfils57 as set out in BSS 4466.

Reinforcement shall be thoroughly cleaned and all dirt, scale, loose rust, oil and other contaminants removed before it is placed in the works.

**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 the space to be occupied by the concrete being correctly placed.

No splices shall be made in the reinforcement except where shown on the drawings or agreed by the Engineer. Splice lengths shall be as shown on the drawings.

Reinforcement shall not be welded except where required by the Contractor or agreed by the Engineer. If welding is employed, the procedures shall be as set out in BSS2640 for gas welding or DIN8558 for metal is welding. Full strength butt welds shall only be used for steel complying with BSS4449, and if used on high yield deformed bars complying with BSS4449 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 BSS4461 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.
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.

CONSTRUCTION OF FORMWORK AND FALSEWORK

Before construction begins, the contractor shall submit to the Engineer drawings showings details of the proposed formwork and false work.

Formwork and False work shall be constructed that they 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 positions shown on Drawings within the tolerances set out in Clause 5.6.

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 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 damages 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 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 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 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 on the Drawings unless otherwise instructed by the Engineer.

Support 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 ties through the concrete are used in conjunction with the 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 is sufficient to impair the finished surfaces of the concrete.

Where circumstances prevent easy within the form for cleaning and inspection, temporary opening 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 element 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.

PREPARATION OF FORMWORK

Before any reinforcement is placed into position within formwork, the latter shall be thoroughly cleaned and dressed with a release agent. The agent shall be either suitable oil incorporating a wetting agent; an emulsion of water suspended in oil low viscosity oil containing chemical agents. The Contractor shall not use an emulsion of oil suspended in water nor release any agent which causes staining or discoloration of the concrete, air holes on the concrete surface, or retards the set of the concrete.

In order to avoid colour difference on adjacent concrete surfaces, only one type of release agent shall be used in any one section of the works.

In cases where it 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.

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 completing 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 longer periods.

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 the 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.

**MINIMUM PERIODS FOR FORMWORK REMOVAL**

<table>
<thead>
<tr>
<th>Position of formwork</th>
<th>Min. Period for temperature over 10 degrees Centigrade</th>
<th>Strength to be Attained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical or near vertical faces of mass concrete</td>
<td>24 hours</td>
<td>0.2 C</td>
</tr>
<tr>
<td>Vertical or near vertical faces of reinforced walls, beams and columns</td>
<td>48 days</td>
<td>0.3 C</td>
</tr>
<tr>
<td>Underside or arches beams and slabs (formwork only )</td>
<td>4 days</td>
<td>0.5 C</td>
</tr>
<tr>
<td>Support to under of arches, beams and slabs</td>
<td>14 days</td>
<td>C</td>
</tr>
<tr>
<td>Arches lining in tunnels and underground works</td>
<td>24 hours</td>
<td>4 N / mm²</td>
</tr>
</tbody>
</table>

**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 support temporarily for the purpose of stripping formwork and subsequently replace them.

As soon as the formwork has been removed, bolt holes in concrete faces other than construction joints which are not required for subsequent operations shall be completely filled with mortar sufficiently dry to prevent any slumping at the face. The mortar shall be mixed in the same proportions as the fine aggregate and cement in the surrounding concrete and with the same materials and shall be finished flush with the face of the concrete.

**SURFACE FINISHES ON FORMED SURFACES**
Classes of finish

The surface finish to be achieved on formed concrete surfaces shall be as shown on the Drawings and defined hereunder:-

a) **Class F1 finish**

This finish is for surfaces against which backfill or further concrete will be placed. Formwork may be sawn boards, sheet metal or any other suitable material which will prevent the loss of fine material from the concrete being placed.

b) **Class F2 finish**

This finish is for surfaces which are permanently exposed to view but where the highest standard finish is not required. Forms to provide a Class F2 finish shall be faced with wrought thicknesses tongued and groove boards with square edges arranged in a uniform pattern and close jointed or with 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 good appearance is for special importance. To achieve this finish, which shall be free of board marks, the formwork shall be faced with plywood complying with BSS6566 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 panel 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 splices cut to make a tight surface which shall be dressed to produce the required finish.

Alternatively single curvature surfaces may be faced with plaster or plywood linings attached to the backing with the adhesive or with escutcheon pins driven flush. Linings shall not bulge, wrinkle or otherwise deform when the subject to temperature and moisture changes.

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
Drawings shall rule.

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.

**TOLERANCES**

<table>
<thead>
<tr>
<th>Class of Finish</th>
<th>Tolerance in mm (See Note below for explanations)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>F1</td>
<td>10</td>
</tr>
<tr>
<td>F2</td>
<td>5</td>
</tr>
<tr>
<td>F3</td>
<td>2</td>
</tr>
</tbody>
</table>

**Note:** The tolerances A, B and C given in the Table are defined as follows:

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

- **B** Is a gradual deviation from a plane surface as indicated by a straight edge
  3 m long. In the case of curved surfaces the straight edge shall be replaced
  by a correctly shaped template.

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

GENERAL

All masonry work shall be constructed from building stone as specified in Clause 7.19 or concrete blocks, as specified in Clause 7.48.

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.

WORKMANSHIP

The Contractor shall provide and use proper setting out rods for all work.

Stones shall be all 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 7.23 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 4.7.

CAST STONWORK

Cast stone shall be as specified in Clause 7.29. Facing stones shall be brought up in courses to a height not exceeding 1 meter at a time, the concrete backing being brought up and well incorporated into the and round the backs of the stones and the projecting metal ties to ensure a complete bond. The stones shall be bonded 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,
Materials

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, insufficient 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 item 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 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 bituminous 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 pipe work and fittings shall be subjected to a work hydrated test pressure, which shall be not less than twice the maximum operating pressure.

h) The Contractor should exercise diligence to provide the best material.

i) Where necessary the Contractor shall provide rubber gaskets to comply with BS 4865 and all other bolts, nuts etc. to undertake jointing at fittings etc.

j) Any article 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 provided the length is not less than 4 meters or two thirds of the standard length whichever is the lesser and will be priced pro rata.

k) Wherever possible, sample of pipes and fittings shall be submitting for approval of the Engineer prior to the contractor obtaining the total requirements.

GALVANISED PIPES AND SPECIALS

All Galvanised pipes shall conform to BS 1387 and BS 729 for medium piping. The pipes shall be screwed and 65ulfil65 or flanged.
All specials shall be of such dimensions as will mate with the piping supplied. Screw down stop valves shall conform to BS 1010. Barrel nipples shall conform to BS 21 and all other special shall conform to BS 143.

All pipes supplied shall be certified by the manufacturer to have been tested in accordance with the relevant standard specification.

STEEL PIPES AND FITTINGS

Standard of Manufacture

Steel pipes will be manufactured to AWWA C200. Pipes from DN150mm and above will be manufactured with a spiral weld seam or with a spiral seam or longitudinal weld seam. Automatic submerged-arc fusion welding from both sides shall be used.

Design criteria, steel grade, minimum thicknesses and working pressures

Design Criteria

Steel grades and wall thicknesses shall meet the following criteria set out in AWWA M11 (Design manual for steel water pipe):

Internal Working Pressure of 16bars, utilization factor: 50% of min. yield stress

3% max. deflection under Trench and Vehicle Loads for 1-3 m soil cover

3% max. deflection under Trench and Vacuum Loads for 1-3m soil cover

Resistance to Buckling (Factor of Safety 2.5) under above Loads

Pipe Stiffness of 2000N/m² for Handling (CIRIA 78 Report)

The supplier shall provide calculations to this effect.

Steels used shall be ASTM A570 Grade 33 (228 Mpa yield stress) or equivalent/superior minimum yield stress. The working pressures and test pressures for the minimum wall thickness shall be as follows:

<table>
<thead>
<tr>
<th>Outside Diameter (mm)</th>
<th>Min. Wall Thickness (mm)</th>
<th>Max. Working Pressure (bars)</th>
<th>Works Test Pressure (bars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>88.9</td>
<td>2.6</td>
<td>67</td>
<td>100</td>
</tr>
<tr>
<td>114.3</td>
<td>2.6</td>
<td>52</td>
<td>78</td>
</tr>
<tr>
<td>168.3</td>
<td>2.9</td>
<td>39</td>
<td>59</td>
</tr>
<tr>
<td>219.1</td>
<td>2.9</td>
<td>30</td>
<td>45</td>
</tr>
<tr>
<td>273.0</td>
<td>3.2</td>
<td>27</td>
<td>40</td>
</tr>
<tr>
<td>323.9</td>
<td>3.6</td>
<td>25</td>
<td>38</td>
</tr>
<tr>
<td>355.6</td>
<td>4.0</td>
<td>26</td>
<td>38</td>
</tr>
<tr>
<td>406.4</td>
<td>4.0</td>
<td>22</td>
<td>34</td>
</tr>
<tr>
<td>457.2</td>
<td>4.5</td>
<td>22</td>
<td>34</td>
</tr>
<tr>
<td>508.0</td>
<td>4.5</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>610.0</td>
<td>5.0</td>
<td>19</td>
<td>28</td>
</tr>
<tr>
<td>711.0</td>
<td>5.0</td>
<td>16</td>
<td>24</td>
</tr>
</tbody>
</table>
Pipe Ends

Pipes shall be joined by either bolted sleeve couplings to AWWA C219 or be manufactured with integrally formed push fit socket and spigot joints to AWWA C200 4.13.6.

Pipes to be joined with bolted sleeve type couplings shall be delivered with plain ends square to the axis with the external spiral weld bead ground back 203mm.

Pipe with socket and spigot push fit joints shall have the socket hot or cold expanded to incorporate an internal groove for fitting of the rubber gasket either in the socket or the spigot. The rubber gasket shall conform to BS2494 Type W. The external weld on the spigot end shall be ground back 203mm from the pipe ends.

Lengths, Dimensional Tolerances and Visual Inspection.

Pipes shall be delivered with 12 m length from 323.9 mm and above and 6m lengths for below 323.9mm. Tolerance on length will be +/-51mm (AWWA C200 4.12.4)

Tolerance on diameters over a distance L from pipe ends shall be as follows:

<table>
<thead>
<tr>
<th>Tolerances (mm)</th>
<th>L (mm)</th>
<th>Pipe Outside Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+1.6/-0.8</td>
<td>100</td>
<td>88.9 – 323.9</td>
</tr>
<tr>
<td>+1.6/-1.6</td>
<td>150</td>
<td>355.6 – 1219</td>
</tr>
<tr>
<td>+1.6/-3.0</td>
<td>150</td>
<td>1422</td>
</tr>
<tr>
<td>+3.0/-3.0</td>
<td>150</td>
<td>1626 – 1829</td>
</tr>
</tbody>
</table>

Circumferential Tolerances of Pipe Body shall not exceed +/-1.00% of the pipe outside circumference but not exceeding a maximum of 19mm (AWWA C200 4.12.2)

Wall thickness tolerances shall not exceed +/-7.5% of the specified wall thickness

Maximum deviation from straightness shall not exceed 3.2mm over a length of 3000mm
(AWWA C200 4.12.3).

Weld bead height shall not exceed 3.2mm

Defects in the parent metal of the pipe such as dents, scabs, tears, laps, slivers not greater than 12.5 percent of wall thickness shall be removed by grinding and smoothly dressed to match the pipe contour provided the minimum wall thickness tolerance is not exceeded. Defects greater than 12.5 percent of wall thickness will not be accepted. Cracks, sweats and leaks in welds shall not be acceptable.

