**WATER SECTOR TRUST FUND (WSTF)**

**MURANGA SOUTH WATER AND SANITATION COMPANY LTD**

# TENDER DOCUMENT FOR CONSTRUCTION OF MURANGA SOUTH WATER SUPPLY PROJECT

1. **NAME AND CONTACT ADDRESSES OF PROCURING ENTITY**

   **NAME:** MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED(MUSWASCO)

   **ADRESS:** murangasouth@gmail.com or info@muswasco.co.ke

   **WEBSITE:** www.muswasco.co.ke

2. **INVITATION TO TENDER (ITT) NO:** MUSWASCO/KWASH/26-27/01
3. **TENDER NAME:** CONSTRUCTION OF MURANGA SOUTH WATER SUPPLY PROJECT
4. **CLOSING DATE:** WEDNESDAY,18TH NOVEMBER, 2026 AT 10:30AM

**NOVEMBER,2026**

**Employer:**
Managing Director
Murang'a South Water & Sanitation Company Ltd (MUSWASCO)
P.O. BOX 87-01034 Kandara

**Funding**
Chief Executive Officer Water Sector Trust Fund
P.O. Box 49699-00100
Nairobi

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## INVITATION TO TENDER

**PROCURING ENTITY: MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED**
**CONTRACT NAME AND DESCRIPTION: CONSTRUCTION OF MURANGA SOUTH WATER SUPPLY PROJECT**

1. The **Murang'a South water & sanitation Co. Ltd** invites sealed tenders for the **Construction of Muranga South Water Supply Project**

### About the Project area and Expected works

The Murang'a South Water and Sanitation Company Ltd (MUSWASCO), was incorporated on 23rd May 2008 under the Companies Act, Cap 486 and became operational immediately. The company is mandated by WASREB to provide water and sanitation services to the three sub-counties of Murang'a County namely:

1. Kandara Sub-County
2. Kigumo Sub-County
3. Murang'a south sub-County

Muranga South Water and sanitation Company intends to undertake the Muranga South Water Supply Project on various locations identified by the Employer.

The Contractor shall provide all labour, materials, plant, equipment, supervision and incidentals necessary for the complete execution of the Works in accordance with the Contract Documents.

The Works comprise the following water/civil pipeline works:

| | | |
|---|---|---|
| **KANGARI SCHEME** | | |
| *WATUHU LINE(BEHIND NJIIRIS)* | | |
| **Description** | **Unit** | **Qty** |
| Pipes | | |
| **63mm Hdpe pipe PN 16** | M | 780 |
| **50mm Hdpe PN 16 pipes** | M | 530 |
| *KENOL SCHEME* | | |
| DESCRIPTION | **UNIT** | **QTY** |
| Pipes | | |
| **63mm diameter Hdpe Pipe PN16** | M | 1890 |
| **50mm diameter Hdpe Pipe PN16** | M | 500 |
| **32mm diameter Hdpe Pipe PN16** | M | 200 |
| *catholic line 1 & 2* | | |
| **63mm diameter Hdpe Pipe PN16** | M | 2,120 |
| **50mm diameter Hdpe Pipe PN16** | M | 800 |
| | | |
| *Kahumbu-ini* | | |
| *PENKA & PENKA SCHOOL LINE* | | |
| Description | **Unit** | **Qty** |
| **63 mm diameter Hdpe PN16 pipes** | M | 493 |
| **32 mm diameter Hdpe PN16 pipes** | M | 294 |
| *MUTARINGWA LINE* | | |
| Description | **Unit** | **Qty** |
| **32 mm diameter Hdpe PN16 pipes** | M | 580 |
| *Gakuyu TC 1* | | |
| Description | **Unit** | **Qty** |
| **25 mm diameter Hdpe PN 16 pipes** | M | 200 |
| *Gakuyu TC 2* | | |
| Description | **Unit** | **Qty** |

| | | |
|---|---|---|
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Gakuyu TC 3* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16 pipes** | M. | 60 |
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Gakuyu TC 4* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16 pipes** | M. | 60 |
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Gakuyu TC 5* | | |
| Description | **Unit** | **Qty** |
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Githuthu ini A* | | |
| Description | **Unit** | **Qty** |
| **32mm diameter Hdpe PN 16 pipes** | M | 400 |
| **25mm diameter Hdpe PN 16 pipes** | M | 400 |
| *Githuthu ini B* | | |
| Description | **Unit** | **Qty** |
| **32mm diameter Hdpe PN 16 pipes** | M | 200 |
| **25mm diameter Hdpe PN 16 pipes** | M | 464 |
| *MATHURI LINE* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16pipes** | M. | 1100 |
| **32mm diameter Hdpe PN 16 pipes** | M. | 400 |
| **25mm diameter Hdpe PN 16 pipes** | M. | 200 |
| *Kahuho Baptist* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16pipes** | M | 550 |
| **32 mm diameter Hdpe PN 16pipes** | M | 890 |
| *Kahuho Baptist 1* | | |
| **32 mm diameter Hdpe PN 16pipes** | M | 906 |
| *Kahuho Baptist 2* | | |
| **25 mm diameter Hdpe PN 16pipes** | M. | 906 |
| *Kahuho Baptist 3* | | |
| **25 mm diameter Hdpe PN 16pipes** | M | 344 |
| *Kibingu line* | | |
| **50 mm diameter Hdpe PN 16pipes** | M | 642 |
| **32 mm diameter Hdpe PN 16pipes** | M | 498 |
| *Kibingu 2* | | |
| **32 mm diameter Hdpe PN 16pipes** | M. | 652 |
| *Kibingu 1* | | |
| **32 mm diameter Hdpe PN 16pipes** | M. | 1000 |
| *Kandani and Distribution Lines* | | |
| **50 mm diameter Hdpe PN 16pipes** | M. | 280 |
| **32 mm diameter Hdpe PN 16pipes** | M | 420 |
| **25 mm diameter Hdpe PN 16pipes** | M | 435 |

| | | |
|---|---|---|
| *Kihorwe Line* | | |
| **32 mm diameter Hdpe PN 16pipes** | M. | 791 |
| *Kahuho 1 line* | | |
| **50 mm diameter Hdpe PN 16pipes** | M | 219 |
| **32 mm diameter Hdpe PN 16pipes** | M | 221 |
| *Kahuho Gakindu lines* | | |
| **50 mm diameter Hdpe PN 16pipes** | M | 659 |
| **32 mm diameter Hdpe PN 16pipes** | M | 706 |
| *Kandani rehabilitation* | | |
| **110mm diameter Hdpe PN16 Pipe** | M | 500 |

2. Tendering will be conducted under open **National** competitive method using a standardized tender document. Tendering is open to all qualified and interested Tenderers.

3. Qualified and interested tenderers may obtain further information and inspect the Tender Documents during office hours *ie.* **0800 hrs** to **1700 hrs** at the address given below. Tender documents may be viewed and/or downloaded from the website: **www.muswasco.co.ke** or Public Procurement Information Portal (PPIP) website: **www.tenders.go.ke**

4. A complete set of tender documents may be obtained by interested tenders electronically from the Website(s): **www.muswasco.co.ke** or Public Procurement Information Portal (PPIP) website: www.tenders.go.ke.Tender documents obtained electronically will be free of charge.

5. Tender documents may be viewed and downloaded for free from the website **www.muswasco.co.ke** or Public Procurement Information Portal (PPIP) website: **www.tenders.go.ke** Tenderers who download the tender document must forward their particulars immediately to **murangasouth@gmail.com** **or** **info@muswasco.co.ke** to facilitate any further clarification or addendum.

6. All Tenders must be accompanied by a bid security in form of an unconditional Bank Guarantee or from an insurance company registered by IRA and approved by PPRA of **Kshs. 350,000** valid for **210** days. This shall be in the format provided in the tender document.

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

8. Completed tenders must be delivered to the address below on or before **18th November, 2026** at **10:30am**. Electronic Tenders **will not** be permitted.

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

10. Late tenders will be rejected.

11. The addresses referred to above are:

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

***MANAGING DIRECTOR***
***MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED***
***P.O BOX 84-01034 KANDARA, NEXT TO DC'S OFFICE-KANDARA.***
***Telephone: +254716645345***
***Email: murangasouth@gmail.com or info@muswasco.co.ke***
***Website: www.muswasco.co.ke***

b. **Address for Submission of Tenders.**

***MANAGING DIRECTOR***
***MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED***
***P.O BOX 84-01034 KANDARA, NEXT TO DC'S OFFICE-KANDARA.***
***Telephone: +254716645345***
***Email: murangasouth@gmail.com or info@muswasco.co.ke***
***Website: www.muswasco.co.ke***

c. **Address for Opening of Tenders.**

***MANAGING DIRECTOR***
***MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED***
***P.O BOX 84-01034 KANDARA, NEXT TO DC'S OFFICE-KANDARA.***
***Telephone: +254716645345***
***Email: murangasouth@gmail.com or info@muswasco.co.ke***
***Website: www.muswasco.co.ke***

**MANAGING DIRECTOR**
**MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED**
**P.O BOX 84-01034 KANDARA, NEXT TO DC'S OFFICE-KANDARA.**
**Telephone: +254716645345**

**DATE: 3RD NOVEMEBER,2026**

# PART 1 - TENDERING PROCEDURES

## SECTIONI-INSTRUCTIONS TO TENDERERS

## A GENERALPROVISIONS

### 1. Scope of Tender

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

### 2. Fraud and Corruption

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

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

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

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

### 3. Eligible Tenderers

3.1 A Tenderer may be a firm that is a private entity, a state-owned enterprise or institution subject to ITT 3.8, or an individual or any combination of such entities in the form of a joint venture (JV) under an existing agreement or with the intent to enter into such an agreement supported by a letter of intent. In the case of a joint venture, all members shall be jointly and severally liable for the execution of the entire Contract in accordance with the Contract terms. The JV shall nominate a Representative who shall have the authority to conduct all business for and on behalf of any and all the members of the JV during the tendering process and, in the event the JV is awarded the Contract, during contract execution. Members of a joint venture may not also make an individual tender, be a subcontractor in a separate tender or be part of another joint venture for the purposes of the same Tender. The maximum number of JV members shall be specified in the **TDS.**

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

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

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

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

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

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

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

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

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

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

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

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

3.6 A Tenderer may have the nationality of any country, subject to the restrictions pursuant to ITT3.9. A Tenderer shall be deemed to have the nationality of a country if the Tenderer is constituted, incorporated or registered in and operates inconformity with the provisions of the laws of that country, as evidenced by its articles of incorporation (or equivalent documents of constitution or association) and its registration documents, as the case may be. This criterion also shall apply to the determination of the nationality of proposed subcontractors or sub-consultants for any part of the Contract including related Services.

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

3.8 A Tenderer that is a state-owned enterprise or a public institution in Kenya may be eligible to tender and be awarded a Contract(s) only if it is determined by the Procuring Entity to meet the following conditions, i.e. if it is:
   i) A legal public entity of Government and/or public administration,
   ii) financially autonomous and not receiving any significant subsidies or budget support from any public entity or Government, and
   iii) operating under commercial law and vested with legal rights and liabilities similar to any commercial enterprise to enable it compete with firms in the private sector on an equal basis.

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

a) as a matter of law or official regulations, Kenya prohibits commercial relations with that country, or

b) by an act of compliance with a decision of the United Nations Security Council taken under Chapter VII of the Charter of the United Nations, Kenya prohibits any import of goods or contracting of works or services from that country, or any payments to any country, person, or entity in that country.

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

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

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

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

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

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

**4. Eligible Goods, Equipment, and Services**

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

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

**5. Tenderer's Responsibilities**

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

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

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

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

**B. CONTENTS OF TENDER DOCUMENTS**

**6. Sections of Tender Document**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## 8. Amendment of Tender Documents

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

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

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

## C. PREPARATION OF TENDERS

## 9. Cost of Tendering

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

## 10. Language of Tender

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

## 11. Documents Comprising the Tender

11.1 The Tender shall comprise the following:

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

11.2 In addition to the requirements under ITT 11.1, Tenders submitted by a JV shall include a copy of the Joint Venture Agreement entered into by all members. Alternatively, a letter of intent to execute a Joint Venture Agreement in the event of a successful Tender shall be signed by all members and submitted with the Tender, together with a copy of the proposed JV Agreement. Change of membership and conditions of the JV prior to contract signature will render the tender liable for disqualification.