Radial Offset of weld seams shall be 1.6mm or 0.1875 wall thickness whichever larger for thicknesses 9.5mm or less and 3.2mm or 0.1875 wall thickness for thicknesses above 9.5mm (AWWA C200 Sec 4.10.1).

Testing

Hydrostatic Testing

All pipes shall be hydrostatically tested. Works Test Pressures shall be carried to induce a hoop stress of 75% of the minimum yield stress of the steel

The results of all hydrostatic tests shall be recorded on a pressure recording chart. All test pressures must be held for a minimum of 10 seconds.

Destructive Testing

One set of production weld tests consisting of reduce section tensile tests, bend tests and etching tests shall be carried out on each batch of pipes in accordance with AWWA C200 Section 4.11.5. One batch is defined as 915 meters of pipes having the same diameter, thickness and steel grade

Chemical Composition

The steel manufacturer shall furnish a ladle analysis of each heat of steel supplied and the analysis shall conform to the requirements of ASTM A 570

Pipe Repairs

Pipes with defects exceeding the 12.5 percent limitation of Clause 1.4.7 shall be disposed of in following way:

Defect removed and cavity cleaned.

Defect repaired by automatic or manual welding according qualified under 4.11.2.1 or 4.11.3.1 of AWWA C200

Hydrostatic testing of the repaired pipe
Cutting off of the section containing the defect provided length limits are met.

All weld repairs shall be carried out in accordance with AWWA C200 4.11.8.

**Pipe Couplings**

Plain ends of pipes and fittings will be joined using bolted, sleeve-type couplings and manufactured in accordance with AWWA C219 (Standard for Bolted, Sleeve Type Couplings) and rated at PN 25. Deflections will be as per Table 3 of AWWA C219.

End rings and canter sleeves will be manufactured from specially shaped hot rolled steel tee sections and hot rolled steel coil respectively. After rolling into circular sections, ends will undergo automatic flash welding and welds will be tested by internal radial expansion.

All couplings will be coated internally and externally in fusion bonded epoxy to AWWA C213 to a thickness of 300-400 microns. All coatings will be holiday tested and checked for thickness.

Rubber gaskets will be to BS2494 Type W (Nitrile) and suitable for portable water.

Bolts, nuts and washers will be hot dipped galvanised to BS729 with minimum coating weight of 305 gms/m².

**Fittings, flanges and flange gaskets.**

All fittings shall be manufactured from pipes that have been previously successfully tested. All new welds made during the fabrication of the fittings shall be subjected to non-destructive testing using wither radiological, ultrasonic or dye penetrants or a combination of these depending on the geometry of the weld.

Fittings will have dimensions in accordance with BS534 or AWWA C208 depending on the client’s preference. If required fittings can be manufactured with dimensions in accordance with Ductile Iron specifications BS4772 or ISO2531. If required fittings will be reinforced in accordance with AWWA M11 and AWWA C208.

Calculation of wall thickness of bends will be carried out in accordance with AWWA C208. Reinforcement of Tees and washout tees shall be carried out with AWWA M11 and AWWA C208 respectively.

Flanges shall be manufactured in accordance with the relevant table of BS4504 for steel flanges.
Flanges gaskets will be manufactured with dimensions to BS4865 Part 1 and shall be of the inside bolt circle diameter type with material to BS2494 Type W for potable water.

Flange Bolts, nuts and washers shall manufacture to BS4190 and BS4320 respectively and hot dipped galvanised to BS729 with a minimum coating weight of 305 gms/m2.

**External Coatings of Pipes and Fittings**

7.3.10.1 Prior to external and internal lining, all Pipes and Fittings will be grit blasted to ISO8501-1 SA2.5 quality with a surface profile of 38-102 microns. All grit blasting machines will be fitted with air-wash systems to remove dust and fines from the surfaces during grit blasting. All surfaces will be cleaned of dust by compressed air prior to coating or lining.

Pipes and fittings will be coated externally in fusion bonded epoxy powder to AWWA C213 to a thickness of 300-400 microns. Pipes will be electrostatically sprayed and fittings will be coated using a combination of electrostatic sprays and fluidized beds.

Prior to start up of coating, the following tests will be done on epoxy powder or on steel plate specimens coated with epoxy powder by the epoxy manufacturer or the coating contractor in accordance with AWWA C213 Clause 5.3.2.

During production external epoxy coatings will be tested by the pipe coating contractor according to AWWA C213 Clause 5.3.3 as follows

**Cement Mortar Linings for Pipes and Fittings**

All Pipes and fittings will be lined internally in cement mortar to AWWA C205.

Prior to cement mortar lining, all surfaces will cleaned to remove any loose or other foreign matter that could interfere with the adherence of the cement mortar.

(36) Portland cement shall conform to ASTM C150 Type 1 or 2

(ii) Sand shall consist of inert materials having hard, strong, durable, uncoated grains conforming to ASTM C33. Sand shall be graded according to the following envelope and a sieve analysis shall be done for each day of sifting and recorded:

<table>
<thead>
<tr>
<th>Size</th>
<th>% passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.18mm</td>
<td>100</td>
</tr>
<tr>
<td>600 microns</td>
<td>60-90</td>
</tr>
<tr>
<td>425 microns</td>
<td>30-98</td>
</tr>
<tr>
<td>300 microns</td>
<td>10-95</td>
</tr>
<tr>
<td>212 microns</td>
<td>5-75</td>
</tr>
<tr>
<td>150 microns</td>
<td>2-30</td>
</tr>
<tr>
<td>75 microns</td>
<td>0-2</td>
</tr>
</tbody>
</table>

(iii) Water used shall be clean, odourless and free from quantities of organic matter, alkali, salt or other impurities that might reduce the strength, durability or other desirable qualities of the mortar.
(iv) Pipes will be lined using a retracting rotating spraying head that will deposit a circumferential layer of cement mortar on the internal surfaces of the pipe before the pipe is rotated at high speed for a short period of time to smoothen the lining. The pipe surface may be subjected to vibration to aid smoothening of the lining.

(v) The cement to sand ratio will be 1:1 by weight and shall be checked each day of lining application. The water to cement ratio shall not exceed 0.46:1 and shall also be checked each day of lining application.

(vi) Lining thicknesses shall be in accordance with AWWA C205 Table 1 as follows:

<table>
<thead>
<tr>
<th>Pipe DN</th>
<th>Nom Thickness</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-250</td>
<td>6.0</td>
<td>-1.6/+3.2</td>
</tr>
<tr>
<td>280-580</td>
<td>8.0</td>
<td>-1.6/+3.2</td>
</tr>
<tr>
<td>600-900</td>
<td>10.0</td>
<td>-1.6/+3.2</td>
</tr>
<tr>
<td>&gt;900</td>
<td>13</td>
<td>-1.6/+3.2</td>
</tr>
</tbody>
</table>

Lining thicknesses shall be measured on each pipe using a graduated steel point for wet linings or with an electromagnetic or magnetic measuring instrument for dry linings. The average of thickness readings taken from 4 points spaced at 90 degrees along any cross sectional plane at least 50mm from the pipe ends shall be calculated and this average shall fall within the tolerances above.

(vii) Compression Tests on Mortar Lining Test Cylinders shall be done weekly in accordance with AWWA C205 Section 4.8. Compressive strength shall reach 18Mpa in 7 days and 31Mpa in 28 days.

(viii) Curing shall be done in accordance with Section 4.7 of AWWA C205. Curing shall take place under an ambient temperature of more than 5 deg C and pipes shall be kept shaded for the first 24 hours after lining to prevent cracking. Pipe ends shall be sealed with plastic end caps not later than 30 minutes after lining and the internals kept wet during the curing period. Linings have to be cured for a minimum of 4 days before shipment.

(ix) Cracks in Linings shall not exceed 1.6mm. Cracks wider than 1.6mm shall be repaired unless it can be demonstrated to the satisfaction of the purchaser that cracks will heal autogenously under constant soaking of water.

(x) Linings shall not contain defects such as sand pockets, voids, oversanded areas, blisters and cracks as a result of impacts.

Specials whose shape precludes lining by spinning shall be lined either using mechanical placement, pneumatic placement or hand application and finished to produce a smooth, dense surface. Specials larger than 610mm shall be reinforced with wire-fabric or ribbon-mesh in accordance with Section 4.5 of AWWA C205.

UNPLASTICISED UPVC PIPES

Unplasticised PVC piping shall be in accordance with BS 3505.

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 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 joints 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 capable of linear deflection upto 3 degrees.

The sealing ring shall be of first grade natural rubber and the physical properties of the mix shall meet the requirements of BS 2494.

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 fitting 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 fitting shall not be allowed to drop or strike objects. Pipes lifting and lowering shall be carried out be approved equipment only.

Special care shall be taken in transit, handling and storage to avoid any damage to the ends.

Pipes and fittings shall be marked at not greater than one metre intervals showing their class and diameter.

Pipes and fittings shall be marked at not greater than one metre intervals showing their class and diameter.

GATE VALVES
Gate valves shall comply with requirement of BS 5163

The gate valves shall be suitable for use in pipelines and for operating pressure equipment to a head of 100 metres of water.

The gate valves shall double flanged. The dimensions and drilling of flanges shall be in accordance with BS 4504, flanges shall be machined flat. Flanges shall be NP 16 complying with BS 4504.

Spindles of the gate valves shall be provided with iron cast confirming to the requirements as specified under ‘valve caps’ in BS 5163 or handwheels if so specified.

The spindles of the gates valves shall be of non-rising type and screwed so as to close the valves when rotated in a clockwise direction. The direction of closing shall be clearly case on the valve cap or handwheel.

The gate valves shall be subject to ‘closed end test’ in accordance with the procedure head by manual operation.

FIRE HYDRANT

Fire hydrants shall be in accordance with BSS750. They shall be for installation underground and shall be in accordance with BSS750.

The spindle shall be provided with a cast iron cap confirming to dimension under spindle cap in BSS 5163.

The spindle of the fire hydrant shall be on the non-arising 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 gayonet joint cutlet for a 63mm standpipe. The outlet of the hydrant shall be of the hooked type with hocks 112mm apart.

The outlet shall have a gun metal standpipe seating and be covered by a loose case iron cap, which shall be attached to the hydrant by means of a chain.

Both flanges shall be 63mm drilled to requirements of BSS 2035.

The outlets bends shall be subject to a hydrostatic test in accordance with procedure set out in BSS 750 and shall be water tight against a rest pressure of 1.95 pa. head of water.

AIR VALVE

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 BSS 1452.

The body, cover, splash cowl and joint support ring of the air valve shall be of mechanite cast iron with flanges drilled to British Standards or other approved standards.

The internal screwed isolating valve shall have the valve and seating of gunmetal, operating screws of bronze, nuts of gunmetal, and glands and cap of machinate.

The small orifice valve shall have a rubber-covered ball and the air release nipple shall be
of special alloy screwed into a bronze plug. The ball guiders may be lined with gunmetal.

The large orifice valve shall have a vulcanite covered ball closing on a moulded dexion seat ring. The bush may be in gunmetal.

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 inspect of valve. The spindle of 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 dimension as specified in a BSS 5163.

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.

WATER METERS

All water meters upto 50mm size be of the rotary piston positive action 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 rotary type meter shall be made of bronze or similar on 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 interchangeable and the working chamber so designed as to be full of water under all conditions of flow.

The dial of the meter shall be of the direct reading type registered in cubic meters 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
- 19mm meter 350 cubic metres
- 25mm meter 500 cubic metres
- 50mm 700 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 - 2.5 c.u/hr
- 100mm meter - 45 cu.m/hr
150mm meter - 90cu.m/hr

All meters shall be accurate to within +0 1/3 over the range of the meter upwards from the minimum flows given for each size:

- 12mm - 23litres/hour
- 19mm - 29litres/hours
- 25mm - 32litres/hour
- 38mm - 110litres/hour
- 50mm - 190litres/hours
- 75mm - 2.5cu.m/hour
- 100mm - 2.8cu.m/hour
- 150mm - 4.5cu.m/hour

Meters above 150mm diameter should conform to specifications as set out 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 184 meters of water.

STOP VALVES

All stop valves shall be in accordance with BS 1010. Sample of valves be submitted for test and approval to the Engineer.

CHECK VALVES (DIRECTIONAL VALVES)

Check valves of 65mm diameter and under shall comply with the requirements of BSS 6282 with cast iron body and cover, gunmetal doors with leather facing discs and fernal screwed ends in accordance with BSS 2591.

Check valves of 75mm diameter and over shall comply with the requirements of BSS 6282 with cast iron body and cover, gunmetal doors with bronze facing rings and flanges connections in accordance with BSS, NP 16.

PENSTOCKS

The penstocks shall be made of cast iron and shall be in accordance with BSS 1452. Seating faces shall be of gunmetal or bronze.

The spindles shall be threaded as necessary and non-rising unless otherwise specified. The spindles shall be of aluminium bronze or manganese bronze and extension spindles may be of mild steel.

Handwheels shall be of cast iron and word “OPEN” and “SHUT” marked on the upper side with appropriate direction arrows.

FLANGED JOINTS
All flange on fittings and pipework where flanged connection are required must comply with the requirements of BS 4504 and NP 16, unless otherwise specified.

Inspection gaskets for flanged joints shall be rubber reinforced with cotton 3m thick and shall be in accordance with BS 4865. Bolts and nuts for flanges joints shall be of thick mild steel complying with BS 4190.

FLEXIBLE JOINTS

All flexible coupling (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 portable water.

PRESSED STEEL TANKS

The pressed Steel tanks (or similar approved), towers and associated materials and fittings shall comply with BSS 1564.

Detailed drawings of steel tank should be submitted to the Engineer for approval prior to acceptance.

The pressed steel tank to BSS 1564 Type A (2) or of similar approval shall be supplied complete with:

a) All stays, clests, bolts, nuts, washers, joining compound and associated materials and fittings.

b) Connection for inlet, outlet, washout and overflow

c) Galvanized access ladders 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 impact taste, colour nor odour to the water.

Connection to the tank shall be wheeled to the outside of the tank plate and drilled and tapped to suit flanges to BS 4504, 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 centre.

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 joint sections or similar. For such columns shall be provided with adequate bracing.

Internal surfaces of the tank and tower shall be painted with approved non-toxic primer and not toxic bituminous paint.

External surfaces of the tank and tower shall be painted with approved primer and approved bituminous aluminium paint.

**PAINTS**

All priming, undercoating and finishing paints shall be in accordance with BSS 5212 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, diatemps 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 colours.

**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 of fines from the concrete.

Moulds shall be set up on firm foundations so that no settlement occurs under the weight of the fresh concrete.

Moulds shall be constructed so that units may be removed from them without sustaining any damage.

Release agents used for demoulding shall not stain the concrete or affect its properties.

**b) Reinforcement For Precast Units**

Reinforcement in precast units shall comply with the requirement of Clauses 7.30 and 4.19-4.20. When preformed cages are used the cages shall be made up on jigs to ensure dimensional accuracy and shall be carefully supported within the
Reinforcement complying with BSS4449 may be tack welded where bars cross to provide rigidity in the cage but reinforcement complying with BSS4461 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 placed so that the minimum clear distance between them is the maximum nominal aggregate size plus five but in any cast not less that 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 7.18 and 4.1-4.10 using the class of concrete specified on the drawings.

If lightweight aggregates are specified, they shall comply with BSS3797.

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 4.7.

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 proposed 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 5.5 (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 surface 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. Detail 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 percent of the full load deflection.

If the unit fails to meet the above requirement, further tests shall be carried out on two more units. If either of these fails the whole batch of unit 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 unit 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 that 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 exceed the specified amount the Engineer may order two further tests, and if either of these fail, the batch of units which they represent may be rejected.

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 the 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 approved 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.

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 standards: -

BSS12 for Ordinary Portland cement

BS12 for Rapid Hardening Portland cement plus all special conditions to its use stipulated by the manufacturer.

BSS12 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 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 3m 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 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 of work is not interrupted due to lack of cement.

Cement which has become hardened or lumpy or fails to comply with the Specifications 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 BSS12 and the Contractor shall supply two copies of each certificate to the Engineer.

Each set of tests carried out by the manufacturer of 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 retested in an laboratory approved by the Ministry of Public Works Republic of Kenya or at the Kenya Bureau of Standard at the rate of one set of tests as shown in BSS12 for every 200 tonnes, and at monthly intervals thereafter.

Cement which does not comply with the Specification shall not be used in Works and it shall be disposed of 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 Zone 1, 2 or 3 of BSS882. 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 BSS1200.

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 BSS1881, 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 of crushed gravel sand of 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 BSS812, subject also to the further restriction given in the note on total chloride content in sub-clause 7.18(d).

Sulphate soluble in a 10 per cent solution by weight of hydrochloric acid shall not exceed 0.4 per cent by weight expressed as \( \text{SO}_3 \) when tested as set out in BSS1377, subject also to the further restriction given in the note on total sulphate content in sub-clause 7.18(d).

Soundness: after five cycle of the test in AASHTO 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 BSS1881 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 stopped, shaken thoroughly and allowed to stand for 24 hours. If, after 24 hours, the colour of the solution is no 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 BSS882. 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 be
comparative tests on finished concrete as set out in BSS1881 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 BSS12.

Coarse aggregate shall be supplied in the nominal sizes called for in the Contract and
shall be graded in accordance with BSS882 for each nominal size.

Other properties shall be as set out below:-

The proportion of clay, slit and other impurities passing a 75 micron standard sieve
shall be not more than one per cent by weight.

The content of hollow and flat shells shall not be such as will adversely affect the
concrete quality when tested as set out in BSS1881. The total content of aggregate
shall not be more than the following:-

<table>
<thead>
<tr>
<th>Nominal Size</th>
<th>Percentage of Dry Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>40mm</td>
<td>2%</td>
</tr>
<tr>
<td>20mm</td>
<td>5%</td>
</tr>
<tr>
<td>10mm</td>
<td>15%</td>
</tr>
</tbody>
</table>

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 BSS812
but subject also to the further restriction under the note on total chloride content
hereunder. Sulphate solution in a 10 per cent solution by weight of hydrochloric acid
shall not exceed 0.4 per cent by weight expressed as 50g when tested as set out in
BSS1377 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 or approved equivalent,
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 or approved equivalent, the aggregate shall be non-reactive.

**Flakiness Index** when tested in accordance with BSS812 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 that 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 BSS812.

Ten per cent fines value: Not less than 50kN when tested in accordance with
BSS812.

**Shrinkage:** When mixed with other ingredients in the approved proportions for concrete and tested as set out in BSS1881, the shrinkage factor shall not exceed 0.05 per cent.

Organic impurities: If the test for presence of organic impurities in aggregate 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 BSS1881 that the presence of organic impurities does not adversely affect the properties of the concrete.

**Water absorption:**

The aggregate shall not have water absorption of more than 2.5 per cent when tested as set out in BSS812.

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 supersulphated 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 50g 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 fulfilled to show its origin and shall be accompanied by all the information called for in BSS812.

Tests to determine compliance of the aggregates with the requirements of sub-clause 7.18(c ) and (d) shall be carried out by the Contractor in 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 aggregate 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 aggregate 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 tones of fine aggregate nor more than 500 tones of coarse aggregate, and provided also that the aggregate 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 BSS812
- Silt and clay contents BSS812
- Moisture content BSS812
- Check on organic impurities

In addition to the above routine tests, the Contractor shall carry out the water content of the concrete as required by the Specification.

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 aggregate 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 BSS812 (the volhard test).

(f) Delivery and Storage of Aggregates

Aggregate 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 fluctuation 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

Seawater or brackish water containing more than 1000 ppm chloride ion or 2000 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 BSS3148.

The Contractor shall carry out tests in accordance with BSS3148 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 in compliance with the Specification.

In all cases the Contractor shall submit to the Engineer full details of the admixture he proposes to add it to the mix. The information provided shall include:

- 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 chloride, and if so the chloride ion content expressed as a percentage by weight of admixture.

- d) Whether the admixture leads to the entertainment of air when used at 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.

Admixture shall not be mixed together without the consent of the Engineer.

Calcium chloride or admixtures containing calcium chloride shall not be used in pre-stressed concrete.

(ii) Workability agents

Workability agents shall comply with BSS5075 and shall not have any adverse effect on the properties of concrete.

BUILDING STONE

All building stone shall be capable of withstanding when wet a crushing stress of 1.4kg./sq.mm. The source of stone shall be approved by the Engineer and stone supplied there from shall be free from Magadi (bicarbonate compounds), 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 surface, 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 to 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 BSS1438 except that:-

I) The treatment shall be repeated for 10 cycles only 1 and

II) The second criterion of failure shall be amended to allow for a loss of weight of not more than 20k of its original weight.

STONE DUST

Stone dust for blinding shall be blackstrap screened to the following grading:-

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passing 10mm</td>
<td>100%</td>
</tr>
<tr>
<td>Passing No. 4</td>
<td>85% - 100%</td>
</tr>
<tr>
<td>Passing No. 100</td>
<td>5% - 25%</td>
</tr>
</tbody>
</table>

MURRAM

Murram shall be from an approved source quarried so as to exclude vegetable matter, loam, topsoil or clay. The California Bearing Ratio of the murram, as determined for a sample compacted to maximum density (as defined under BSS1377) 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.

7.22 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 BSS3148: Tests for water for making concrete, all to the cost of the Contractor.

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 on BSS1200 and BSS1199: 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.

HYDRATED LIME

Hydrated lime shall comply with BSS890: Building Limes, and shall be of the semi –
hydrated type.

CALCIUM CHLORIDE

Calcium chloride shall be of good industrial grade, and shall be obtained from an approved source.

LIME MORTAR

Lime mortar shall consist of proportions by volume as specified by hydrated lime and natural sand or crushed natural stone or a combination of both as specified for cement mortar in Clause 7.23. The constituent materials shall be accurately gauged and mixed in an approved manner.

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 7.23. The constituent materials shall be accurately gauged and mixed by volume in an approved manner in proportion specified.

Cement–lime mortar shall be made only in small quantities as and when required and any mortar which has begun to set or which had been mixed for a period of more than two hours shall be rejected.

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.