## 12. Form of Tender and Schedules

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

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

## 13. Alternative Tenders

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

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

13.3 Except as provided under ITT13.4 below, Tenderers wishing to offer technical alternatives to the requirements of the Tender Documents must first price the Procuring Entity's design as described in the Tender Documents and shall further provide all information necessary for a complete evaluation of the alternative by the Procuring Entity, including drawings, design calculations, technical specifications, breakdown of prices, and proposed construction methodology and other relevant details. Only the technical alternatives, if any, of the Tenderer with the Winning Tender conforming to the basic technical requirements shall be considered by the Procuring Entity.

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

## 14. Tender Prices and Discounts

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

14.2 The Tenderer shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by the Tenderer shall be deemed covered by the rates for other items in the Bill of Quantities and will not be paid for separately by the Procuring Entity. An item not listed in the priced Bill of Quantities shall be assumed to be not included in the Tender, and provided that the Tender is determined substantially responsive notwithstanding this omission, the average price of the item quoted by substantially responsive Tenderers will be added to the Tender price and the equivalent total cost of the Tender so determined will be used for price comparison.

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

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

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

14.6 Where tenders are being invited for individual lots (contracts) or for any combination of lots (packages), tenderers wishing to offer discounts for the award of more than one Contract shall specify in their Tender the price reductions applicable to each package, or alternatively, to individual Contracts within the package. Discounts shall be submitted in accordance with ITT 14.4, provided the Tenders for all lots (contracts) are opened at the same time.

14.7 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date 30 days prior to the deadline for submission of Tenders, shall be included in the rates and prices and the total Tender Price submitted by the Tenderer.

## 15. Currencies of Tender and Payment

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

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

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

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

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

15.3 Tenderers may be required by the Procuring Entity to justify, to the Procuring Entity's satisfaction, their local and foreign currency requirements, and to substantiate that the amounts included in the unit rates and prices and shown in the Schedule of Adjustment Data in the Appendix to Tender are reasonable, in which case a detailed breakdown of the foreign currency requirements shall be provided by Tenderers.

## 16. Documents Comprising the Technical Proposal

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

## 17. Documents Establishing the Eligibility and Qualifications of the Tenderer

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

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

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

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

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

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

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

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

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

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

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

## 18. Period of Validity of Tenders

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

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

## 19. Tender Security

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

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

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

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

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

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

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

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

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

b) if the successful Tenderer fails to:

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

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

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

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

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

**20. Format and Signing of Tender**

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

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

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

20.4 In case the Tenderer is a JV, the Tender shall be signed by an authorized representative of the JV on behalf of the JV, and so as to be legally binding on all the members as evidenced by a power of attorney signed by their legally authorized representatives.

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

**D. SUBMISSION AND OPENING OF TENDERS**

**21. Sealing and Marking of Tenders**

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

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

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

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

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

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

The inner envelopes or packages or containers shall:

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

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

## 22. Deadline for Submission of Tenders

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

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

## 23. Late Tenders

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

## 24. Withdrawal, Substitution, and Modification of Tenders

24.1 A Tenderer may withdraw, substitute, or modify its Tender after it has been submitted by sending a written notice, duly signed by an authorized representative, and shall include a copy of the authorization in accordance with ITT 20.3, (except that withdrawal notices do not require copies). The corresponding substitution or modification of the Tender must accompany the respective written notice. All notices must be:

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

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

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

## 25. Tender Opening

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

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

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

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

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

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

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

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

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

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

## E. Evaluation and Comparison of Tenders

### 26. Confidentiality

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

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

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

### 27. Clarification of Tenders

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

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

### 28. Deviations, Reservations, and Omissions

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

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

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

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

**29. Determination of Responsiveness**

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

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

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

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

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

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

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

**30. Non-material Non-conformities**

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

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

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

**31. Arithmetical Errors**

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

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

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

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

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

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

## 32. Conversion to Single Currency

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

## 33. Margin of Preference and Reservations

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

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

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

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

## 34. Nominated Subcontractors

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

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

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

## 35. Evaluation of Tenders

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

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

a) Price adjustment in accordance with ITT 31.1(iii); excluding provisional sums and contingencies, if any, but including Day work items, where priced competitively;
b) Price adjustment due to discounts offered in accordance with ITT 14.4;
c) converting the amount resulting from applying (a) and (b) above, if relevant, to a single currency in accordance with ITT 32;
d) price adjustment due to quantifiable non material non-conformities in accordance with ITT 30.3; and
e) any additional evaluation factors specified **in the TDS** and Section III, Evaluation and Qualification Criteria.

35.3 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be considered intender evaluation.

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

**36. Comparison of Tenders**

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

**37. Abnormally Low Tenders and Abnormally High**

**Tenders Abnormally Low Tenders**

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

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

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

**Abnormally High Tenders**

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

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

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

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

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

**38. Unbalanced and/or Front-Loaded Tenders**

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

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

a) accept the Tender; or

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

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

d) reject the Tender,

**39. Qualifications of the Tenderer**

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

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

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

**40. Lowest Evaluated Tender**

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

a) Most responsive to the Tender document; and

b) The lowest evaluated price.

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

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

## F. AWARD OF CONTRACT

**42. Award Criteria**

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

**43. Notice of Intention to enter into a Contract**

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

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

b) the Contract price of the successful tender;

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

d) the expiry date of the Standstill Period; and

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

## 44. Stand still Period

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

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

## 45. Debriefing by the Procuring Entity

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

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

## 46. Letter of Award

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

## 47. Signing of Contract

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

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

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

## 48. Performance Security

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

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

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

## 49. Publication of Procurement Contract

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

a) name and address of the Procuring Entity;

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

## 50. Procurement Related Complaint and Administrative Review

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

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

## Section II - Tender Data Sheet (TDS)

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

| Reference to ITC Clause | PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS |
|---|---|
| **A. General** | |
| **ITT 1.1** | The name of the contract is: **Construction of Muranga South Water Supply Project.**<br><br>The reference number of the Contract is: **MUSWASCO/KWASH/26-27/01**<br>The number and identification of lots (contracts) comprising this Tender are: **Not Applicable** |
| **ITT 2.4** | The Information made available on competing firms is as follows: **Not Applicable** |
| **ITT 2.4** | The firms that provided consulting services for the contract being tendered for are:<br>**Not Applicable** |
| **ITT 3.1** | Maximum number of members in the Joint Venture (JV) shall be: **Not Applicable** |
| **B. Contents of Tender Document** | |
| **ITT 7.1** | (i) The Tenderer will submit any request for clarifications in writing at the Address<br>***MANAGING DIRECTOR***<br>***MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED***<br>***P.O BOX 84-01034 KANDARA, NEXT TO DC'S OFFICE-KANDARA.***<br>***Telephone:*** *+254716645345*<br>***Email:*** *murangasouth@gmail.com or info@muswasco.co.ke*<br><br>to reach the Procuring Entity not later than **9th NOVEMBER, 2026** AT **1700HRS**<br><br>(ii) The Procuring Entity will publish its response at the website: **www.muswasco.co.ke** |
| **ITT 7.2** | (A) A pre-arranged pretender site visit *"***shall***"* take place at the following date, time and place:<br>Date: **10TH NOVEMBER,2026**<br>Time**: 10:30 AM**<br>Place: **HEADQUARTERS OFFICES-MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED**<br>**P.O BOX 84-01034 KANDARA, NEXT TO DC'S OFFICE-KANDARA.**<br><br>(B) Pre-Tender meeting *"***shall***"* take place at the following date, time and place:<br>Date: **10TH NOVEMBER,2026**<br>Time**: 10:30 AM**<br>Place: **HEADQUARTERS OFFICES-MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED**<br>**P.O BOX 84-01034 KANDARA, NEXT TO DC'S OFFICE-KANDARA.** |
| **ITT 7.3** | The Tenderer will submit any questions in writing, to reach the Procuring Entity not later than **9th November,2026** at **1700hrs** |
| **ITT 7.5** | The Procuring Entity's website where Minutes of the pre-Tender meeting and the pre-arranged pretender will be published is:**www.muswasco.co.ke** but also the minutes shall be shared to all the mails who will be registered during the pre-tender site visit. |
| **C. Preparation of Tenders** | |
| ITT 11.1 (h) | The Tenderer shall submit the following additional documents in its Tender:<br>*The list of additional documents should include the following:*<br><br>1) *Registration with NCA (National Construction Authority) -NCA 7 and above*<br>*2) Copies of certificates of registration/incorporation, and principal place of business;*<br>*3) Total monetary value of construction work performed for each of the last five years-with proof of the works as requested*<br>*4) Tender security of stated amount in the tender document from a reputable financial institution as required in this Tender document*<br>*5) Experience in works of a similar nature and size as the prime contractor for each* |

| Reference to ITC Clause | PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS |
|---|---|
| | *of the last 10 years, and clients who may be contacted for further information on these contracts;*<br>*6) Major items of construction equipment owned and to be leased*<br>*7) Qualifications and experience of key site management and technical personnel proposed for the Contract (minimum of 5 years required in works of an equivalent nature and volume).*<br>***Note: An employment contract should be provided which covers the duration of the project,***<br>*8) Authority to seek references from the Tenderer's bankers.*<br>*9) Certified Audited accounts for the last 3 years*<br>*10) Tenderers are required to attach copies of the, TAX Compliance Certificate, PIN and VAT certificates from Income Tax and Value Added Tax Departments, current Single Business*<br>*11) Permit and receipt/copy of the sent mail to Muswasco as proof of download of the Tender Document.*<br>*12) Organizational structure, delivery schedule and proposed Workplan*<br>*13) Duly filled and signed form of tender.*<br>*14) Copy of the signed pretender site visit certificate.*<br>*15) Litigation history*<br>*16) CR12 for the company*<br>*17)Any other document listed in the qualification criteria* |
| **ITT 13.1** | Alternative Tenders *"**shall not be**"* considered. |
| ITT 13.2 | Alternative times for completion *"**shall not be**"* permitted. |
| ITT 13.4 | Alternative technical solutions shall be permitted for the following parts of the Works ***shall not be"*** permitted. |
| **ITT 14.5** | The prices quoted by the Tenderer shall be**: *"fixed"*** |
| **ITT 15.2(a)** | Foreign currency requirements **not allowed.** |
| **ITT 18.2** | The Tender validity period shall be **210** days. |
| **ITT 18.3** | a) The Number of days beyond the expiry of the initial tender validity period will be _____**30**__days.<br><br>(b) The Tender price shall be adjusted by the following percentages of the tender price: **Not Applicable**<br>(i) By _____% of t*he local currency portion of the Contract price adjusted to reflect local inflation during the period of extension,*<br>*and*<br><br>*(ii) By_____% the foreign currency portion of the Contract price adjusted to reflect the international inflation during the period of extension.* |
| **ITT 19.1** | A Tender Security *"**shall be**"* required.<br>A Tender-Securing Declaration _____ ***shall not be*** _____ required.<br>Tenderer shall provide a tender security of Ksh. **350,000** valid for 210 days in the format provided in this tender document |
| **ITT 19.5** | Other documents required are _____ **Not Aplicable** |
| **ITT 20.1** | In addition to the original of the Tender, the number of copies is: **one (1) Original and One (1) copy of the original** |
| **ITT 20.3** | The written confirmation of authorization to sign on behalf of the Tenderer shall consist of: ***Written power of Attorney duly notarized by a commissioner of oaths*** |
| **D. Submission and Opening of Tenders** | |
| **ITT 21.2** | A tender package or container that cannot fit in the tender box shall be received as follows: **Shall be delivered at the reception desk (Managing Director's Office) and clearly recorded on the register.** |
| **ITT 22.1** | (A) For Tender submission purposes only, the Procuring Entity's address is: |