CAST STONE

Cast stone shall be manufactured by an approved manufactures to the shapes and dimensions shown on the drawings, and shall conform to the requirements of BSS1217: Cast Stone. It shall have dense and even surface of the texture and colour detailed on the drawings or required by the Engineer. Where indicated, exposed faces of the stone shall be formed of a specially graded mix. Metal bond ties of approved manufacture shall be cast in with the stone as shown on the drawings. Sample 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 coating or by other approved methods.

REINFORCEMENT FOR CONCRETE

Reinforcement which shall comply with the following Standard, 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.

BSS4449 for hot rolled plain bar and high yield deformed bar

BSS4461 for cold worked steel bar

BSS4483 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 Standard in a laboratory acceptable 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 requirement 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 acceptable 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 form 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 BSS4461 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 naptha or other approved compound meeting the following requirements.

36) 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 89ulfils8989z 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 in section and 0.45 metre long and made with the same mix proportions as used in the Works.

**STRUCTURAL STEEL FOR WELDED WORK**

Structural steel for welded work shall comply with the requirements of BSS4360 : Structural Steel, BSS4449 : The use of Structural Steel in Building and for welded work, BSS4360 : High Yield Stress and High Tensile Structural Steel, High Tensile (Fusion Welding Quality) Structural Steel for Bridges, etc, and General Building Construction.
WATERPROOF UNDERLAY

Waterproof underlay shall consist of either waterproof paper complying with BSS1521: Waterproof Building Paper, containing approved fibrous reinforcement, or 900 Gauge polythene sheeting as stated in the Bill of Quantities.

PREFORMED JOINT FILLER

Preformed joint filler be of the thickness shown on the drawing 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.

JOINT PRIMER

Joint priming compound shall be entirely in accordance with the manufacturer’s recommendations for the joint sealant to be used.

JOINT SEALING COMPOUND

Poured joint sealing material shall consist of an approved rubber-bitumen compound, complying with the requirements of BSS5212 or a two component, cold applied compound complying with BSS5212 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 requirement:

<table>
<thead>
<tr>
<th>Test Cone</th>
<th>Hot – poured Materials</th>
<th>Cold – poured Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penetration 0.15 kg. For. At 25 degrees centi grade using standard grease cone</td>
<td>Penetration not to exceed 9mm than 5mm and Penetration to be not less</td>
<td>Penetration to be not less not more than 27.5mm</td>
</tr>
</tbody>
</table>

Flow

<table>
<thead>
<tr>
<th>Test Cone</th>
<th>Hot – poured Materials</th>
<th>Cold – poured Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penetration 0.15 kg. For. At 25 degrees centi grade using standard grease cone</td>
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<td>Penetration to be not less not more than 27.5mm</td>
</tr>
</tbody>
</table>

Bond

<table>
<thead>
<tr>
<th>Test Cone</th>
<th>Hot – poured Materials</th>
<th>Cold – poured Materials</th>
</tr>
</thead>
</table>
25mm wide joint extended 12mm at rate of 4mm per hour at 18 degree centigrade. Not 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 degree centigrade below the safe heating temperature whichever is the greater shall still comply with the flow requirement of this Clause.

In addition to materials complying with BSS5212, 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.

**CONCRETE PIPES AND SPECIALS**

Concrete pipe and special shall comply with the requirements of BSS5911. They shall carry the relevant Standards Institution registration certification trade mark, or test certificates shall be furnished by the manufacturers.

**CONCRETE POROUS PIPES**

Concrete porous pipes shall comply with the requirements of BSS1194: porous pipes for under-drainage.

**CONCRETE DRAIN INVERT BLOCKS**

Precast concrete invert blocks shall be manufactured to the details drawings supplied from concrete Class 20/10 as specified in Table 4.2 using maximum 12mm size aggregates. The Invert Block Drains are to be manufactured in accordance with BSS 340. If required, cube test certificates shall be supplied by the manufacturer.

**CONCRETE SLABS FOR OPEN DRAINS**

Precast concrete slabs for lining open drains shall be manufactured to the detail drawing supplied from concrete Class 20/10 as specified in Table 4.2 using maximum 12mm size aggregate. The slabs are to be manufactured in accordance with the relevant provisions of BSS 368. If required cube test certificates shall be supplied by the manufacturer.

**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.

**MANHOLE COVERS AND FRAMES**

Manhole covers and frames shall be basically in accordance with the requirements of
BSS497: 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 manhole shall have triangular Grade ‘A’ heavy duty covers and frames. Circular manhole covers and frames shall be used on surface water sewer manhole.

GULLY GRATING AND FRAMES

Gully grating and frames shall be basically in accordance with the requirements of BSS497, nominal size 500mm x 350mm except that the gully grating 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 conforms to BSS497

PRECAST CONCRETE MANHOLE AND INSPECTION CHAMBERS

Precast concrete manholes and inspection chambers shall comply with the requirements of BSS5911 : Concrete Cylindrical Pipes and Fitting 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.

PRECAST CONCRETE GULLIES

Precast concrete gullies shall be unreinforced and shall comply with the requirements of BSS5911: Concrete Cylindrical Pipes and Fitting including Manholes, Inspection Chambers and Street Gullies.

MANHOLE STEP IRONS

Step irons of general-purpose type shall comply in all respects with BSS1247: Malleable Step Irons.

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 BSS144: Coal Tar Creosote for the preservation of Timber or an alternative approved timber preservative.

WATER BARS

Water bars shall be ‘Dumbbell’ 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’s instruction including recommended adhesive shall be followed and used. Samples shall be submitted for approval of the Engineer before use of any material.

CONCRETE BLOCKS
Solid and hollow concrete blocks for walling shall comply with BSS6398 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 per square millimetre after 29 days. The blocks shall be cast in metric sizes.

MECHANICAL FLOCCULATORS

The Flocculation shall be of mechanical type installed in each chamber. Its peripheral velocity shall be 0.6m/s. The detention time shall be a minimum of 15 minutes at velocity gradient of G=30s^{-1} - 60s^{-1} and product GT=30,000 – 100,000.

The blades shall be of stainless steel material and fixed to stainless steel shaft and connected to and driven by electric motor mounted on steel cheaquer plate with angle iron supports.

The motor shall be weather proof type mounted outside exposed to wet and dry weather conditions.

BULK FLOW MEASUREMENTS AND INDICATORS

Flow measurement and Indication

Flow meters shall operate on either the differential pressure principle on level measurement over a weir or on direct mechanical indication. Venturi tubes shall be inserted into the rising mains of the respective pump stations and installed together with transmitters in meter chambers adjoining the stations. The differential pressure shall be converted to 4+20mA electrical output.

The venture tube shall be flanged and fitted with vents and cocks in the pressure connection outlet.

The receivers operated from venture tube transmitters shall consist of rate of flow indicators (liters per second) and total aggregate flow (cubic meters) instruments.

Flow measurement equipments shall be installed as indicated in the table below.

<table>
<thead>
<tr>
<th>Location</th>
<th>Equipment</th>
<th>Max pressure</th>
<th>Rate of flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type</td>
<td>Size</td>
<td>Min (l/s)</td>
</tr>
<tr>
<td>Aerator outlet</td>
<td>Weir</td>
<td>Atmospheric</td>
<td>600</td>
</tr>
<tr>
<td>Backwash pumps</td>
<td>Venture</td>
<td>200</td>
<td>25</td>
</tr>
<tr>
<td>Raw water pumps</td>
<td>Venture</td>
<td>450</td>
<td>100</td>
</tr>
<tr>
<td>Treated water pumps</td>
<td>Venture</td>
<td>450</td>
<td>150</td>
</tr>
</tbody>
</table>

Pressure switches

Pressure switches shall be of pressure controlled electrical type. All parts coming in contact with water shall be constructed of corrosion resistant materials. The switch shall allow for adjustment to the required head at which contact shall be actuated.

Level Switches

Level switches shall be float operated or electrode type two of which shall be installed in
the sumps of each pump station.

**LIFTING APPLIANCES**

Provision for treated Water Pump station of installation of one number manually operated gantry crane on mono rail of lifting capacity 5 tons in the treated water pump station.

The manually operated gantry cranes shall be of single girder type with crab suitable for the works arrangement. The lifting capacity of each crane shall be sufficient to lift the heaviest load when erecting or dismantling all items of plant located within range of the crane, and in any case of lifting capacity of not less than 5 tons.

The travelled carriage shall run on bridge rails securely fixed to the gantry. The treads of the carriage wheels shall machined. The crab hoisting gear shall such that one man shall be capable of easily lifting the maximum load.

The crane design shall be designed in accordance with the requirements of class III overhead travelling cranes and also the general requirements of British Standards Specifications and or Kenya Bureau of Standards.

Longitudinal and traverse motions shall be provided to allow speedy operation without impairing safety in working.

The longitudinal and transverse motions shall be operated by means of a hand chains which shall extend to within 500mm of floor level. Ball bearings shall be employed on all motions. All gears shall be machine formed.

The load chain and hook shall of sufficient length to reach the main access floor level. The crab unit shall include a reliable braking and locking arrangement on the hoist mechanism as well as a load chain connection box. The load hook shall revolve on a ball swivel and incorporate a safety catch.

**LIFTING APPLIANCES**

The grading of the filter media shall be in accordance to the table of grading shown on the 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.
Workmanship

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.

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.

STORAGE

The Contractor shall comply with the manufacturer’s specification regarding the storage of pipes, fitting 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.

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.

EXAMINATION OF PIPES AND FITTINGS

The Contractor shall examine all pipes, valves or other materials to ascertain that they are in perfectly sound condition before commencing to lay the pipes, valves etc.

INTERFERENCE WITH FENCES, DRAINS AND OTHER SERVICES

The Contractor shall ensure the proper reinstatement of fences, drains, telephone lines, KPLC cables etc, where effected 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.

METHOD OF EXCAVATION

The Contractor shall excavate the pipe trenches in the line and to the depths indicated on drawings or as indicated by the Engineer. Except where otherwise indicated on the drawings or directed by the Engineer, it is intended that the trench shall be excavated to such a depth as will allow of a minimum cover of 600mm over top of the barrel of the pipe when laid plus or minus a tolerance of 40mm either way. All trenches shall be excavated in open cuttings and trenching shall not be opened too far in advance of pipe laying.

a) For the purpose of measurement, the width of trench shall be taken as the nominated width for the particular size of main, irrespective of the width of trench the Contractor may choose to excavate.
### Table  Trench Width to be measured

<table>
<thead>
<tr>
<th>Diameter of Pipe</th>
<th>Nominated trench width</th>
</tr>
</thead>
<tbody>
<tr>
<td>75mm</td>
<td>0.5m</td>
</tr>
<tr>
<td>100mm</td>
<td>0.6m</td>
</tr>
<tr>
<td>130mm</td>
<td>0.6m</td>
</tr>
<tr>
<td>200mm</td>
<td>0.6m</td>
</tr>
<tr>
<td>225mm</td>
<td>0.6m</td>
</tr>
<tr>
<td>250mm</td>
<td>0.6m</td>
</tr>
<tr>
<td>300mm</td>
<td>0.7m</td>
</tr>
<tr>
<td>400mm</td>
<td>0.8m</td>
</tr>
<tr>
<td>500mm</td>
<td>0.9m</td>
</tr>
<tr>
<td>600mm</td>
<td>1.0m</td>
</tr>
<tr>
<td>700mm</td>
<td>1.1m</td>
</tr>
<tr>
<td>800mm</td>
<td>1.2m</td>
</tr>
</tbody>
</table>

For two or more pipes in same trench the nominated width shall be the distance between centers of outer pipes plus the internal radial of the out pipes plus 400mm.

b) Where the trench passes through grassland actable land or garden, 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 trench has been refilled.

c) The bottom of the trench shall be properly trimmed off, and all low placed or irregularities shall be filled 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 bottom of the inlet 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 8.7 (b)

d) Joint holes shall be excavated to suit minimum dimensions as will allow the joints to be well and properly jointed.

e) The pipe trench shall be kept clear of water at all times as per Clause 3.21 of this Specification.

f) 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, he will be paid for accordingly.
g) 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.

h) 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 not for the cost of filling up to required levels.

i) If a mechanical excavator is used by the Contractor, he shall indemnify the Employer against all claims for damage which in the opinion or the Engineer, may be caused by the use of this plant.

j) The Contractor shall fix sight Rails for use with boning roads at intervals of not more than 30 meters and temporary Bench Marks related to the Survey of Kenya Datum shall be provided at intervals as directed by the Engineer.