| Reference to ITC Clause | PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS |
|---|---|
| | ***MANAGING DIRECTOR***<br>***MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED***<br>***P.O BOX 84-01034 KANDARA, NEXT TO DC'S OFFICE-KANDARA.***<br>***Telephone:*** *+254716645345*<br>***Email:*** *murangasouth@gmail.com or info@muswasco.co.ke*<br><br>(B)Date and time for submission of Tender: **18TH NOVEMBER, 2026** at **10:30 AM**<br>(C) Tenders **shall not submit** tenders electronically. |
| **ITT 25.1** | The Tender opening shall take place at the time and the address for Opening of Tenders provided below:<br><br>***MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED***<br>***P.O BOX 84-01034 KANDARA, NEXT TO DC'S OFFICE-KANDARA.***<br>***Telephone:*** *+254716645345*<br>***Email:*** *murangasouth@gmail.com or info@muswasco.co.ke*<br><br>State date and time of tender opening.<br>Date:**18th November,2026**<br>Time: **1030hrs EAT** |
| **ITT 25.1** | If Tenderers are allowed to submit Tenders electronically, they shall follow the electronic tender submission procedures**: Not Applicable** |
| **E. Evaluation, and Comparison of Tenders** | |
| **ITT 30.3** | The adjustment shall be based on the _____ **Not Applicable** _____ *[insert "average" or "highest"]* price of the item or component as quoted in other substantially responsive Tenders. If the price of the item or component cannot be derived from the price of other substantially responsive Tenders, the Procuring Entity shall use its Lowest estimate. **The lowest evaluated bidder shall be awarded the tender** |
| **ITT 31.2** | The error shall be considered a major deviation that leads to disqualification of the tender if the percentage of the error (error over the tender price quoted) is: more than_____% or less than _____ %. **(Not Applicable)** |
| **ITT 32.1** | The currency that shall be used for Tender evaluation and comparison purposes to convert at the selling exchange rate all Tender prices expressed in various currencies into a single currency is: **Kenya Shillings** |
| **ITT 33.2** | A margin of preference *"**shall not**"* apply.<br>*[If a margin of preference applies, the application methodology shall be defined in Section III – Evaluation and Qualification Criteria.]* |
| **ITT 33.4** | The invitation to tender is extended to the following groups that qualify for Reservations: **Tendering shall be conducted under open competitive method** |
| **ITT 34.1** | At this time, the Procuring Entity *"**does not intend**"* to execute certain specific parts of the Works by subcontractors selected in advance. |
| **ITT 34.2** | Contractor's may propose subcontracting: Maximum percentage of subcontracting permitted is: ___ **Not Applicable** ____*% of the total contract amount.* Tenderers planning to subcontract more than 10% of total volume of work shall specify, in the Form of Tender, the activity (ies) or parts of the Works to be subcontracted along with complete details of the subcontractors and their qualification and experience. |
| **ITT 34.3** | The parts of the Works for which the Procuring Entity permits Tenderers to propose Specialized Subcontractors are designated as follows: **Not Applicable**<br><br>For the above-designated parts of the Works that may require Specialized Subcontractors, the relevant qualifications of the proposed Specialized Subcontractors will be added to the qualifications of the Tenderer for the purpose of evaluation. |
| **ITT 35.2 (e)** | Additional requirements apply. These are detailed in the evaluation criteria in Section III, Evaluation and Qualification Criteria.:<br>**All documents as listed in the qualification criteria** |
| **ITT 48.2** | Additional requirements are: **All documents as listed in the qualification criteria** |
| **ITT 50.1** | The procedures for making a Procurement-related Complaint are available from the |

| Reference to ITC Clause | PARTICULARS OF APPENDIX TO INSTRUCTIONS TO TENDERS |
|---|---|
| | PPRA website info@ppra.go.ke or complaints@ppra.go.ke. If a Tenderer wishes to make a Procurement-related Complaint, the Tenderer should submit its complaint following these procedures, in writing (by the quickest means available, that is either by hand delivery or email to:<br><br>For the attention:<br><br>Title/position: **MANAGING DIRECTOR**<br><br>Procuring Entity: ***MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED***<br><br>Email address*: murangasouth@gmail.com or info@muswasco.co.ke*<br><br>In summary, a Procurement-related Complaint may challenge any of the following:<br><br>(i) the terms of the Tender Documents; and<br><br>(ii) the Procuring Entity's decision to award the contract. |

# SECTION III- EVALUATION AND QUALIFICATION CRITERIA

**General Provisions**

## 1. General Provisions

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

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

a) For construction turnover or financial data required for each year - Exchange rate prevailing on the last day of the respective calendar year (in which the amounts for that year is to be converted) was originally established.
b) Value of single contract - Exchange rate prevailing on the date of the contract signature.
c) Exchange rates shall be taken from the publicly available source identified in the ITT 14.3. Any error in determining the exchange rates in the Tender may be corrected by the Procuring Entity.

1.3 Evaluation and contract award Criteria

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

## 2. Preliminary examination for Determination of Responsiveness

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

**N/B:**
**Any false information or documentary evidence provided by a tenderer at Preliminary or Technical evaluation stage shall lead to disqualification, the tenderer shall not be considered further throughout the evaluation process regardless of their financial offer**

**EVALUATION AND COMPARISON OF BIDS**

The following evaluation criteria shall be applied not withstanding any other requirement in the tender documents.

**a) Mandatory Requirements (MR)**

**The following requirements must be met by the tenderer**

| S/No. | MANDATORY REQUIREMENT | REQUIREMENT | B1 | B2 | B3 |
|---|---|---|---|---|---|
| MR1 | Must Submit a copy of certificate of Registration/Incorporation | Year of Reg./Incorp | | | |
| MR2 | Must Submit a copy of KRA Pin Certificate | Serial No. | | | |
| MR3 | Must Submit a certified copy of a valid Tax Compliance certificate. | Serial No.& Expiry Date | | | |
| MR4 | Must Fill the Bill of Quantities in the Format provided. All financial alternations if any must be countersigned by the Tenderer | Dully Filled, Signed & stamped | | | |
| MR5 | Must Fill the Form of Tender in the Format provided | Dully Filled, Signed & stamped | | | |
| MR6 | Must submit a certified copy of certificate of registration with the National Construction Authority (NCA – 7 & above (Water category) | Registration Class & Expiry Date | | | |
| MR7 | Must submit a certified copy of certificate of practicing license from the National Construction Authority (NCA – 7 & above (Water category) | Registration Class & Expiry Date | | | |
| MR8 | Must submit a certified valid certificate of registration as a water works contractor with Ministry of Water, Sanitation and Irrigation | Registration Class & Expiry Date | | | |
| MR9 | Must submit a duly filled up Confidential Business Questionnaire in format provided | Duly Filled, Signed & Stamped | | | |
| MR10 | Certified Audited Financial Accounts for the last 3 Financial Years:(2022/2023,2023/2024,2024/25 or certified management account for 2024/25) | Signed and stamped by Auditor. (*Tenderers must clearly indicate the Auditor's ICPAK practicing license number in the audited financial statements report.*) | | | |
| MR11 | Must attend the mandatory pre-tender site visit and submit a certificate of Pre-tender site visit duly signed by client | Duly signed Certificate | | | |
| MR12 | Litigation history related to government contracts – Fill the litigation form and should be signed by the commissioner of oaths | Form signed/Certified by commissioner of oaths | | | |
| MR13 | Must attach a valid Proof of county business permit | Registration Class & Expiry Date | | | |
| MR14 | Tender security of the stated amount in tender document (Kshs. 350,000) and as per given conditions | Bankers' cheque/ Unconditional bank guarantee | | | |
| MR15 | Receipt/Copy of the sent mail to Muswasco as proof of download of the tender document | Attached evidence | | | |
| MR16 | Must submit a certified copy of valid CR12 alongside copies of identification Cards/Passport of directors | Valid within 12 Months from the Tender opening date | | | |
| MR17 | Tenderers must sequentially serialize all pages of their document numerically ie. 1,2, 3.. up to the last page including attachments. | | | | |
| MR18 | Must submit a certified copy of valid compliance certificate to N.S.S.F | Serial No.& Expiry Date | | | |
| MR19 | Must submit a written power of attorney on tender's letter head for the authorized person to sign the tender | Form signed/Certified by commissioner of oaths | | | |

| | | | | | |
|---|---|---|---|---|---|
| | on behalf of the tenderer | | | | |
| MR20 | Must Submit a duly filled, signed and stamped written confirmation on Tenderer's Letter head that the Bidder has not been debarred as a contractor in Kenya and that the Tenderer is Eligible to participate in procurement | | | | |
| MR21 | Must Submit a duly filled, signed and stamped written declaration on Tenderer's Letter head that if selected/awarded, the Tenderer shall not be involved in corruption or fraudulent practices | | | | |
| MR22 | Must submit a dully filled, signed and stamped declaration and commitment to the code of Ethics on Tenderer's letter head | | | | |
| MR23 | Must submit a dully filled, signed and stamped certificate of Independent Tender Determination on Tenderer's letter head | | | | |
| **RESPONSIVE/NON-RESPONIVE(NR/R)** | | | | | |

Key:

B1= Bidder 1
B2= Bidder 2
B3= Bidder 3

***NB: AT THIS STAGE, THE TENDERER'S SUBMISSION WILL EITHER BE RESPONSIVE OR NON-RESPONSIVE.THE NON-RESPONSIVE SUBMISIONS WILL BE ELIMINATED FROM THE ENTIRE EVALUATION PROCESS AND WILL NOT BE CONSIDERED FURTHER REGARDLESS OF THEIR TECHNICAL AND FINANCIAL OFFER***

## b) Technical Evaluation Score

This section (Technical Evaluation) will be marked out of 100 and will determine the technical score (TS)

| | | | **Max Score** | **Tenderer's Score** | | |
|---|---|---|---|---|---|---|
| **No.** | **Evaluation Attribute** | **Weighting Score** | **Max Score** | **B1** | **B2** | **B3** |
| T.S.1 | Evidence of experience of atleast 10 No. works of Similar nature for atleast 10 years prior to the applications submission deadline. The Tenderer **must** attach client list alongside **certified** copies of **either**:<br>i. Notification of award with corresponding certificate of practical completion<br>ii. Purchase order with corresponding practical completion certificate<br>iii. Duly signed & stamped contract of works with corresponding certificate of practical completion | ▪ 10 Clients with complete submission – 20 Marks<br>▪ Others prorated at: 2 Marks each | 20 marks | | | |
| T.S.2 | Evidence of equipment and accessories owned by the company and to be directly assigned to the project during the contract period<br>(Attach **certified** copies of certificates of ownerships, purchase receipts, sale agreements or lease agreements) | Provide details/ list of at least 10 equipment and accessories and explain what they will be used for in the project implementation<br>(1 marks for each equipment) | 10 marks | | | |
| T.S.3 | Evidence of qualification and experience of key site management and Technical personnel proposed for the contract.<br>For each personnel submit **certified** copies of certificates, membership to professional bodies, updated curriculum vitae with evidence of undertaking similar works and affirmation letter of availability of each proposed personnel to be deployed to the site) | i. **Site Engineer**:<br>Be a holder of a bachelors degree in civil/water engineering, construction or equivalent with atleast 5 years relevant experience (5 Marks)<br>**ii. Foreman**<br>Be a holder of a diploma in Civil/water engineering, construction or equivalent with atleast 4 years relevant experience (3 Marks)<br>**iii. Supervisor**<br>Be a holder of a certificate in Civil/water engineering, construction or equivalent with atleast 3 years relevant experience(2 Marks) | 10 marks | | | |
| T.S.3 | Financial Strength of the company.<br>Average Current Ratio<br>= Current Assets / Current liabilities | ▪ 2:1 ratio – 10 marks<br>Others prorated at:<br>The ratio x10 / 2 | 10 marks | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| T.S.4 | Financial Strength of the company:<br>Average Acid Test Ratio<br>= Current Assets– Average stock<br>Current Liabilities | ▪ 1:1 ratio – 10 marks<br>Others prorated at:<br>The ratio x10<br>1 | 10 marks | | | |
| T.S.6 | Physical Facilities: provide details of physical address and contacts<br>(Attach **certified** evidence only) | Details of physical address and contacts with copy of either title, premises lease documents or latest utility bill | 5 marks | | | |
| T.S.7 | Organizational Structure | Give structure with details of responsibilities | 5 marks | | | |
| T.S.8 | Detailed workplan & detailed delivery schedule of Works for the period indicated | As per provided Timeline in Tender document | 20 marks | | | |
| T.S.9 | Authority to seek references from tenderers bankers | Tenderer committal letter | 5 marks | | | |
| T.S.10 | Fully filled tender forms as per section IV for qualifications | All filled forms | 5 Marks | | | |
| **TOTAL TECHNICAL SCORE(Marks)** | | | **100 Marks** | | | |
| **Only bidders who score 70% and above will be subjected to financial evaluation. Those who score below 70% shall be eliminated at this stage from the entire evaluation process and will not be considered further** | | | | | | |

**c) The Financial Evaluation (FS)**

Tenderer that shall pass the technical evaluation shall be subjected to financial evaluation as follows:

**i. Arithmetic Error check**

The evaluation will check the arithmetic errors and confirm the changed prices with the tenderer but, as per clause 31.0,

No change of the tender sum submitted and read out during tender opening, including any voluntary increase or decrease, in the prices or substance of the tender shall be sought, offered, or permitted, except to confirm the correction of arithmetic errors discovered by the Procuring Entity in the evaluation of the tenders, in accordance with ITT 31.

| No. | Evaluation Attribute | Weighting Score | Max Score | B1 | B2 | B3 |
|---|---|---|---|---|---|---|
| F.S.1 | Arithmetic errors | (Original Tender Sum – Corrected Tender Sum)/ Original Tender Sum | - | | | |
| | | | | | | |

**ii. Comparison and ranking of bid amounts/tender sums**

The bidders tender sum /bid amount shall be compared to establish the lowest evaluated responsive tenderer

**iii. Award of Contract**

The lowest evaluated responsive tenderer within the engineer's estimate shall be recommended for awarded the works contract.

**NB:**

i. **The procuring entity reserves the right to carry out due diligence on the responsive tenders prior to award of the contract**

ii. **MUSWASCO may conduct negotiation prior to award in line to the applicable Procurement Laws in instances where:**

   a) **There is a tie in the lowest evaluated bid price by two or more tenderers**
   b) **The lowest evaluated bid price is in excess of the available budget**
   c) **Where change of scope is envisaged**

**3. Evaluation (ITT 35) N/A**

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

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

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

iii) **Other Criteria; i**f permitted under ITT 35.2(d)

:…….....

**4. Multiple Contracts N/A**

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

**OPTION 1**

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

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

awarded the combination of Lots for which the tenderer qualifies and the others will be considered for award to second lowest the tenderers.

**OPTION 2 N/A**

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

**5. Alternative Tenders (ITT 13.1) N/A**

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

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

**6. MARGIN OF PREFERENCE N/A**

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

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

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

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

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

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

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

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

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

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

   ii) Minimum average annual construction turnover of Kenya Shillings forty million, equivalent calculated as total certified payments received for contracts in progress and/or completed within the last 10 years.

iii) At least 10 of contract(s) of a similar nature executed within Kenya, or the East African Community or abroad, that have been satisfactorily and substantially completed as a prime contractor, or joint venture member or sub-contractor each of minimum value Kenya shillings forty million equivalent.

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

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

vi) Other conditions depending on their seriousness.

a) **History of non-performing contracts**:
Tenderer and each member of JV incase the Tenderer is a JV, shall demonstrate that Non-performance of a contract did not occur because of the default of the Tenderer, or the member of a JV in the last 5 years. The required information shall be furnished in the appropriate form.

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

**c) Litigation History**
There shall be no consistent history of court/arbitral award decisions against the Tenderer, in the last 5 years All parties to the contract shall furnish the information in the appropriate form about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the years specified. A consistent history of awards against the Tenderer or any member of a JV may result in rejection of the tender.

## 8. QUALIFICATION FORM SUMMARY

| 1 | 2 | 3 | *4* | *5* |
|---|---|---|---|---|
| **Item No.** | **Qualification Subject** | **Qualification Requirement** | ***Document To be Completed by Tenderer*** | ***For Procuring Entity's Use (Qualification met or Not Met)*** |
| 1 | Nationality | Nationality in accordance with ITT 3.6 | Forms ELI – 1.1 and 1.2, with attachments | |
| 2 | Tax Obligations for Kenyan Tenderers | Has produced a current tax clearance certificate or tax exemption certificate issued by Kenya Revenue Authority in accordance with ITT 3.14. | Attachment | |
| 3 | Conflict of Interest | No conflicts of interest in accordance with ITT 3.3 | Form of Tender | |
| 4 | PPRA Eligibility | Not having been declared ineligible by the PPRA as described in ITT 3.7 | Form of Tender | |
| 5 | State- owned Enterprise | Meets conditions of ITT 3.8 | Forms ELI – 1.1 and 1.2, with attachments | |
| 6 | Goods, equipment and services to be supplied under the contract | To have their origin in any country that is not determined ineligible under ITT 4.1 | Forms ELI – 1.1 and 1.2, with attachments | |
| 7 | History of Non-Performing Contracts | Non-performance of a contract did not occur as a result of contractor default since 1st January [……*]*. | Form CON-2 | |
| 8 | Suspension Based on Execution of Tender/Proposal Securing Declaration by the Procuring Entity | Not under suspension based on-execution of a Tender/Proposal Securing Declaration pursuant to ITT 19.9 | Form of Tender | |
| 9 | Pending Litigation | Tender's financial position and prospective long-term profitability still sound according to criteria established in 3.1 and assuming that all pending litigation will NOT be resolved against the Tenderer. | Form CON – 2 | |
| 10 | Litigation History | No consistent history of court/arbitral award decisions against the Tenderer since 1st January *[insert year]*. | Form CON – 2 | |
| 11 | Financial Capabilities | (i) The Tenderer shall demonstrate that | Form FIN – 3.1, with | |

| 1 | 2 | 3 | *4* | *5* |
|---|---|---|---|---|
| **Item No.** | **Qualification Subject** | **Qualification Requirement** | ***Document To be Completed by Tenderer*** | ***For Procuring Entity's Use (Qualification met or Not Met)*** |
| | | it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow requirements estimated as Kenya Shillings *[insert amount]* equivalent for the subject contract(s) net of the Tenderer's other commitments.<br><br>(ii) The Tenderers shall also demonstrate, to the satisfaction of the Procuring Entity, that it has adequate sources of finance to meet the cash flow requirements on works currently in progress and for future contract commitments.<br><br>(iii) The audited balance sheets or, if not required by the laws of the Tenderer's country, other financial statements acceptable to the Procuring Entity, for the last *[insert number of years]* years shall be submitted and must demonstrate the current soundness of the Tenderer's financial position and indicate its prospective long-term profitability. | attachments | |
| 12 | Average Annual Construction Turnover | Minimum average annual construction turnover of Kenya Shillings *[insert amount]*, equivalent calculated as total certified payments received for contracts in progress and/or completed within the last *[insert of year]* years, divided by *[insert number of years]* years | Form FIN – 3.2 | |

| 1 | 2 | 3 | *4* | *5* |
|---|---|---|---|---|
| **Item No.** | **Qualification Subject** | **Qualification Requirement** | ***Document To be Completed by Tenderer*** | ***For Procuring Entity's Use (Qualification met or Not Met)*** |
| 13 | General Construction Experience | Experience under construction contracts in the role of prime contractor, JV member, sub-contractor, or management contractor for at least the last *[insert number of years]* years, starting 1st January *[insert year]*. | Form EXP – 4.1 | |
| 14 | Specific Construction & Contract Management Experience | A minimum number of *[state the number]* similar contracts specified below that have been satisfactorily and substantially completed as a prime contractor, joint venture member, management contractor or sub-contractor between 1st January [*insert year*] and tender submission deadline i.e. …. (Number) contracts, each of minimum value Kenya shillings…….. equivalent.<br>[*In case the Works are to be tender as individual contracts under multiple contract procedure, the minimum number of contracts required for purposes of evaluating qualification shall be selected from the options mentioned in ITT 35.4]*<br><br>The similarity of the contracts shall be based on the following: [*Based on Section VII, Scope of Works, specify the minimum key requirements in terms of physical size, complexity, construction method, technology and/or other characteristics including part of the requirements that may be met by specialized subcontractors, if permitted in accordance with ITT 34.3]* | Form EXP 4.2(a) | |

## SECTION IV - TENDERING FORMS

### QUALIFICATION FORMS

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

### OTHER FORMS

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

### TECHNICAL PROPOSAL FORMS

Site Organization.

Method Statement.

Mobilization Schedule.

Construction Schedule.

## QUALIFICATION FORMS

### 1. FOREIGN TENDERERS 40% RULE

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

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

## 3. FORM EQU: EQUIPMENT

The Tenderer shall provide adequate information to demonstrate clearly that it has the capability to meet the requirements for the key equipment listed in Section III, Evaluation and Qualification Criteria. A separate Form shall be prepared for each item of equipment listed, or for alternative equipment proposed by the Tenderer.

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

Omit the following information for equipment owned by the Tenderer.

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

## 4. FORMPER-1

**Contractor's Representative and Key Personnel Schedule**

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

**Contractor' Representative and Key Personnel**.

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

| | | |
|---|---|---|
| | **Time commitment: for this position:** | [*insert the number of days/week/months/ that has been scheduled for this position*] |
| | **Expected time schedule for this position:** | [*insert the expected time schedule for this position (e.g. attach high level Gantt chart*] |

## 5. FORM PER-2:

Resume and Declaration - Contractor's Representative and Key Personnel

| Name of Tenderer |
|---|

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

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

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

**DECLARATION**

I, the under signed *[insert either "Contractor's Representative" or "Key Personnel" as applicable]*, certify that to the Lowest of my knowledge and belief, the information contained in this Form PER-2 correctly describes myself, my qualifications and my experience.

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

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

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

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

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

Signature:_____

Date: (day month year): _____

Countersignature of authorized representative of the Tenderer:

Signature:_____

Date: (day month year): _____

## 6. TENDERERS QUALIFICATION WITHOUT PRE-QUALIFICATION

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

### 6.1 FORM ELI-

### 1.1 Tenderer Information

**Form**

Date:_____

ITT No. and title:_____

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

## 62 FORM ELI-1.2

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

Date:_____

ITT No. andtitle:_____

| |
|---|
| Tenderer's JV name: |
| JV member's name: |
| JV member's country of registration: |
| JV member's year of constitution: |
| JV member's legal address in country of constitution: |
| JV member's authorized representative information<br>Name: _____<br>Address: _____<br>Telephone/Fax numbers: _____<br>E-mail address: _____ |
| 1. Attached are copies of original documents of<br>☐ Articles of Incorporation (or equivalent documents of constitution or association), and/or registration documents of the legal entity named above, in accordance with ITT 43.6.<br>☐ In case of a state-owned enterprise or institution, documents establishing legal and financial autonomy, operation in accordance with commercial law, and that they are not under the supervision of the Procuring Entity, in accordance with ITT 3.8.<br><br>2. Included are the organizational chart and a list of Board of Directors |

## 63 FORM CON – 2

**Historical Contract Non-Performance, Pending Litigation and Litigation History**

Tenderer'sName:_____

Date:_____

JV Member's Name_____

ITT No. and title:_____

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

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

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

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

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

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

## 64 FORM FIN –3.1:

**Financial Situation and Performance**

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

### 6.4.1. Financial Data

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

**Refer to ITT 15 for the exchange rate*

### 6.4.2 Sources of Finance

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

| No. | Source of finance | Amount (Kenya Shilling equivalent) |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |

### 6.4.3 Financial documents

The Tenderer and its parties shall provide copies of financial statements for_____years pursuant Section III, Evaluation and Qualifications Criteria, Sub-factor 3.1. The financial statements shall:

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

Attached are copies of financial statements [1] for the_____years required above; and complying with the requirements

### 6.5 FORM FIN – 3.2:

**Average Annual Construction Turnover**

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

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

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

## 6.6 FORM FIN –3.3:

**Financial Resources**

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

## 6.7 FORM FIN–3.4:

**Current Contract Commitments / Works in Progress**

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

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

## 6.8 FORM EXP -4.1

**General Construction Experience**

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

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

## 6.9 FORM EXP -4.2(a)

**Specific Construction and Contract Management Experience**

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

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

## 6.10 FORM EXP -4.2(b)

**Construction Experience in Key Activities**

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

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

*l.* Key Activity No One: _

| | **Information** | | | |
|---|---|---|---|---|
| Contract Identification | | | | |
| Award date | | | | |
| Completion date | | | | |
| Role in Contract | Prime Contractor ☐ | Member in JV ☐ | Management Contractor ☐ | Sub-contractor ☐ |
| Total Contract Amount | | | **Kenya Shilling** | |
| Quantity (Volume, number or rate of production, as applicable) performed under the contract per year or part of the year | Total quantity in the contract (i) | Percentage participation (ii) | | Actual Quantity Performed (i) x (ii) |
| Year 1 | | | | |
| Year 2 | | | | |
| Year 3 | | | | |
| Year 4 | | | | |
| Procuring Entity's Name: | | | | |
| Address:<br>Telephone/fax number<br>E-mail: | | | | |

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

2. Activity No. Two

3. . ……

## OTHER FORMS

### 7. FORM OF TENDER

**(Amended and issued pursuant to PPRA CIRCULAR No. 02/2022)**

***INSTRUCTIONS TO TENDERERS***

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

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

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

**Date of this Tender submission**:.....*[insert date (as day, month and year) of Tender submission]* **Tender Name and Identification**:.....*[insert identification]* **Alternative No.**:.....*[insert identification No if this is a Tender for an alternative]*

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

Dear Sirs,

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

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

_____

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

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

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

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

5. We, the undersigned, further declare that:

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

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

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

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

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

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

**Option2,** in case of multiple lots:

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

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

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

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

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

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

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

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

xiii) *Suspension and Debarment:* We, along with any of our subcontractors, suppliers, Engineer, manufacturers, or service providers for any part of the contract, are not subject to, and not controlled by any entity or individual that is subject to, a temporary suspension or a debarment imposed by the Public Procurement Regulatory Authority or any other entity of the Government of Kenya, or any international organization.