MAIN LAYING

a) Main 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 relaid 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 without to air valve.

When laying up pipes, final connection at any fixed joints shall be deferred until the majority of the pipeline has been covered with backfill.

36) Large diameter curves to mains shall whatever possible be formed by allowing for deflection of flexible joints, not exceeding 3 degrees or as specified by the manufacturers.

a) In jointing of the pipes and the specials the Contractor shall comply with the standards adopted for the various types of joints as specified.

b) In laying pipes and specials with flanged joints, flanges shall be brought together and bolted with the faces absolutely parallel. A rubber jointing gasket shall be used in each flange joint and one washer with 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 97ulfils97 gun metal ring washer between the flanges.

c) The Contractor shall fix the gate valves, air valves and washout pipes all in accordance with the drawings.
d) 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 axis. Cut should be made with an approved cuttings device dependant on type of pipe specified. Ends of pipes should be tapered if mechanical joints are to be used.

e) Equipment for tapping off the mains under pressure may be employed in the making of service or branch connection. 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.

BACKFILLING OF TRENCH

a) When a section of the main has been jointed, the ends shall be 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 cover of 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 inspection. Special care shall be exercised when using surround to uPVC pipes which shall be free from any stones and compacted 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 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 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.

I 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 leakage at this section the Contractor is required to re-excavate and repair the pipeline all at his own expense.

ANCHOR BLOCKS AND SUPPORT

Concrete Class 15/20 shall be placed in anchor blocks at all changes of direction of the pipeline exceeding 6 degrees and whatever else required to withstand thrust resulting from internal water pressure e.g. at blank ends. Concrete in plinths shall be placed where specified.

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.

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 3 hours.

The leakage from the mains and connections from each section tested shall be according to BSS 8010:2 i.e. not exceeding 0.02 liters per 99ulfils9999ze of nominal bore per 99ulfils9999 or pipeline per 24 hour per bar of pressure applied head.

e) To determine the rate of leakage, the Contractor shall furnish a suitable hydraulic test pump, pressure gauge, connections and water meter or other appliance, for measuring the amount of water pumped. The pressure shall be raised to the amount required and specified by the Engineer, and shall be so maintained for a period of not less than one hour or whatever longer period as required by the Engineer to examine every joint to satisfy himself that they are sound.

f) 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.

g) 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.

h) 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.

i) In carrying out the test for water tightness the Employer only shall authorize the operation of all valves, but the Contractor shall provide all the necessary labour to assist in the opening and closing of the valves to the Engineer’s instructions, and he shall allow in his prices for all his expenses in connection with testing on completion.

j) The engineer shall be sole judge of water tightness.

CLEANING AND STERILIZING 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 20p.p.m 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 sample will be taken by the Engineer’s Representative and only on receipt of satisfactory certificate from a Medical Research Laboratory or a 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 of 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.

CLEARANCE OF SITE

The Contractor shall remove all surplus pipes, specials and other fittings as directed by the Engineer. The site of Works shall be leveled and all surplus excavation, debris, cut trees or bushes shall be carted to approved tip sites.

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 takes place. This period may be 7 days after which the level of the water surface should be recorded at 24 hours interval for a test period of 7 days. The structures shall be considered satisfactory if, during this period the total permissible drop in level, after making due exceed 1/500th of the average water depth of the full tank 100, or another specified amount all in accordance with BSS8007. 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 8.13.

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 re-test at his own expense.

**Testing Of Materials**

**APPARATUS REQUIRED FOR TESTING ON SITE**

Apparatus for testing shall be, if directed by the Engineer, made available onsite 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 BSS410 Test Sieves, or the following nominal sizes.
  - Fine mesh wire cloth 200, 100, 72, 52, 36, 25, 18, 14, 10 and 7
  - Perforated plate 5mm, 6mm, 9mm, 12mm, 20mm, 38mm, 30mm, 65mm and 75mm

- b) A suitable balance, a pyenometer and a stove or other approved apparatus for determining the moisture content of the aggregate. The methods of test shall be described in Part Four of BSS812: Sampling and Testing of Mineral Aggregates, Sands and Fillers.

- c) A 200ml graduated cylinder in accordance with BSS604: Graduate Measuring Cylinders, for the use in the field setting test for clay and fine silt in aggregate.

- 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 BSS6072: Methods of Test for Soil Classification and Compaction, and BSS1924: Methods of Test for Stabilized Soil

- f) Apparatus for testing concrete in accordance with BSS1881 and: Methods of Testing Concrete

- g) A straight edge 3 meters long and measuring wedge or other approved apparatus for testing the accuracy of surfaces

  36) Additional testing equipment as stated in the Bill of Quantities

**Drains, Sewers and Manholes**

**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 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 balling and pumping, timbering, shoring and supporting of sides that may be required,
and any materials necessary in carrying out the excavations and backfilling of trenches shall be taken to provide a solid and even 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 bills of quantities shall include for keeping trenches dry and for all bailing, pumping, timbering, shoring and supporting of the sides that may be required.

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 sharing, opening in short lengths or otherwise, during the time the trenches are open.

ROCK CUTING IN TRENCHES FOR PIPES

Where solid rock is met within trenches, 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 100m 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 lying of pipes and disposing of surplus material as directed by the Engineer.

WATER IN TRENCHES FOR PIPELINES

Trenches 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 the 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 of excavation.

LAYING AND JOINTING, RIGID JOINTED CONCRETE PIPES

Concrete pipes as specified in Clause 7.36, shall be laid true to line and level, each pipe being separately bond 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 or 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 wooden caulking tool and wooden mallet, such socket shall then be completely filled with cement
morton 1 to 2 as specified in Clause 7.23 and a fillet of the same worked all round the side. The fillet shall be 103 of 103 off and extend for a length of not less than 30mm 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 7.23 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 wok 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 a tight-fitting mad 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 plug shall be well secured at the end of the last laid pipe and shall be removed only when joint 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.

**PIPES LAID WITH OPNE JOINTS**

Ogee porous concrete pipes as specified in clause 7.28 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 surround 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, supply and placing graded packing materials, refilling trench and disposing of surplus all as specified.

**CAST IRON PIPES**

Cast iron pipes and special castings, 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 drains are laid on unstable ground or 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.

**DRAINS TO BE LEFT CLEAN ON COMPLETION**

On completion, all drains, manholes, etc. shall be flushed from end with water and left clean and free from obstructions.

**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 surround 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.

CONNECTIONS OF EXISTING SEWER AND DRAINS

Where shown on the drawings existing sewers and drains shall be properly extended, connected and jointed to new sewers, culverts, drain or other work and a 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 connections are between pipe sewers or drains, special connecting pipes as shown on the drawings shall be supplied and laid properly jointed.

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 7.19 in accordance with the drawings.

The side walls shall be fair faced or rendered internally as specified on drawings. They shall be brought of vertically to receive a precast slab formed of concrete of the appropriate classes specified and reinforced all as shown on the drawing. Cast iron manhole covers and frames as specified in clause 7.41 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 cases may be. Any slight adjustment of the slab level which may be necessary to accomplish this shall be effected by topping the side walls with concrete integral with the slab.

If required half channel pipes, bends and junctions as specified in clause 7.36 and clause 7.28 shall be laid and bedded in cement mortar 1 to 3 to the required lines and levels, and both sides 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 metro below the finished surface of the carriageway or the adjacent ground, step irons 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.

PRECAST CONCRETE MANHOLE

Precast concrete manholes as specified in clause 7.43 shall be supplied and laid generally in accordance with clause 1011 and the drawings.

GULLY CONNECTIONS
Connections from gullies to sewers and surface water drains or ditches shall consist of concrete pipes and fittings as specified in clause 7.36 jointed with cement mortar 1 to 3 as specified in clause 7.23. All pipes, bends and junctions shall be laid to the lines and levels shown in the drawings or as directed by the Engineer.

SURFACE BOXES, COVERS ETC.

Surface boxes manhole and other covers lying within the site of the works, shall be raised, and lowered. Altered or removed as directed by the Engineer.

GULLIES

Gullies completed with gratings end with ridding eyes where necessary all as specified in clause 7.44 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 to be brought up to the underside of the frame or flush with the top surface as the case may be. Masonry gullies shall be constructed from 225mm building stone and rendered internally. The rates included in the Bill of Quantities shall include for excavation, provision of all materials, construction, making junctions with connections to main drains, accurate setting of frames to line and level, refilling and disposal of surplus materials. Gullies shall be trapped where leading into foul sewers or into combined foul surface water sewers.

COMPLETION OF DRAINAGE WORKS.

All sub-soil and surface water drains shall be completed in advance of the construction.

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 such stakes or training wires properly marked and labeled.

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.

SURROUND OR HAUCHING OF PIPE WITH CONCRETE

Surrounding or haunching of pipes shall be carried out using concrete of the appropriate class 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 trowel or template and neatly finished off. The rates shall include for any formwork that the Contractor requires to use under this item.

INVERT BLOCK AND STONE DRAINAGE

Precast concrete invert and side slabs shall be formed of concrete of the appropriate class specified in table 4.2 to the dimensions shown on the drawings. Each course of side slabs rewired in the Bill of Quantities shall be interpreted as one completed row of side slab 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 drained.

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 100mm maximum thickness layers of compacted murram. The earth sides to such channels shall be neatly finished to a slope of I to I or such other slopes 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 block or stone, backfilling and disposal of surplus all as specified and all in-situ connections in concrete of the appropriate class specified in table 4.2

TESTING OF JOINTED PIPES AND MANHOLES.

Sealed jointed drains, up to end including 600mm diameters shall be tested in sections (e.g. between manholes) by filling with water under a head of not less than 1 metre. Drains found to be water –tight after a period of 30 minutes will be passed as satisfactory but the water must be retained in the pipes until a depth of at least 450mm of filling has been deposited and compacted on top thereof. Drains failing to stand the test shall be taken out and the pipes re-laid and re-joined 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 drains 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-joined 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 labour and apparatus for above tests.

All testing will be done in accordance with BSS2005.

PIPPES LAID ON MURRAM BED.

The pipes will be laid on 75mm murram bed. The murram to be laid shall be approved by the Engineer. The murram shall be well rammed after watering it. Proper grooves shall be made in the murram bed so that the socket of the spigot and socket can be received. The backfill shall be properly rammed along the side of the pipes.