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

*xv)* *Commissions, gratuities, fees:* We have paid, or will pay the following commissions, gratuities, or fees with respect to the tender process or execution of the Contract: *[insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount and currency of each such commission or gratuity]*

| Name of Recipient | Address | Reason | Amount |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

*(If none has been paid or is to be paid, indicate "none.")*

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

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

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

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

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

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

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

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

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

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

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

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

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

*Tender*]

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

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

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

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

Date signed_____day of_____,_____

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

## A. TENDERER'S ELIGIBILITY-CONFIDENTIAL BUSINESS QUESTIONNAIRE

**Instruction to Tenderer**

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

**i) Tenderer's details**

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

## General and Specific Details

**ii) Sole Proprietor,** provide the following details.

Name in full_____Age_____
Nationality_____Country of Origin_____
Citizenship _____

**iii) Partnership,** provide the following details.

| | Names of Partners | Nationality | Citizenship | % Shares owned |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

**(iv) Registered Company,** provide the following details.

i) Private or public Company _____

ii) State the nominal and issued capital of the Company

Nominal Kenya Shillings (Equivalent).....

Issued Kenya Shillings (Equivalent).....

iii) Give details of Directors as follows.

| | Names of Director | Nationality | Citizenship | % Shares owned |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

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

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

If yes, provide details as follows.

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

**ii) Conflict of interest disclosure**

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

**Certification**

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

Full Name_____ Title or Designation_____

_____ _____

*(Signature)* *(Date)*

## B. CERTIFICATE OF INDEPENDENT TENDER DETERMINATION

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

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

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

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

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

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

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

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

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

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

Name_____

Title_____

Date_____

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

## SELF-DECLARATION FORMS

### FORM SD1

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

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

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

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

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

| ……. | ……. | …… |
|---|---|---|
| (Title) | (Signature) | (Date) |

Bidder Official Stamp

**FORM SD2**

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

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

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

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

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

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

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

…… …… ……
(Title) (Signature) (Date)

Bidder's Official Stamp

## DECLARATION AND COMMITMENT TO THE CODE OF ETHICS

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

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

Name of Authorized signatory.....

Sign.....

Position.....

Office address..... Telephone.....
E-mail.....
Name of the Firm/Company.....
Date.....

(Company Seal/Rubber Stamp where
applicable) Witness

Name.....

Sign.....

Date.....

## D. APPENDIX 1-FRAUD AND CORRUPTION

*(Appendix 1 shall not be modified)*

### 1. Purpose

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

### 2. Requirements

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

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

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

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

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

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

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

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

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

2.3 In compliance with Kenya's laws, regulations and policies mentioned above, the Procuring Entity:
   a) Defines broadly, for the purposes of the above provisions, the terms set forth below as follows:

i) "corrupt practice" is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;

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

iii) "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

iv) "coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

v) "obstructive practice" is:

- deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede investigation by Public Procurement Regulatory Authority (PPRA) or any other appropriate authority appointed by Government of Kenya into allegations of a corrupt, fraudulent, coercive, or collusive practice; and/or threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or

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

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

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

c) Rejects a proposal for award[1] of a contract if PPRA determines that the firm or individual recommended for award, any of its personnel, or its agents, or its sub-consultants, sub-contractors, service providers, suppliers and/ or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;

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

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

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

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

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

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

**Beneficiary:**_____

**Request for Tenders No:**

_____

**Date:**_____

**TENDER GUARANTEE No.:**_____

**Guarantor:** _____

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

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

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

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

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

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

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

_____

*[signature(s)]*

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

**FORMAT OF TENDER SECURITY [Option 2–Insurance Guarantee]**

**TENDER GUARANTEE No.: _____**

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

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

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

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

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

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

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

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

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

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

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

**FORM OF TENDER-SECURING DECLARATION**

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

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

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

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

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

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

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

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

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

Signed:……..……..

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

Name:……..

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

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

*signing]*

Seal or stamp

## Appendix to Tender

**Schedule of Currency requirements**

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

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

## 5. TECHNICAL PROPOSAL

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

### 5.1 Site Organization

*[Insert Site Organization information]*

### 5.2 Method Statement

*[Insert Method Statement]*

### 5.3 Mobilization Schedule

*[Insert Mobilization Schedule]*

### 5.4 Construction Schedule

*[Insert Construction Schedule]*

# PART 2 - WORKS' REQUIREMENTS

## SECTION V - BILLS OF QUANTITIES

### SCOPE OF WORKS

**Introduction**

Muranga South Water and sanitation Company intends to undertake the Muranga South Water Supply Project on various locations identified by the Employer.

The Contractor shall provide all labour, materials, plant, equipment, supervision and incidentals necessary for the complete execution of the Works in accordance with the Contract Documents.

**i) Project Location**

The project is located within the service area of Muranga South Water and Sanitation Company (MUSWASCO). MUSWASCO is one of the WSPs mandated to provide water and sanitation services in Muranga County. It focuses mainly on service provision in the rural areas within the County.

**ii) Scope of Works**

The scope of the assignment includes; Engineering construction of:

| | | |
|---|---|---|
| **KANGARI SCHEME** | | |
| *WATUHU LINE(BEHIND NJIIRIS)* | | |
| Description | **Unit** | **Qty** |
| Pipes | | |
| **63mm Hdpe pipe PN 16** | M | 780 |
| **50mm Hdpe PN 16 pipes** | M | 530 |
| *KENOL SCHEME* | | |
| DESCRIPTION | **UNIT** | **QTY** |
| Pipes | | |
| **63mm diameter Hdpe Pipe PN16** | M | 1890 |
| **50mm diameter Hdpe Pipe PN16** | M | 500 |
| **32mm diameter Hdpe Pipe PN16** | M | 200 |
| *catholic line 1 & 2* | | |
| **63mm diameter Hdpe Pipe PN16** | M | 2,120 |
| **50mm diameter Hdpe Pipe PN16** | M | 800 |
| | | |
| *Kahumbu-ini* | | |
| *PENKA & PENKA SCHOOL LINE* | | |
| Description | **Unit** | **Qty** |
| **63 mm diameter Hdpe PN16 pipes** | M | 493 |
| **32 mm diameter Hdpe PN16 pipes** | M | 294 |
| *MUTARINGWA LINE* | | |
| Description | **Unit** | **Qty** |
| **32 mm diameter Hdpe PN16 pipes** | M | 580 |
| *Gakuyu TC 1* | | |
| Description | **Unit** | **Qty** |
| **25 mm diameter Hdpe PN 16 pipes** | M | 200 |
| *Gakuyu TC 2* | | |
| Description | **Unit** | **Qty** |
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Gakuyu TC 3* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16 pipes** | M. | 60 |

| | | |
|---|---|---|
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Gakuyu TC 4* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16 pipes** | M. | 60 |
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Gakuyu TC 5* | | |
| Description | **Unit** | **Qty** |
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Githuthu ini A* | | |
| Description | **Unit** | **Qty** |
| **32mm diameter Hdpe PN 16 pipes** | M | 400 |
| **25mm diameter Hdpe PN 16 pipes** | M | 400 |
| *Githuthu ini B* | | |
| Description | **Unit** | **Qty** |
| **32mm diameter Hdpe PN 16 pipes** | M | 200 |
| **25mm diameter Hdpe PN 16 pipes** | M | 464 |
| *MATHURI LINE* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16pipes** | M. | 1100 |
| **32mm diameter Hdpe PN 16 pipes** | M. | 400 |
| **25mm diameter Hdpe PN 16 pipes** | M. | 200 |
| *Kahuho Baptist* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16pipes** | M | 550 |
| **32 mm diameter Hdpe PN 16pipes** | M | 890 |
| *Kahuho Baptist 1* | | |
| **32 mm diameter Hdpe PN 16pipes** | M | 906 |
| *Kahuho Baptist 2* | | |
| **25 mm diameter Hdpe PN 16pipes** | M. | 906 |
| *Kahuho Baptist 3* | | |
| **25 mm diameter Hdpe PN 16pipes** | M | 344 |
| *Kibingu line* | | |
| **50 mm diameter Hdpe PN 16pipes** | M | 642 |
| **32 mm diameter Hdpe PN 16pipes** | M | 498 |
| *Kibingu 2* | | |
| **32 mm diameter Hdpe PN 16pipes** | M. | 652 |
| *Kibingu 1* | | |
| **32 mm diameter Hdpe PN 16pipes** | M. | 1000 |
| *Kandani and Distribution Lines* | | |
| **50 mm diameter Hdpe PN 16pipes** | M. | 280 |
| **32 mm diameter Hdpe PN 16pipes** | M | 420 |
| **25 mm diameter Hdpe PN 16pipes** | M | 435 |
| *Kihorwe Line* | | |
| **32 mm diameter Hdpe PN 16pipes** | M. | 791 |
| *Kahuho 1 line* | | |
| **50 mm diameter Hdpe PN 16pipes** | M | 219 |
| **32 mm diameter Hdpe PN 16pipes** | M | 221 |

| | | |
|---|---|---|
| *Kahuho Gakindu lines* | | |
| **50 mm diameter Hdpe PN 16pipes** | M | 659 |
| **32 mm diameter Hdpe PN 16pipes** | M | 706 |
| *Kandani rehabilitation* | | |
| Description | **Unit** | **Qty** |
| **110mm diameter Hdpe PN16 Pipe** | M | 500 |

### iii) Additional Contractor's Responsibilities

Briefly, the Contractor's Additional Responsibilities will include:

i. Setting out and verification survey of pipeline routes;
ii. Preparation of construction working drawings
iii. Preparation of "As-Built" drawings and O&M manuals for the whole Project;
iv. Compliance with the project specific Environmental and Social Management Plan, all according to NEMA Conditions. This shall include issues such as disposal of wastes, health and safety of workers, safety of public, access and avoid nuisance to the public and property owners, confirm to emissions requirements, drainage and excessive erosion, among others;
v. Maintaining the works for a pre-determined period (12 months) following hand-over, to ensure that the materials and workmanship are performing as intended.
vi. The Client has no land available for Contractor's Camp or Camps. The Contractor will procure rent adequate land for his camps including offices, workshops, stores, labour camp and other facilities within the vicinity of the Project Site. The Contractor will submit probable camp site(s) location details with the Bid.
vii. The Client has no land available for Storage of Materials including Pipes, Valves, Fittings, etc. The Contractor will procure / rent adequate land for proper storage and protection of all pipes, valves, fittings, etc. The Contractor will submit probable storage site(s) location details with the Bid.
viii. The Contractor shall be responsible for locating and protecting existing utilities and services, including existing bulk water supply trunk mains, electrical power cable routes (KPLC/Kenya Power), telephone (KPTC/Telekom) and other service providers), water pipes, roads and drains (KeNHA, KURA, KERRA). In this respect, the Contractor shall be responsible for obtaining all Permits and Approvals, and in general complying with the requirements of the individual utilities and agencies.
ix. The Contractor will be required to liaise closely with the operator MUSWASCO when executing the works activities. Further, strict "rules" will apply to all such tie-in works since, in general, they may require for some time, a partial shut-down of the supply system and affected consumers to be informed well in advance.
x. The water pipelines traverse along roads and densely populated commercial and residential areas. Working in these areas will require provision of safety barriers, warning signs and lighting, temporary accesses to properties, etc. The Contractor should indicate the cost of these works under Bill No. 1, Method Related Charges. If this item is not priced or inadequately priced, the Contractor's rates for Other Works will be deemed to cover this requirement.
xi. The Contractor shall be responsible for identifying and paying all Government Levies and Statutory costs such as training levy, licensing fee, etc. The costs of these are deemed to be covered in the Contractor's rates for the Works.

**These Notes for Preparing Bills of Quantities are intended only as information for the Procuring Entity or the person drafting the tendering documents. They should not be included in the final documents.**

## 1. Objectives

1.1 The objectives of the Bills of Quantities are:

(a) to provide sufficient information on the quantities of Works to be performed to enable tenders to be prepared efficiently and accurately; and
(b) when a contract has been entered into, to provide a priced Bills of Quantities for use in the periodic valuation of Works executed.

1.2. In order to attain these objectives, Works should be itemized in the Bills of Quantities in sufficient detail to distinguish between the different classes of Works, or between Works of the same nature carried out in different locations or in other circumstances which may give rise to different considerations of cost. Consistent with these requirements, the layout and content of the Bills of Quantities should be as simple and brief as possible.

## 2. Content

The Bills of Quantities should be divided generally into the following sections:

a) Preamble;
b) Work Items (grouped into parts);
c) Day work Schedule; and
d) Summary.

## 3. Preamble

The Preamble should indicate the inclusiveness of the unit prices, and should state the methods of measurement that have been adopted in the preparation of the Bills of Quantities and that are to be used for the measurement of any part of the Works.

## 4. Rock

Where excavation, boring, or drilling is included in the Works, a comprehensive definition of rock (always a contentious topic in contract administration), should be provided in the Technical Specification and this definition should be used for the purposes of measurement and payment.

## 5. Work Items

The items in the Bill of Quantities should be grouped into sections to distinguish between those parts of the Works that by nature, location, access, timing, or any other special characteristics may give rise to different methods of construction, phasing of the Works, or considerations of cost. General items common to all parts of the Works may be grouped as a separate section in the Bills of Quantities. When a family of Price Adjustment Formulae are used, they should relate to appropriate sections in the Bills of Quantities.

## 6. Quantities

Quantities should be computed net from the Drawings, unless directed otherwise in the Contract, and no allowance should be made for bulking, shrinkage, or waste. Quantities should be rounded up or down where appropriate and spurious accuracy should be avoided.

## 7. Units of Measurement

The following units of measurement and abbreviations are recommended for use (unless other national units are mandatory in the country of the Procuring Entity).

| Unit | Abbreviation | Unit | Abbreviation |
|---|---|---|---|
| cubic meter | $m^3$ *or* cu m | millimeter | mm |
| hectare | ha | month | mon |
| hour | h | number | nr |
| kilogram | kg | square meter | $m^2$ *or* sq m |
| lump sum | sum | square millimeter | $mm^2$ *or* sq mm |
| meter | m | week | wk |
| metric ton (1,000 kg) | t | | |

## 8. Ground and Excavation Levels

The commencing surface should be identified in the description of each item for work involving excavation, boring, or driving, for which the commencing surface is not also the original surface. The excavated surface should be identified in the description of each item for worki nvolving excavation for which the excavated surface is not also the final surface. The depths of work should be measured from the commencing surface to the excavated surface, as defined.

## 9. Day work Schedule

A Day work Schedule should be included if the probability of unforeseen work, outside the items included in the Bills of Quantities, is relatively high. To facilitate checking by the Procuring Entity of the realism of rates quoted by the Tenderers, the Day work Schedule should normally comprise:

a) a list of the various classes of labor, materials, and Contractor's Equipment for which basic Day work rates or prices are to be inserted by the Tenderer, together with a statement of the conditions under which the Contractor will be paid for work executed on a Day work basis; and

b) a percentage to be entered by the Tenderer against each basic Daywork Subtotal amount for labor, materials, and Plant representing the Contractor's profit, overheads, supervision, and other charges.

## 10. Provisional Quantities and Sums

10.1 Provision for quantity contingencies in any particular item or class of work with a high expectation of quantity overrun should be made by entering specific "Provisional Quantities" or "Provisional Items" in the Bills of Quantities, and *not* by increasing the quantities for that item or class of work beyond those of the work normally expected to be required. To the extent not covered above, a general provision for physical contingencies (quantity overruns) should be made by including a "Provisional Sum" in the Summary of the Bills of Quantities. Similarly, a contingency allowance for possible price increases should be provided as a "Provisional Sum" in the Summary of the Bills of Quantities. The inclusion of such Provisional Sums often facilitates budgetary approval by avoiding the need to request periodic supplementary approvals as the future need arises.

10.2 The estimated cost of specialized work to be carried out, or of special goods to be supplied, by a Nominated Subcontractor should be specified in the relevant part of the Bills of Quantities as a particular Provisional Sum with an appropriate brief description. A separate tendering procedure is normally carried out by the Procuring Entity to select the specialists, who are then nominated as subcontractors to the main or prime contractor. To provide an element of competition among the main Tenderers (or prime contractors) in respect of any facilities, amenities, attendance, etc., to be provided by the successful Tenderer as prime contractor for the use and convenience of the specialist or nominated subcontractor, each related Provisional Sum should be following by an item in the Bills of Quantities inviting a percentage (to be quoted by the main Tenderer) payable on the actual expenditure from the Provisional Sum.

## 11. Summary

The Summary should contain a tabulation of the separate parts of the Bills of Quantities carried forward, with provisional sums for Daywork, for physical (quantity) contingencies, and for price contingencies (upward price adjustment) where applicable.

## 12 Sample Bills of Quantities

## A. Preamble

1. The Bills of Quantities shall be read in conjunction with the Instructions to Tenderers, General and Particular Conditions of Contract, Technical Specifications, and Drawings.

2. The quantities given in the Bills of Quantities are estimated and provisional, and are given to provide a common basis for tendering. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Engineer and valued at the rates and prices tender in the priced Bills of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix within the terms of the Contract.

3. The rates and prices tender in the priced Bills of Quantities shall, except in so far as it is otherwise provided under the Contract, include all Constructional Plant, labor, supervision, materials, erection, maintenance, insurance, profit, taxes, and duties, together with all general risks, liabilities, and obligations set out or implied in the Contract.

4. A rate or price shall be entered against each item in the priced Bills of Quantities, whether quantities are stated or not. The cost of Items against which the Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bills of Quantities.

5. The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the priced Bills of Quantities, and where no Items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.

6. General directions and descriptions of work and materials are not necessarily repeated nor summarized in the Bills of Quantities. References to the relevant sections of the Contract documentation shall be made before entering prices against each item in the priced Bills of Quantities.

7. Provisional Sums included and so designated in the Bills of Quantities shall be expended in whole or in part at the direction and discretion of the Engineer in accordance with Sub-Clause 13.5 and Clause 13.6 of the General Conditions.

8. The method of measurement of completed work for payment shall be in accordance with *[insert the name of a standard reference guide, or full details of the methods to be used]* [6].

## B. Work Items

**1.** The Bills of Quantities usually contains the following part Bills, which have been grouped according to the nature or timing of the work:

Bill No. 1: General Items;
Bill No. 2: Earthworks;
Bill No. 3: Culverts and Bridges;
Bill No. 4: etc., as required;
Daywork Schedule; and
Summary Bills of Quantities.

[6] *The method of measurement should be spelled out precisely in the Preamble to the Bills of Quantities, describing for example the allowances (if any) for timbering in excavation, etc. Many national standard reference guides have been prepared on the subject, and one such guide is the Standard Method of Measurement of the U.K. Institution of Civil Engineers.*

2. If TDS-ITT 15.1 (a) applies, Tenderers shall price the Bills of Quantities in local currency only and shall indicate in the Appendix to Tender the percentage expected for payment in foreign currency or currencies. If TDS-ITT 15.1 (b) applies Tenderers shall price the Bills of Quantities in the applicable currency or currencies.

***[Note to the Procuring Entity: The tables in BOQ must be prepared in accordance with the currency alternative retained in TDS – ITT 15.1.]***

**BILLS OF QUANTITIES**

-

**MURANGA SOUTH WATER SUPPLY PROJECT**

**GRAND SUMMARY PAGE**

| BILL NO | DESCRIPTION | AMOUNT (KSh) |
|---|---|---|
| 1 | Preliminary and General Items | - |
| 2 | Water Pipelines | - |
| **BILL TOTAL EXCLUSIVE OF VAT** | | **-** |
| **ADD 10% CONTINGENCY** | | **-** |
| **BILL TOTAL INCLUSIVE OF CONTINGENCY** | | **-** |
| **ADD 16% VAT TAX** | | **-** |
| **BILL TOTAL INCLUSIVE OF VAT AND CONTINGENCY** | | **-** |

## MURANGA SOUTH WATER SUPPLY PROJECT

## BILL NO. 1: PRELIMINARY AND GENERAL ITEMS

| ITEM No. | ITEM DESCRIPTION | UNIT | QUANTITY | RATE (Ksh) | AMOUNT (Ksh) |
|---|---|---|---|---|---|
| **A1** | **Contractual Requirements** | | | | |
| A110.1 | If value of the works is under Kshs 15,450,000 provide 10% bank guarantee. If over, leave blank | sum | 1 | | |
| A110.2 | If value of work is over Kshs 15,450,000 inclusive of VAT, provide 100% performance bond. If under, leave blank | sum | 1 | | |
| A130 | General Liability insurance (personnel and equipment) in the amount of: Kshs 1,000,000 | sum | 1 | | |
| A140.1 | Equipment Insurance in the amount of Kshs 1,000,000 | sum | 1 | | |
| A140.2 | Workman's Compensation insurance - personnel injury or death (WIBA). i. of the subcontractor's employees: Kshs 500,000 for one incident, number of incidences unlimited ii. of other people: Kshs 500,000 for one incident, number of incidences unlimited | sum | 1 | | |
| **A2** | **Specified requirements** | | | | |
| A280.1 | Provide for facilitation in the form of fare/lunch reimbursement for Infrastructure Owner personnel during contract implementation on a needs basis (to be expended as approved by the Engineer's Representative) | PS | 1 | | |
| A280.1A | Add Sub- Contractor's overheads and profits on item A280.1 above | % | | | - |
| | **Equipment for supervision services** | | | | |
| A233.1 | Survey equipment for use by the Engineer's staff (to carry out measurements and setting out checks) | sum | 1 | | |
| A233.2 | Attendance upon the Engineer's staff (chainmen) to carry out measurements and setting out checks) | month | 3.0 | | |
| | **Testing of Materials** | | | | |
| A25.1 | Concrete Tests | sum | 1 | | |

| | | |
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| | PAGE TOTAL CARRIED TO SECTION COLLECTION PAGE | - |

## BILL NO. 1: PRELIMINARY AND GENERAL ITEMS

| ITEM No. | ITEM DESCRIPTION | UNIT | QUANTITY | RATE (Ksh) | AMOUNT (Ksh) |
|---|---|---|---|---|---|
| | **Project Sign board** | | | | |
| A279.1 | Provide, fix and maintain project sign board per drawing (including any payments to local authorities) through to end of defects liability period of contract | nr | 1 | | |
| | **Project completion documents** | | | | |
| A279.2 | Prepare & submit "As Built" Drawings, Operation & Maintenance (O&M) Manuals & conduct training on O&M of system | sum | 1 | | - |
| | **Project plaque** | | | | |
| A279.3 | Affix plaque provided by client at location/wall to be instructed by the Engineer | nr | 1 | | |
| **A3** | **Method Related** | | | | |
| A39 | Allow for establishment of Contractor's camp, maintenance for the period of the Contract and removal at the end of the Contract | Item | 1 | | - |
| **A4** | **Payment for Permits** | | | | |
| A471 | Permits fees to Roads Authorities e.g KERRA or County Government for road crossings | sum | 1 | | |
| | ***Other Provisional Sums*** | | | | |
| A421 | Allow a provisional sum of Kshs. 500,000 to cover cost for capacity building of the WSP including,Rehabilitation, purchase of maintenance equipments and, NRW management,, institutional strengthening measures and other activities, to be expended as directed by the Project Manager. | PS | | | |
| A422 | Allow a Provisional sum of Kshs. 100,000 to cater for facilitation of monthly site meetings, as directed by the Project Manager | PS | | | |
| A427 | Allow provisional sum of Kshs.300,000 to be spent in whole or part, for community sensitisation/mobilisation activities as directed by the Engineer | PS | | | |
| A42.1 | Contractors overhead and profit items A421 - A427 | % | - | | - |

| | | | | | |
|---|---|---|---|---|---|
| **A7** | **Specific Conditions** | | | | |
| A7.1 | Allow for any costs associated with compliance with Environmental, Health and Safety Requirements as specified in the Specifications and as required by Government Agencies and Prevailing Legislation. | Item | L.S | | |
| **PAGE TOTAL CARRIED TO SECTION COLLECTION PAGE** | | | | | |

## BILL NO. 1: PRELIMINARY AND GENERAL ITEMS

| ITEM No. | ITEM DESCRIPTION | UNIT | QUANTITY | RATE (Ksh) | AMOUNT (Ksh) |
|---|---|---|---|---|---|
| | **COLLECTION** | | | | |
| 1 | From page 1 | | | | - |
| 2 | From page 2 | | | | - |

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| **BILL NO. 1 TOTAL CARRIED FORWARD TO GRAND SUMMARY** | | | | | - |

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**MURANGA SOUTH WATER SUPPLY PROJECT**

**Muranga County**

-

## GRAND SUMMARY PAGE

| BILL NO | DESCRIPTION | AMOUNT (KSh) |
|---|---|---|
| Bill 2.2 | Kenol Scheme | - |
| Bill 2.3 | Kangari Scheme | - |
| Bill 2.4 | Kahumbu lastmiles | - |
| BILL TOTAL EXCLUSIVE OF VAT | | - |