PIPPES WITH RUBBER RING JOINTS

Rubber ring complying with BSS2494 will be provided by the Contractor. The jointing of pipes shall be carried out in accordance with manufacture’s instructions and in conformity with any modifications proposed by the Engineer.
SECTION VI – DRAWINGS

(To be provided on site or upon inquiry by interested contractors only: Chief Officer-Harun Kanathi: 0728108288)
## SECTION VII - BILL OF QUANTITIES

### KALUI LAKUMUKUMU - KINURIA WATER PROJECT

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Qty</th>
<th>Rate (Kshs)</th>
<th>Amount (Kshs)</th>
</tr>
</thead>
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<tr>
<td></td>
<td>THE FOLLOWING WORKS IN SUB SURFACE MASONRY 50M³</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>STORAGE TANK INCLUDING SUPPLY OF ALL MATERIALS AND</td>
<td></td>
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<tr>
<td></td>
<td>NECESSARY WORKS FOR PLACING, ERECTING, COMPLETION,</td>
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<tr>
<td></td>
<td>TESTING AND COMMISSIONING. ALL WORKS PROVISIONAL AND</td>
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<td></td>
<td>SUBJECT TO MEASUREMENTS</td>
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<tr>
<td><strong>Site clearance</strong></td>
<td></td>
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</tr>
<tr>
<td>1.1</td>
<td>Clear site of all bushes and shrubs and remove debris from site</td>
<td>M²</td>
<td>49</td>
<td></td>
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<tr>
<td></td>
<td>as directed by the Engineer.</td>
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<td></td>
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<tr>
<td>1.2</td>
<td>Cut down trees over 1.5m girth measured 1m from ground level,</td>
<td>No</td>
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<tr>
<td></td>
<td>grab out roots and dispose as directed.</td>
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</tr>
<tr>
<td><strong>Excavation and Earthworks</strong></td>
<td></td>
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</tr>
<tr>
<td>2.1</td>
<td>Excavate pit for water tank n.e 1.5 m deep store onsite and</td>
<td>M³</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>backfill with selected material and spread surplus</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>onsite;including all necessary works for side protection and for</td>
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<tr>
<td></td>
<td>keeping site free from water, mud and fallen material.</td>
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<tr>
<td>2.2</td>
<td>Ditto over 1.5 but n.e 3m deep</td>
<td>M³</td>
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<td>2.3</td>
<td>Extra over for excavation in decomposed/compacted murrum</td>
<td>M³</td>
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<td>2.4</td>
<td>Extra over for excavation in rock</td>
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Hardcore filling
<table>
<thead>
<tr>
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<th>Lay and compact 200mm thick hand-packed hardcore laid in layers not exceeding 150mm thick.</th>
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<tbody>
<tr>
<td></td>
<td><strong>Mass concrete grade 15/20 in:</strong></td>
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<tr>
<td>4.1</td>
<td>50mm thick blinding to to receive base slab and treat the surface with 'GLADIATOR' or other equal approved anti termite treatment</td>
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</tr>
<tr>
<td></td>
<td>Vibrated reinforced concrete 25/20 as described in:</td>
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</tr>
<tr>
<td>5.1</td>
<td>200mm thick floor slab</td>
<td>M3</td>
</tr>
<tr>
<td>5.2</td>
<td>200mm thick thick suspended slab</td>
<td>M3</td>
</tr>
<tr>
<td>5.3</td>
<td>Allow for finishing in cement plaster (1:3) on roof slab laid in 2.5% fall.</td>
<td>M2</td>
</tr>
<tr>
<td></td>
<td><strong>Erect and strike sawn formwork to:</strong></td>
<td></td>
</tr>
<tr>
<td>6.1</td>
<td>Edges of 200mm thick floor slab.</td>
<td>M2</td>
</tr>
<tr>
<td>6.2</td>
<td>Soffit of suspended slab</td>
<td>M2</td>
</tr>
<tr>
<td>6.3</td>
<td>Edges of suspended roof slab 200mm thick.</td>
<td>M2</td>
</tr>
<tr>
<td>6.6</td>
<td>Allow for forming 600X600mm opening for access manhole in 200mm thick slab.</td>
<td>No</td>
</tr>
<tr>
<td>6.7</td>
<td>Allow for construction of 25mm X 25mm drip all around the roof slab</td>
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</tr>
<tr>
<td></td>
<td><strong>Supply and fix steel reinforcements including bending, binding wire, cutting, apacers and supporting all in position as described. High tensile twisted bars to BS 4449</strong></td>
<td></td>
</tr>
<tr>
<td>7.1</td>
<td>16mm diameter</td>
<td>Kg</td>
</tr>
<tr>
<td>7.2</td>
<td>12mm diameter</td>
<td>Kg</td>
</tr>
<tr>
<td>7.3</td>
<td>10mm diameter</td>
<td>Kg</td>
</tr>
<tr>
<td>7.4</td>
<td>8mm diameter</td>
<td>Kg</td>
</tr>
<tr>
<td></td>
<td>Natural stone walling jointed and pointed in cement and mortar (1:3) reinforced every course to Engineer's details.</td>
<td></td>
</tr>
<tr>
<td>8.1</td>
<td>225mm thick</td>
<td>M2</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
<td>Unit</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>9.1 Plaster</td>
<td>25mm thick cement and sand (1:2) plaster to internal wall surface with water proof cement at ratio 1kg to 50kgs cement.</td>
<td>M2</td>
</tr>
<tr>
<td>9.2 Plaster</td>
<td>20mm thick cement/sand (1:3) plaster to external wall surface</td>
<td>M2</td>
</tr>
<tr>
<td>9.4 Screed</td>
<td>40mm thick cement/sand ratio (1:3) screed to floor, smooth render laid to falls and brushed with water proof treatment as vandex, master seal, hyseal or any other equally approved to manufacturer's specification</td>
<td>M2</td>
</tr>
<tr>
<td>10.1 Ladder</td>
<td>3000mm long X 800mm wide mild steel ladder stringers. 3000mmX 50mmX 10mm flat bars, ring 800mmX200mmX20mm round bars at 300mm centres externally anchored to wall lugs: one coat red oxide primer: three coats gloss oil finish: all to Engineer's details.</td>
<td>NO</td>
</tr>
<tr>
<td>10.2 Ladder</td>
<td>3000mm long X 800mm wide mild steel ladder stringers. 3000mmX 50mmX 10mm flat bars, ring 800mmX200mmX20mm round bars at 300mm centres internally anchored to wall lugs: one coat red oxide primer: three coats gloss oil finish: all to Engineer's details.</td>
<td>NO</td>
</tr>
<tr>
<td>11.1 Manhole cover</td>
<td>Supply and fix steel prefabricated lockable cover 600mmX600mm complete with frames, steel gauge 16 and as directed by Engineer.</td>
<td>NO</td>
</tr>
<tr>
<td>Vents</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12.1 Supply and fix 100mm vent pipes (complete with G.I elbows, hexagonal nipple and wire gauze) and fittings to Engineer’s details.

Supply, cut, thread, fabricate, lay, test and fix all pipes and fittings including jointing materials (bolts, nuts, washers gaskets and packings)

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.1</td>
<td>100mm X 90 degrees diameter galvanized iron flanged bend</td>
</tr>
<tr>
<td>13.2</td>
<td>100mm galvanized steel flanged galvanized iron piece 500mm long</td>
</tr>
<tr>
<td>13.3</td>
<td>100mm diameter galvanized iron pipe 3m long</td>
</tr>
<tr>
<td>13.4</td>
<td>Standard valve chamber</td>
</tr>
<tr>
<td>13.5</td>
<td>100mm diameter flanged cast iron sluice valve</td>
</tr>
</tbody>
</table>

**Inlet**

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>14.1</td>
<td>100mm diameter galvanized steel pipe piece 3m long flanged</td>
</tr>
<tr>
<td>14.2</td>
<td>100mm diameter galvanized steel bend with puddle flange</td>
</tr>
<tr>
<td>14.3</td>
<td>150mm X 100mm diameter bell mouth</td>
</tr>
<tr>
<td>14.4</td>
<td>100mm diameter flanged cast iron sluice valve</td>
</tr>
<tr>
<td>14.5</td>
<td>Standard valve chamber</td>
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**Outlet**

<table>
<thead>
<tr>
<th>Section</th>
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<tbody>
<tr>
<td>15.1</td>
<td>50mm diameter flanged bend 90 degrees</td>
</tr>
<tr>
<td>15.2</td>
<td>50mm diameter galvanized steel socket</td>
</tr>
<tr>
<td>15.3</td>
<td>50mm diameter galvanized steel 3m long pipe</td>
</tr>
<tr>
<td>15.4</td>
<td>No 2</td>
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**Overflow**

<table>
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<tr>
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<tbody>
<tr>
<td>15.1</td>
<td>50mm diameter flanged bend 90 degrees</td>
</tr>
<tr>
<td>15.2</td>
<td>50mm diameter galvanized steel socket</td>
</tr>
<tr>
<td>15.3</td>
<td>50mm diameter galvanized steel 3m long pipe</td>
</tr>
<tr>
<td>15.4</td>
<td>No 2</td>
</tr>
<tr>
<td>Item No</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>15.5</td>
<td>50mm diameter nipple</td>
</tr>
<tr>
<td></td>
<td><strong>Scour</strong></td>
</tr>
<tr>
<td>16.1</td>
<td>150mm X 100mm diameter bell mouth</td>
</tr>
<tr>
<td>16.2</td>
<td>100mm X 90 degrees diameter galvanized flanged iron bend</td>
</tr>
<tr>
<td>16.3</td>
<td>100mm diameter galvanized steel pipe piece 6m long flanged</td>
</tr>
<tr>
<td>16.4</td>
<td>100mm diameter flanged cast iron sluice valve</td>
</tr>
<tr>
<td>16.5</td>
<td>Standard valve chamber</td>
</tr>
<tr>
<td></td>
<td><strong>Testing and Sterilization</strong></td>
</tr>
<tr>
<td>17.1</td>
<td>Allow for water tightness test as directed by the engineer</td>
</tr>
<tr>
<td>17.2</td>
<td>Allow for sterilization of the tank</td>
</tr>
<tr>
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<td><strong>SUB-TOTAL</strong></td>
</tr>
<tr>
<td></td>
<td>Allow for sign board as per design</td>
</tr>
<tr>
<td></td>
<td>monitoring and evaluation</td>
</tr>
<tr>
<td></td>
<td>Add supervisory cost</td>
</tr>
<tr>
<td></td>
<td>Add Contingencies at 5%</td>
</tr>
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<td></td>
<td><strong>GRAND TOTAL</strong></td>
</tr>
<tr>
<td></td>
<td>Description</td>
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<td>---</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Clear site of all bushes and shamba and remove debris from site directed by the engineer</td>
</tr>
<tr>
<td>2</td>
<td>Excavate strip foundation for the intake weir including necessary works for side protection and for keeping site free from water, mud and fallen materials</td>
</tr>
<tr>
<td>3</td>
<td>Extra over for excavation in decomposed /compacted maruum</td>
</tr>
<tr>
<td>4</td>
<td>Extra over for excavation in rock</td>
</tr>
<tr>
<td></td>
<td>Concrete</td>
</tr>
<tr>
<td>5</td>
<td>Reinforced concrete class 25/20 for the weir wall</td>
</tr>
<tr>
<td>6</td>
<td>Vibrated reinforced concrete 15/20 in 200mm thick suspended slab</td>
</tr>
<tr>
<td>7</td>
<td>Supply and fix steel reinforcements including bending, binding, cutting and supporting all in position</td>
</tr>
<tr>
<td>7.1</td>
<td>12mm diameter</td>
</tr>
<tr>
<td>7.2</td>
<td>10mm diameter</td>
</tr>
<tr>
<td>8</td>
<td>Provide for collection chamber to offtake scour and second offtake line</td>
</tr>
<tr>
<td></td>
<td>FORM WORK</td>
</tr>
<tr>
<td>9</td>
<td>Provide for erecting and striking off timber form work</td>
</tr>
<tr>
<td>10</td>
<td>Allow for fittings to intakes and connections to Pipeline</td>
</tr>
<tr>
<td>11</td>
<td>Supply and lay G.I flanged pipes ND 150</td>
</tr>
<tr>
<td>12</td>
<td>Supply and fix flanged Gate valve ND 150 (peglar)</td>
</tr>
<tr>
<td>13</td>
<td>Concrete support, thrust blocks and anchor blocks - Volume not exceeding 0.1m3</td>
</tr>
<tr>
<td>14</td>
<td>Allow for connection of water to existing pipeline and tanks</td>
</tr>
<tr>
<td>Item No</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>15</td>
<td>Allow for transportation of materials</td>
</tr>
<tr>
<td>16</td>
<td>Provide for protective clothing for engineers staff</td>
</tr>
<tr>
<td>17</td>
<td>Provide communication cost and for maintenance</td>
</tr>
<tr>
<td>18</td>
<td>Allow for sign board as per design</td>
</tr>
<tr>
<td>19</td>
<td>monitoring and evaluation cost</td>
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<td>20</td>
<td>Project management cost</td>
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<td><strong>Total</strong></td>
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**KALUI LAKUMUKUMU - KINURIA WATER PROJECT**