**MURANGA SOUTH WATER SUPPLY PROJECT**

**KENOL SCHEME**

**BILL 2.2: Behind Karigu-ini Pry sch.(Upcoming estate) & Karigu-ini Golden Palm line**

| ITEM | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | These works are to be carried out along narrow wayleaves where there may be some existing active services (electrical, water, e.t.c). This should be considered in the Contractor's rates. | | | | |
| | **CLASS A: GENERAL ITEM** | | | | |
| **A25** | ***Testing of works*** | | | | |
| A25.11 | Pressure testing and commissioning for the pipeline, including all necessary equipment, materials and labour for the works e.g. delivery of water for testing, fittings, disposal of used water. Pipe diameter **50 - 150 mm** | m | 2,285 | | - |
| A25.2 | Disinfection of Pipe lines: flushing with clear water, filling with water containing 0.05 g/l calcium hypochlorite for 24 hours. This includes supply of all necessary equipment, materials, chemicals and water, measurement of residual chlorine, all as specified. Pipe diameter **50 - 150 mm** | m | 2,285 | | - |
| | **CLASS D: DEMOLITION AND SITE CLEARANCE** | | | | |
| D1 | General clearance 1.5m wide corridor along the pipeline. Including bushes, shrubs and small trees not exceeding 300mm girth and grubbing up roots | m | 2,285 | | - |
| **D3** | **Removal of Stumps (Provisional)** | | | | - |
| | Grub up stumps and roots and cart away to approved tips | | | | - |
| | - | - | - | - | - |
| D3.1 | Girth: 0.5 m - 1.0 m | nr | 5 | | - |
| D3.2 | Girth: 1.0 m - 2 m | nr | 1 | | - |
| | - | - | - | - | - |
| | Note:- Girth shall be measured 0.5 m above ground level | | | | - |
| | **CLASS I: PIPE WORK - PIPES** | | | | |
| | ***Provide and Lay*** | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | Rate to include Purchase, transportation, laying, jointing, excavation in normal material depth n.e. 2.0 m, preparation of surfaces, disposal of excavated material, shoring sides of excavation, dewatering, backfilling and compacting in layers of 150mm with suitable selected excavated material, to Specifications. Rate to Include for joining of pipes ( Compression Fittings for OD 63 & below and Butt Fusion for OD 75 & above)<br><br>***HDPE PN 16*** | | | | |
| I712.1 | OD 90mm PN 16 Behind Kariguini primary school | m | 1,600 | | - |
| I712.2 | OD 90mm PN 16 Kariguini Golden palm line | m | 366 | | - |
| I712.3 | OD 63mm PN 16 Kariguini Golden palm line | m | 319 | | - |
| I712.4 | OD 63mm diameter Hdpe Pipe PN16 Catholic line | m | 2,120 | | - |
| I712.5 | OD 50mm diameter Hdpe Pipe PN16 catholic line | m | 800 | | - |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | **CLASS J: PIPE WORK - FITTINGS AND VALVES (Provisional)- All Pipes and Fittings to PN 16**<br><br>***Provide and Install*** *(Rate to include supply of jointing materials, Staimless steel bolts, nuts, gaskets etc. Rate to Include for joining of pipes ( Compression Fittings for OD 63 & below and Butt Fusion for OD 90& above)*<br>***Behind Kariguini primary school*** | | | | |
| | 90x25mm dia. saddle clamp | Nr | 1 | | - |
| | 25mm dia. Nipple | Nr | 1 | | - |
| | 25mm dia. Socket | Nr | 1 | | - |
| | 90mm diam.Hdpe couplers PN16 | Nr | 15 | | - |
| | 80 mm diam.Barrel Nipple | Nr | 2 | | - |
| | 80mm dia union socket | Nr | 1 | | - |
| | 90mm diam. Hdpe male adaptor | Nr | 1 | | - |
| | | | | | - |

| | | | | | |
|---|---|---|---|---|---|
| | ***Kariguini Golden palm line*** | | | | |
| | 90x25mm dia. saddle clamp | Nr | 1 | | - |
| | 25mm dia. Nipple | Nr | 1 | | - |
| | 25mm dia. Socket | Nr | 1 | | - |
| | 90mm diam.Hdpe couplers PN16 | Nr | 15 | | - |
| | 80 mm diam.Barrel Nipple | Nr | 2 | | - |
| | 80mm dia union socket | Nr | 1 | | - |
| | 90mm diam. Hdpe male adaptor | Nr | 1 | | - |
| | | | | | - |
| | ***Catholic Line 1&2*** | | | | - |
| | 90x63mm diam. Hdpe Saddle Clamp | No | 2 | | - |
| | 63mm diam.Hdpe couplers PN16 | No | 20 | | - |
| | 63mm dia.Hdpe male Adaptors | No | 4 | | - |
| | 63mm diam. Hdpe end cap | No | 2 | | - |
| | 63X50mm dia Hdpe saddle Clamp | No | 2 | | - |
| | 50mm diam.Hdpe couplers PN16 | No | 7 | | - |
| | 50mm diam. Hdpe male adaptor | No | 2 | | - |
| | 40mm dia GI arrel Nipple | No | 2 | | - |
| | 40mm dia GI union socket | No | 2 | | - |
| | 50mm diam. Hdpe end cap | No | 2 | | - |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KShs) |
|---|---|---|---|---|---|
| | ***Valves*** | | | | |
| | Supply, handle, deliver to site, fix in place and test inclusive of all fittings as in the Standard drawings . Valves to BS 5163 and EN 1074 Standards.<br><br>Rate for valves shall also include for all necessary fittings (Tees, Spigot pipes etc) as per drawings | | | | |
| | | | | | |
| | **Air-Valves** | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | *Air Valves shall be Anti shock combination air valves, with a built in anti-water hammer non slam surge prevention system.To include an isolation valve of DN 50 mm* | | | | |
| J861.1 | PN16 DN 25 mm | nr | 2 | | - |
| | **Line Valves** | | | | |
| | *To include tees, outfall connections as per standard drawings* | | | | |
| J861.1 | DN 50mm | nr | 2 | | - |
| J861.2 | DN 63mm | nr | 4 | | - |
| J861.3 | DN 90mm | nr | 2 | | - |
| | **Washout-Valves** | | | | |
| | **<u>ANCILLARY WORKS</u>** | | | | |
| | - | | | | |
| | Chambers, ducts, culverts, crossings, thrust and anchor blocks, reinstatement and others as listed and specified in drawings. | | | | |
| | **<u>Note</u>:-** Items for work in this class shall include:-<br>- Excavation, preparation of surfaces, disposal of excavated material, shoring sides of excavation, backfilling and removal of redundant services.<br>- Concrete, masonry blocks, reinforcement, formwork, joints and finishes.<br>- Tips for disposal of excavated material or debris to be identified by the Contractor in liaison with the Local Authority. | | | | |
| | ***<u>In Situ Chambers</u>*** | | | | |
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| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | Provide all materials and construct Valve chamber internal dimensions 1000mm x 1000mm. Include for supply and fixing of lockable cover and step irons, as detailed in drawing | | | | |
| K112.2 | Depth: not exceeding 2.0 m | nr | 10 | | - |
| | ***<u>Road Crossings</u>*** | | | | |
| | - | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | *Extra-overs for normal pipe laying for road crossing works: to include breaking up and permanent reinstatement of roads and provision of a sleeve as per standard drawings* | | | | |
| K731.1 | Pipe bore: 63 mm on gravel road | m | 10 | | - |
| | ***Marker Posts*** | | | | |
| | *Provide and install RC standard marker posts for:* | | | | |
| K82.4 | Along Pipeline at 300 m spacing and at change of directions, , inscribed "MAJI" and Diameter of the Pipeline | nr | 5 | | - |
| | **CLASS L:- PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION** | | | | |
| | *Extras over excavation and backfilling for excavation in Rock. Rate to include carting away and disposal. In pipe trench and chambers (Provisional).* | | | | |
| L111.1 | Excavation in trench for rock class "A" | m³ | 1 | | - |
| L111.2 | Excavation in trench for rock class "B" | m³ | 1 | | - |
| L111.3 | Excavation in trench for rock class "C" | m³ | 1 | | - |
| | **Note**:- Blasting is NOT permitted for Item L11 | | | | |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | **Imported Granular Fill (Provisional)** | | | | |
| | *Provide, transport to site and place imported granular material and compact in bed (100 mm thick) and surround to pipes (200 mm thick) as directed/approved by Engineer* | | | | |
| | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| L531 | Surround To pipes nominal bore: n.e. 150 mm | m | 10 | | - |
| **L54** | **Mass Concrete Surround (Provisional)** | | | | - |
| | - | | | | - |
| L551 | 300mm thick Mass Concrete Surround Class 15/20 to pipe as per Standard Drawings at locations directed by the Engineer. Rate to include for formwork, supports, vibrating, etc. | m | 10 | | - |
| | **CLASS X:- MISCELLANEOUS** | | | | |
| X51 | Supply and install with item decrypted before, tracable warning tape, permanently imprinted with= "CAUTION WATER PIPE", color= blue, width= 50mm, thickness= 5mm. | m | 2,285 | | - |
| | | | | | - |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
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| | **COLLECTION PAGE** | | | | |
| 1 | From page 1 | | | | - |
| 2 | From page 2 | | | | - |
| 3 | From page 3 | | | | - |
| 4 | From page 4 | | | | - |
| 5 | From page 5 | | | | - |
| | **TOTAL CARRIED FORWARD TO GRAND SUMMARY SHEET** | | | | - |

## MURANGA SOUTH WATER SUPPLY PROJECT

## KANGARI SCHEME

### BILL 2.1: Watuhu line

| ITEM | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | These works are to be carried out along narrow wayleaves where there may be some existing active services (electrical, water, e.t.c). This should be considered in the Contractor's rates. | | | | |
| | **CLASS A: GENERAL ITEM** | | | | |
| **A25** | ***Testing of works*** | | | | |
| A25.11 | Pressure testing and commissioning for the pipeline, including all necessary equipment, materials and labour for the works e.g. delivery of water for testing, fittings, disposal of used water. Pipe diameter **50 - 150 mm** | m | 3,810 | | - |
| A25.2 | Disinfection of Pipe lines: flushing with clear water, filling with water containing 0.05 g/l calcium hypochlorite for 24 hours. This includes supply of all necessary equipment, materials, chemicals and water, measurement of residual chlorine, all as specified. Pipe diameter **50 - 150 mm** | m | 3,810 | | - |
| | **CLASS D: DEMOLITION AND SITE CLEARANCE** | | | | |
| D1 | General clearance 1.5m wide corridor along the pipeline. Including bushes, shrubs and small trees not exceeding 300mm girth and grubbing up roots | m | 3,810 | | - |
| **D3** | **Removal of Stumps (Provisional)** | | | | - |
| | Grub up stumps and roots and cart away to approved tips | | | | - |
| | - | - | - | - | - |
| D3.1 | Girth: 0.5 m - 1.0 m | nr | 8 | | - |
| D3.2 | Girth: 1.0 m - 2 m | nr | 2 | | - |
| | - | - | - | - | - |

| | | | | | |
|---|---|---|---|---|---|
| | Note:- Girth shall be measured 0.5 m above ground level | | | | - |
| | **CLASS I: PIPE WORK - PIPES**<br><br>***Provide and Lay***<br>Rate to include Purchase, transportation, laying, jointing, excavation in normal material depth n.e. 2.0 m, preparation of surfaces, disposal of excavated material, shoring sides of excavation, dewatering, backfilling and compacting in layers of 150mm with suitable selected excavated material, to Specifications. Rate to Include for joining of pipes ( Compression Fittings for OD 63 & below and Butt Fusion for OD 75 & above)<br>-<br>***HDPE PN 16***<br>- | | | | |
| I712.1 | OD 63mm PN 16 Watuhu Line (Behind Njiriis) | m | 780 | | - |
| I712.2 | OD 50mm PN 16 Watuhu Line (Behind Njiriis) | m | 530 | | - |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | **CLASS J: PIPE WORK - FITTINGS AND VALVES (Provisional)- All Pipes and Fittings to PN 16**<br><br>***Provide and Install*** *(Rate to include supply of jointing materials, Staimless steel bolts, nuts, gaskets etc. Rate to Include for joining of pipes ( Compression Fittings for OD 63 & below and Butt Fusion for OD 90& above)*<br>***Watuhu Line (Behind Njiriis)*** | | | | |
| | 63mm diameter Hdpe Couplers | No | 7 | | - |
| | 50mm diameter Hdpe Couplers | No | 5 | | - |
| | 50mm diameter Hdpe End caps | No | 1 | | - |
| | 63x50mm diameter Hdpe reducer | No | 1 | | - |
| | 63mm diameter Hdpe PN 16 Equal Tee | No | 1 | | - |
| | 63mm dia. Hdpe male adaptor | No | 3 | | - |