(C) 50CM WATER STORAGE TANK - KAONGO KA CHOLE

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description</th>
<th>Unit</th>
<th>Qty</th>
<th>Rate (Kshs)</th>
<th>Amount (Kshs)</th>
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<tbody>
<tr>
<td></td>
<td>THE FOLLOWING WORKS IN SUB SURFACE MASONRY 50M3</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>STORAGE TANK INCLUDING SUPPLY OF ALL MATERIALS AND</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NECESSARY WORKS FOR PLACING, ERECTING, COMPLETION,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TESTING AND COMMISSIONING. ALL WORKS PROVISIONAL AND</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SUBJECT TO MEASUREMENTS</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td><strong>Site clearance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Clear site of all bushes and shrubs and remove debris from site</td>
<td>M2</td>
<td>49</td>
<td></td>
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<tr>
<td></td>
<td>as directed by the Engineer.</td>
<td></td>
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</tr>
<tr>
<td>1.2</td>
<td>Cut down trees over 1.5m girth measured 1m from ground level, grab out roots and dispose as directed.</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td><strong>Excavation and Earthworks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Excavate pit for water tank n.e 1.5 m deep store onsite and</td>
<td>M3</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>backfill with selected material and spread surplus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>onsite; including all necessary works for side protection and for</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>keeping site free from water, mud and fallen material.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Unit</td>
<td>Quantity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>Ditto over 1.5 but n.e 3m deep</td>
<td>M3</td>
<td>23</td>
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<tr>
<td>2.3</td>
<td>Extra over for excavation in decomposed/compacted murrum</td>
<td>M3</td>
<td>28</td>
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<tr>
<td>2.4</td>
<td>Extra over for excavation in rock</td>
<td>M3</td>
<td>10</td>
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<tr>
<td>3.1</td>
<td>Lay and compact 200mm thick hand-packed hardcore laid in</td>
<td>M2</td>
<td>30</td>
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<tr>
<td>4.1</td>
<td>50mm thick blinding to to receive base slab and treat the surface</td>
<td>M2</td>
<td>28</td>
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<tr>
<td></td>
<td>with 'GLADIATOR' or other equal approved anti termite treatment</td>
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<td></td>
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<tr>
<td>5.1</td>
<td>200mm thick floor slab</td>
<td>M3</td>
<td>6</td>
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<td>5.2</td>
<td>200mm thick thick suspended slab</td>
<td>M3</td>
<td>6</td>
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<td>5.3</td>
<td>Allow for finishing in cement plaster (1:3) on roof slab laid in 2.5% fall</td>
<td>M2</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1</td>
<td>Edges of 200mm thick floor slab</td>
<td>M2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.2</td>
<td>Soffit of suspended slab</td>
<td>M2</td>
<td>30</td>
<td></td>
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<tr>
<td>6.3</td>
<td>Edges of suspended roof slab 200mm thick.</td>
<td>M2</td>
<td>4</td>
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<tr>
<td>6.6</td>
<td>Allow for forming 600X600mm opening for access manhole in 200mm thick slab.</td>
<td>No</td>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Allow for construction of 25mm X 25mm drip all around the roof slab</td>
<td>No</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>6.7</td>
<td>Supply and fix steel reinforcements including bending, binding wire, cutting, apacers and supporting all in position as</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
<td>Unit</td>
<td>Quantity</td>
<td></td>
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<td>---------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
<td>----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.1</td>
<td>16mm diameter twisted bars to BS 4449</td>
<td>Kg</td>
<td>15</td>
<td></td>
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</tr>
<tr>
<td>7.2</td>
<td>12mm diameter twisted bars</td>
<td>Kg</td>
<td>130</td>
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<td>7.3</td>
<td>10mm diameter twisted bars</td>
<td>Kg</td>
<td>500</td>
<td></td>
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<tr>
<td>7.4</td>
<td>8mm diameter twisted bars</td>
<td>Kg</td>
<td>300</td>
<td></td>
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</tr>
<tr>
<td>7.5</td>
<td>Natural stone walling jointed and pointed in cement and mortar (1:3)</td>
<td></td>
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</tr>
<tr>
<td>7.6</td>
<td>reinforced every course to Engineer’s details</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>8.1</td>
<td>225mm thick</td>
<td>M2</td>
<td>67</td>
<td></td>
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<tr>
<td>9.1</td>
<td>25mm thick cement and sand (1:2) plaster to internal wall</td>
<td>M2</td>
<td>67</td>
<td></td>
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<tr>
<td>9.2</td>
<td>20mm thick cement/sand (1:3) plaster to external wall surface</td>
<td>M2</td>
<td>67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.4</td>
<td>40mm thick cement/sand ratio (1:3) screed to floor, smooth</td>
<td>M2</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5</td>
<td>render laid to falls and brushed with water proof treatment as</td>
<td></td>
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</tr>
<tr>
<td>9.6</td>
<td>vandex, master seal, hyseal or any other equally approved</td>
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<tr>
<td>9.7</td>
<td>manufacturer’s specification</td>
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<tr>
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<td>3000mm long X 800mm wide mild steel ladder stringers.</td>
<td>NO</td>
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<tr>
<td>10.2</td>
<td>3000mmX 50mmX 10mm flat bars, ring 800mmX200mmX20mm</td>
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</tr>
<tr>
<td>10.3</td>
<td>round bars at 300mm centres externally anchored to wall lugs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.4</td>
<td>one coat red oxide primer: three coats gloss oil finish: all to</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.5</td>
<td>Engineer’s details</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Quantity</td>
<td>Notes</td>
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<td>-----------------------------------------------------------------------------</td>
<td>----------</td>
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</tr>
<tr>
<td>10.2</td>
<td>3000mm long X 800mm wide mild steel ladder stringers.</td>
<td>No</td>
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<tr>
<td></td>
<td>3000mmX 50mmX 10mm flat bars, ring 800mmX200mmX20mm</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>round bars at 300mm centres internally anchored to wall lugs:</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>one coat red oxide primer: three coats gloss oil finish: all to Engineer’s details.</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Manhole cover</td>
<td>Supply and fix steel prefabricated lockable cover</td>
<td>No</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>600mmX600mm complete with frames, steel gauge 16 and as directed by Engineer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vents</td>
<td>Supply and fix 100mm vent pipes (complete with G.I elbows, hexagonal nipple and wire gauze) and fittings to Engineer's details.</td>
<td>No</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply, cut, thread, fabricate, lay, test and fix all pipes and fittings including jointing materials (bolts, nuts, washers gaskets and packings)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inlet</td>
<td>100mm X 90 degrees diameter galvanized iron flanged bend</td>
<td>No</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100mm galvanized steel flanged galvanized iron piece 500mm long</td>
<td>M</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100mm diameter galvanized iron pipe 3m long</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standard valve chamber</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100mm diameter flanged cast iron sluice valve</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outlet</td>
<td>No</td>
<td>Qty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------</td>
<td>----</td>
<td>-----</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.1</td>
<td>100mm diameter galvanized steel pipe piece 3m long flanged</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.2</td>
<td>100mm diameter galvanized steel bend with puddle flange</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.3</td>
<td>150mm X 100mm diameter bell mouth</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.4</td>
<td>100mm diameter flanged cast iron sluice valve</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.5</td>
<td>Standard valve chamber</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Overflow</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.1</td>
<td>50mm diameter flanged bend 90 degrees</td>
<td>No</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.2</td>
<td>50mm diameter galvanized steel socket</td>
<td>No</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.3</td>
<td>50mm diameter galvanized steel 3m long pipe</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.4</td>
<td>50mm threaded 300mm with puddle flange</td>
<td>No</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.5</td>
<td>50mm diameter nipple</td>
<td>No</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Scour</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.1</td>
<td>150mm X 100mm diameter bell mouth</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.2</td>
<td>100mm X 90 degrees diameter galvanized flanged iron bend</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.3</td>
<td>100mm diameter galvanized steel pipe piece 6m long flanged</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.4</td>
<td>100mm diameter flanged cast iron sluice valve</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.5</td>
<td>Standard valve chamber</td>
<td>No</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Testing and Sterilization</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.1</td>
<td>Allow for water tightness test as directed by the engineer</td>
<td>LS</td>
<td>1</td>
<td>10000</td>
<td>10,000.00</td>
</tr>
<tr>
<td>17.2</td>
<td>Allow for sterilization of the tank</td>
<td>LS</td>
<td>1</td>
<td>10000</td>
<td>10,000.00</td>
</tr>
<tr>
<td></td>
<td><strong>SUB-TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Allow for sign board as per design</td>
<td></td>
<td></td>
<td>10,000.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Allow for monitoring and evaluation</td>
<td></td>
<td></td>
<td>30,300.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Add supervisory cost</td>
<td></td>
<td></td>
<td>50,000.00</td>
<td></td>
</tr>
</tbody>
</table>
SUMMARY

INTAKE WORKS ............................................. Kshs  =

TANKS 2NO .................................................. Kshs  =

TOTAL .......................................................... Kshs  =

Signature of tenderer ____________________________

Note: The price schedule should capture each and every item chargeable by the tenderer, including any personnel costs where applicable. No hidden costs are acceptable.

1. Where applicable, the tenderer can modify the price schedule to exhaustively capture all items with no major deviation from the form above.

2. Prices quoted should be inclusive of any applicable taxes – the tenderer should clearly state that their prices are inclusive of VAT where applicable.

Name & Signature of tenderer (authorized signatory)

Stamp ____________________________

Note: In case of discrepancy between unit price and total, the unit price shall prevail.
CONFIDENTIAL BUSINESS QUESTIONNAIRE FORM

You are requested to give the particulars indicated in Part 1 and either Part 2(a), 2(b) or 2(c) whichever applied to your type of business. You are advised that it is a serious offence to give false information on this form.

**Part 1 – General:**

<table>
<thead>
<tr>
<th>Business Name</th>
<th>Location of business premises.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plot</td>
</tr>
<tr>
<td></td>
<td>Street/Road</td>
</tr>
<tr>
<td></td>
<td>Tel</td>
</tr>
<tr>
<td></td>
<td>Fax</td>
</tr>
<tr>
<td></td>
<td>E mail</td>
</tr>
<tr>
<td></td>
<td>Nature of Business</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Registration Certificate No.</th>
<th>Maximum value of business which you can handle at any one time – KShs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of your bankers</td>
<td>Branch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part 2 (a) – Sole Proprietor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your name in full</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Nationality</td>
</tr>
<tr>
<td>Country of origin</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part 2 (b) – Partnership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Given details of partners as follows:</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part 2 (c) – Registered Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private or Public</td>
</tr>
<tr>
<td>State the nominal and issued capital of company:</td>
</tr>
<tr>
<td>Nominal KShs.</td>
</tr>
<tr>
<td>Issued KShs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Given details of all directors as follows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

Date ............................................................ Seal/Signature of Candidate

............................................................
TENDER SECURITY FORM

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 equipment]
(hereinafter called “the Tender”) ....................................................... KNOW
ALL PEOPLE by these presents that WE
............................................... having our registered office at ................. (hereinafter called “the Bank”), are bound unto ................. [name
of Procuring entity] (hereinafter called “the Procuring entity”) in the sum of
............................................... for which payment well and truly to be made to the
said Procuring entity, the Bank binds itself, its successors, and assigns by these presents.
Sealed with the Common Seal of the said Bank this __________________ day of 20 ____________.

THE CONDITIONS of this obligation are:-
1. If the tenderer withdraws its Tender during the period of tender validity
   specified by the tenderer on the Tender Form; or

2. If the tenderer, having been notified of the acceptance of its Tender by the
   Procuring entity during the period of tender validity:
   (a) fails or refuses to execute the Contract Form, if required; or
   (b) fails or refuses to furnish the performance security in accordance
      with the Instructions to tenderers;

We undertake to pay to the Procuring entity up to the above amount upon receipt
of its first written demand, without the Procuring entity having to substantiate its
demand, provided that in its demand the Procuring entity will note that the amount
claimed by it is due to it, owing to the occurrence of one or both of the two
conditions, specifying the occurred condition or conditions.

This tender guarantee will remain in force up to and including thirty (30) days after the
period of tender validity, and any demand in respect thereof should reach the Bank
not later than the above date.

_________________________________________

[signature of the bank]
CONTRACT FORM

THIS AGREEMENT made the ________ day of ___________ 20 ______ between
.................... [name of Procurement entity] of ............ [country of Procurement
entity] (hereinafter called “the Procuring entity) of the one part and
............................. [name of tenderer] of ............. [city and country of tenderer]
(hereinafter called “the tenderer”) of the other part;

WHEREAS the Procuring entity invited tenders for [certain goods] and has accepted a
tender by the tenderer for the supply of those goods in the sum of
................................. [contract price in words and figures] (hereinafter called “the
Contract Price).

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings
as are respectively assigned to them in the Conditions of Contract referred to:

2. The following documents shall be deemed to form and be read and construed
as part of this Agreement viz:
(a) the Tender Form and the Price Schedule submitted by the
tenderer (b) the Schedule of Requirements
(c) the Technical Specifications
(d) the General Conditions of Contract
(e) the Special Conditions of contract; and
(f) the Procuring entity’s Notification of Award

3. In consideration of the payments to be made by the Procuring entity to the
tenderer as hereinafter mentioned, the tenderer hereby covenants with the Procuring
entity to provide the goods and to remedy the defects therein in conformity in all
respects with the provisions of this Contract

4. The Procuring entity hereby covenants to pay the tenderer in consideration
of the provisions of the goods 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 their respective laws the day and year first above
written.

Signed, sealed, delivered by _____ the ______________ (for the Procuring entity)

Signed, sealed, delivered by _____ the ______________ (for the tenderer in the
presence of ____________________


PERFORMANCE SECURITY FORM

To ..................................................
[name of Procuring entity]

WHEREAS ................................. [name of tenderer] (hereinafter called “the tenderer”) has undertaken, in pursuance of Contract No. ____________ [reference number of the contract] dated ________20__________ to supply
.................................................................................... [description of goods] (hereinafter called “the Contract”).

AND WHEREAS it has been stipulated by you in the said Contract that the tenderer shall furnish you with a bank guarantee by a reputable bank for the sum specified therein as security for compliance with the Tenderer’s performance obligations in accordance with the Contract.

AND WHEREAS we have agreed to give the tenderer a guarantee:

THEREFORE WE hereby affirm that we are Guarantors and responsible to you, on behalf of the tenderer, up to a total of ........................................ [amount of the guarantee in words and figure] and we undertake to pay you, upon your first written demand declaring the tenderer to be in default under the Contract and without cavil or argument, any sum or sums within the limits of ....................... [amount of guarantee] as aforesaid, without you needing to prove or to show grounds or reasons for your demand or the sum specified therein.

This guarantee is valid until the ______ day of ________ 20 ________

Signed and seal of the Guarantors
..............................................................................................

[amount of the bank or financial institution]

[address]

[date]
BANK GUARANTEE FOR ADVANCE PAYMENT

To ..................................................

 [name of Procuring entity]

[name of tender] .........................

Gentlemen and/or Ladies:
In accordance with the payment provision included in the Special Conditions of Contract, which amends the General Conditions of Contract to provide for advance payment, .......................................................... [name and address of tenderer](hereinafter called “the tenderer”) shall deposit with the Procuring entity a bank guarantee to guarantee its proper and faithful performance under the said Clause of the Contract an amount of ...... ...................... [amount of guarantee in figures and words].

We, the ........................................ [bank or financial institutions], as instructed by the tenderer, agree unconditionally and irrevocably to guarantee as primary obligator and not as surety merely, the payment to the Procuring entity on its first demand without whatsoever right of objection on our part and without its first claim to the tenderer, in the amount not exceeding ...................... [amount of guarantee in figures and words]

We further agree that no change or addition to or other modification of the terms of the Contract to be performed there-under or of any of the Contract documents which may be made between the Procuring entity and the tenderer, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition, or modification.

This guarantee shall remain valid in full effect from the date of the advance payment received by the tenderer under the Contract until ............ [date].

Yours truly,

Signature and seal of the Guarantors

 [name of bank or financial institution]

 [address]

 [date]
MANUFACTURER’S AUTHORIZATION FORM

To [name of the Procuring entity] …………………

WHEREAS ……………………………………………………… [name of the manufacturer] who are established and reputable manufacturers of ………………… [name and/or description of the goods] having factories at …………………………… [address of factory] do hereby authorize …………………………… [name and address of Agent] to submit a tender, and subsequently negotiate and sign the Contract with you against tender No. …………………………… [reference of the Tender] for the above goods manufactured by us.

We hereby extend our full guarantee and warranty as per the General Conditions of Contract for the goods offered for supply by the above firm against this Invitation for Tenders.

__________________________________

[signature for and on behalf of manufacturer]

Note: This letter of authority should be on the letterhead of the Manufacturer and should be signed by an authorized person.
BIDDER’S DECLARATION AND INTEGRITY PACT

Bidder’s Declaration

We/I the undersigned ........................................, in the capacity of .................................................. for .......................................................... [name of the company/firm/individual] certify that the bidder is not in any of the following situations:

1. Bankruptcy; are the subject of proceedings for a declaration of bankruptcy, or of an order for compulsory winding up or administration by court, or of any other similar proceedings;

2. Payments to us have been suspended in accordance with the judgment of a court other than a judgment declaring bankruptcy and resulting, in accordance with our national laws, in the total or partial loss of the right to administer and dispose off our property;

3. Legal proceedings have been instituted against us involving an order suspending payments and which may result, in accordance with our national laws, in a declaration of bankruptcy or in any other situation entailing the total or partial loss of the right to administer and dispose of our property;

4. Are being wound up, or our affairs are being administered by court, or have entered into an arrangement with creditors, or have suspended business activities or are subject to an injunction against running business by a court of law;

5. Have been convicted by a final judgment of any crime or offence concerning our/my professional conduct;

6. Are guilty of serious misrepresentation with regard to information required for participation in an invitation to tender or execution of a tender already awarded; and

7. Are in breach of contract on another contract with the Government of Kenya or other local or contracting authority or foreign government.

8. Have been convicted of an offence concerning our/my professional conduct by a court of law, or found guilty of grave professional misconduct;

9. Have not fulfilled obligations relating to payments of taxes or statutory contributions.

If the bidder is in any of the above listed situations, kindly attach documents giving details of the situation.

Names in full: [.................................................................]

Duly authorized to sign this bid on behalf of (bidder’s name):

[.................................................................]

Place and date:

[.................................................................] Stamp of the firm/company:
LETTER OF NOTIFICATION OF AWARD

To: __________________________
______________________________
______________________________

RE: Tender No.____________________

Tender Name____________________

This is to notify that the contract/s stated below under the above mentioned tender have been awarded to you.

________________________________________________________________________

1. Please acknowledge receipt of this letter of notification signifying your acceptance.

2. The contract/contracts shall be signed by the parties within 30 days of the date of this letter but not earlier than 14 days from the date of the letter.

3. You may contact the officer(s) whose particulars appear below on the subject matter of this letter of notification of award.

(FULL PARTICULARS)___________________________________________

______________________________
SIGNED FOR ACCOUNTING OFFICER
FORM OF WRITTEN POWER-OF-ATTORNEY

The Tenderer consisting of a joint venture shall state here below the name and address of his representative who is authorized to receive on his behalf correspondence in connection with the Tender.

................................................................................................................................................
(Name of Tenderer’s Representative in block letters)

................................................................................................................................................
(Address of Tenderer’s Representative)

................................................................................................................................................
(Signature of Tenderer’s Representative)
FORM SD1


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 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 hereinabove is true to the best of my knowledge, information and belief.

.............................................. .............................................. ..............................................

(Title) .............................................. (Signature) .............................................. (Date)

Bidder Official Stamp
FORM SD2

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

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

1. THAT I am the Chief Executive/Managing Director/Principal Officer/Director of ............

.............................................. (insert name of the Company) who is a Bidder in respect of Tender No.

.............................................., for .......................................(insert tender title/description) for .......................................(insert name of the Procuring entity) and duly authorized and competent to make this statement.

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

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

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

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

..............................................  ..............................................  ..............................................

(Title)                                         (Signature)                             (Date)

Bidder’s Official Stamp
FORM RB 1
REPUBLIC OF KENYA
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...

REQUEST FOR REVIEW

I/We……………………………,the above named Applicant(s), of address: Physical
address…………….Fax 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. 

etc.

By this memorandum, the Applicant requests the Board for an order/orders that: -

1. 
2. 

etc

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