| | | | | | |
|---|---|---|---|---|---|
| | 50mm dia GI Socket | No | 1 | | - |
| | 63mm dia. valve socket | No. | 1 | | - |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | ***Valves*** | | | | |
| | - | | | | |
| | Supply, handle, deliver to site, fix in place and test inclusive of all fittings as in the Standard drawings . Valves to BS 5163 and EN 1074 Standards. | | | | |
| | Rate for valves shall also include for all necessary fittings (Tees, Spigot pipes etc) as per drawings | | | | |
| | **Air-Valves** | | | | |
| | *Air Valves shall be Anti shock combination air valves, with a built in anti-water hammer non slam surge prevention system.To include an isolation valve of DN 50 mm* | | | | |
| J861.1 | PN16 DN 25 mm | nr | 2 | | - |
| | **Line Valves** | | | | |
| | *To include tees, outfall connections as per standard drawings* | | | | |
| J861.3 | DN63mm | nr | 3 | | - |
| | **Washout-Valves** | | | | |
| | **ANCILLARY WORKS** | | | | |
| | - | | | | |
| | Chambers, ducts, culverts, crossings, thrust and anchor blocks, reinstatement and others as listed and specified in drawings. | | | | |
| | **Note:-** Items for work in this class shall include:-<br>- Excavation, preparation of surfaces, disposal of excavated material, shoring sides of excavation, backfilling and removal of redundant services.<br>- Concrete, masonry blocks, reinforcement, formwork, joints and finishes.<br>- Tips for disposal of excavated material or debris to be identified by the Contractor in liaison with the Local Authority. | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | ***In Situ Chambers*** | | | | |
| | | | | | |

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| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | Provide all materials and construct Valve chamber internal dimensions 1000mm x 1000mm. Include for supply and fixing of lockable cover and step irons, as detailed in drawing | | | | |
| K112.2 | Depth: not exceeding 2.0 m | nr | 5 | | - |
| | ***Road Crossings*** | | | | |
| | *Extra-overs for normal pipe laying for road crossing works: to include breaking up and permanent reinstatement of roads and provision of a sleeve as per standard drawings* | | | | |
| K731.1 | Pipe bore:110- 63 mm on gravel road | m | 10 | | - |
| | ***Marker Posts*** | | | | |
| | *Provide and install RC standard marker posts for:* | | | | |
| K82.4 | Along Pipeline at 300 m spacing and at change of directions, , inscribed "MAJI" and Diameter of the Pipeline | nr | 3 | | - |
| | **CLASS L:- PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION** | | | | |
| | *Extras over excavation and backfilling for excavation in Rock. Rate to include carting away and disposal. In pipe trench and chambers (Provisional).* | | | | |
| L111.1 | Excavation in trench for rock class "A" | m³ | 1 | | - |
| L111.2 | Excavation in trench for rock class "B" | m³ | 1 | | - |

| | | | | | |
|---|---|---|---|---|---|
| L111.3 | Excavation in trench for rock class "C" | m³ | 1 | | - |
| | **Note**:- Blasting is NOT permitted for Item L11 | | | | |
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| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | **Imported Granular Fill (Provisional)**<br><br>*Provide, transport to site and place imported granular material and compact in bed (100 mm thick) and surround to pipes (200 mm thick) as directed/approved by Engineer* | | | | |
| L531 | Surround To pipes nominal bore: n.e. 150 mm | m | 10 | | - |
| **L54** | **Mass Concrete Surround (Provisional)** | | | | - |
| | - | - | - | - | - |
| L551 | 300mm thick Mass Concrete Surround Class 15/20 to pipe as per Standard Drawings at locations directed by the Engineer. Rate to include for formwork, supports, vibrating, etc. | m | 10 | | - |
| | **CLASS X:- MISCELLANEOUS** | | | | |
| X51 | Supply and install with item decrypted before, tracable warning tape, permanently imprinted with= "CAUTION WATER PIPE", color= blue, width= 50mm, thickness= 5mm. | m | 3,810 | | - |
| | | | | | - |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
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| | **COLLECTION PAGE** | | | | |
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| 3 | From page 3 | | | | - |
| 4 | From page 4 | | | | - |
| 5 | From page 5 | | | | - |
| | **TOTAL CARRIED FORWARD TO GRAND SUMMARY SHEET** | | | | - |

**MURANGA SOUTH WATER SUPPLY PROJECT**
**KAHUMBU LASTMILE**

**BILL 2.4 Kahumbu lines**

| ITEM | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | These works are to be carried out along narrow wayleaves where there may be some existing active services (electrical, water, e.t.c). This should be considered in the Contractor's rates. | | | | |
| | **CLASS A: GENERAL ITEM** | | | | |
| **A25** | ***Testing of works*** | | | | |
| A25.11 | Pressure testing and commissioning for the pipeline, including all necessary equipment, materials and labour for the works e.g. delivery of water for testing, fittings, disposal of used water. Pipe diameter **50 - 150 mm** | m | 18,427 | | - |
| A25.2 | Disinfection of Pipe lines: flushing with clear water, filling with water containing 0.05 g/l calcium hypochlorite for 24 hours. This includes supply of all necessary equipment, materials, chemicals and water, measurement of residual chlorine, all as specified. Pipe diameter **50 - 150 mm** | m | 18,427 | | - |
| | **CLASS D: DEMOLITION AND SITE CLEARANCE** | | | | |
| D1 | General clearance 1.5m wide corridor along the pipeline. Including bushes, shrubs and small trees not exceeding 300mm girth and grubbing up roots | m | 18,427 | | - |
| **D3** | **Removal of Stumps (Provisional)** | | | | - |
| | Grub up stumps and roots and cart away to approved tips | | | | - |
| | - | - | - | - | - |
| D3.1 | Girth: 0.5 m - 1.0 m | nr | 37 | | - |
| D3.2 | Girth: 1.0 m - 2 m | nr | 9 | | - |

| | | | | | |
|---|---|---|---|---|---|
| | - | - | - | - | - |
| | Note:- Girth shall be measured 0.5 m above ground level | | | | - |
| | **CLASS I: PIPE WORK - PIPES**<br><br>***Provide and Lay***<br>Rate to include Purchase, transportation, laying, jointing, excavation in normal material depth n.e. 2.0 m, preparation of surfaces, disposal of excavated material, shoring sides of excavation, dewatering, backfilling and compacting in layers of 150mm with suitable selected excavated material, to Specifications. Rate to Include for joining of pipes ( Compression Fittings for OD 63 & below and Butt Fusion for OD 75 & above)<br>-<br>***HDPE PN 16***<br>- | | | | |
| I712.1 | **KAMUNGU** | | | | - |
| | 63mm diameter Hdpe Pipe PN16 | m | 1,890 | | - |
| | 50mm diameter Hdpe Pipe PN16 | m | 500 | | - |
| | 32mm diameter Hdpe Pipe PN16 | m | 200 | | - |
| I712.2 | **PENKA SCHOOL LINE** | | | | - |
| | 63 mm diameter Hdpe PN16 pipes | m | 493 | | - |
| | 32 mm diameter Hdpe PN16 pipes | m | 294 | | - |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KShs ) | AMOUNT (KShs) |
|---|---|---|---|---|---|
| I712.2 | **MUTARINGWA** | | | | |
| | 32 mm diameter Hdpe PN16 pipes | m | 580 | | - |
| I712.3 | **GAKUYU TC1** | | | | - |
| | 25 mm diameter Hdpe PN 16 pipes | m | 200 | | - |
| | **GAKUYU TC2** | | | | - |

| | | | | | |
|---|---|---|---|---|---|
| | 32mm diameter Hdpe PN 16 pipes | m | 100 | | - |
| | 25mm diameter Hdpe PN 16 pipes | m | 82 | | - |
| | **GAKUYU TC3** | | | | - |
| | 50 mm diameter Hdpe PN 16 pipes | m | 60 | | - |
| | 32mm diameter Hdpe PN 16 pipes | m | 100 | | - |
| | 25mm diameter Hdpe PN 16 pipes | m | 82 | | - |
| | **GAKUYU TC4** | | | | - |
| | 50 mm diameter Hdpe PN 16 pipes | m | 60 | | - |
| | 32mm diameter Hdpe PN 16 pipes | m | 100 | | - |
| | 25mm diameter Hdpe PN 16 pipes | m | 82 | | - |
| | **GAKUYU TC5** | | | | - |
| | 32mm diameter Hdpe PN 16 pipes | m | 100 | | - |
| | 25mm diameter Hdpe PN 16 pipes | m | 82 | | - |
| | **GITHUTHU INI A** | | | | - |
| | 32mm diameter Hdpe PN 16 pipes | m | 400 | | - |
| | 25mm diameter Hdpe PN 16 pipes | m | 400 | | - |
| | **GITHUTHU INI B** | | | | - |
| | 32mm diameter Hdpe PN 16 pipes | m | 200 | | - |
| | 25mm diameter Hdpe PN 16 pipes | m | 464 | | - |
| | **MATHURI LINE** | | | | - |
| | 50 mm diameter Hdpe PN 16pipes | m | 1,100 | | - |
| | 32mm diameter Hdpe PN 16 pipes | m | 400 | | - |
| | 25mm diameter Hdpe PN 16 pipes | m | 200 | | - |
| | **KAHUHO BAPTIST** | | | | - |
| | 50 mm diameter Hdpe PN 16pipes | m | 550 | | - |
| | 32 mm diameter Hdpe PN 16pipes | m | 890 | | - |
| | **KAHUHO BAPTIST 1** | | | | - |
| | 32 mm diameter Hdpe PN 16pipes | m | 906 | | - |

| | | | | | |
|---|---|---|---|---|---|
| | **KAHUHO BAPTIST 2** | | | | - |
| | 25 mm diameter Hdpe PN 16pipes | m | 906 | | - |
| | **KAHUHO BAPTIST 3** | | | | - |
| | 25 mm diameter Hdpe PN 16pipes | m | 344 | | - |
| | **KIBINGU LINE** | | | | - |
| | 50 mm diameter Hdpe PN 16pipes | m | 642 | | - |
| | 32 mm diameter Hdpe PN 16pipes | m | 498 | | - |
| | **KIBINGU 2** | | | | - |
| | 32 mm diameter Hdpe PN 16pipes | m | 1,000 | | - |
| | **KIBINGU 1** | | | | - |
| | 50 mm diameter Hdpe PN 16pipes | m | 280 | | - |
| | 32 mm diameter Hdpe PN 16pipes | m | 420 | | - |
| | 25 mm diameter Hdpe PN 16pipes | m | 435 | | - |
| | **KANDANI AND DISTRIBUTION LINES** | | | | - |
| | 110mm diameter Hdpe PN16 Pipe | m | 500 | | - |
| | 32 mm diameter Hdpe PN 16pipes | m | 791 | | - |
| | **KIHORWE LINE(Kandani side)** | | | | - |
| | 32 mm diameter Hdpe PN 16pipes | m | 791 | | - |
| | **KAHUHO 1 LINE** | | | | - |
| | 50 mm diameter Hdpe PN 16pipes | m | 219 | | - |
| | 32 mm diameter Hdpe PN 16pipes | m | 221 | | - |
| | **KAHUHO GAKINDU LINES** | | | | - |
| | 50 mm diameter Hdpe PN 16pipes | m | 659 | | - |
| | 32 mm diameter Hdpe PN 16pipes | m | 706 | | - |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KShs) | AMOUNT (KShs) |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| | **CLASS J: PIPE WORK - FITTINGS AND VALVES (Provisional)- All Pipes and Fittings to PN 16** | | | | |
| | ***Provide and Install*** *(Rate to include supply of jointing materials, Staimless steel bolts, nuts, gaskets etc. Rate to Include for joining of pipes ( Compression Fittings for OD 63 & below and Butt Fusion for OD 90& above)* | | | | |
| | ***KAMUNGU*** | | | | |
| | 110x63mm diam Hdpe saddle clamp | No | 1 | | - |
| | 63mm diam.Hdpe couplers | No | 18 | | - |
| | 50mm diam.Hdpe couplers | No | 4 | | - |
| | 32mm diam.Hdpe couplers | No | 1 | | - |
| | 63x50mm diam.Hdpe reducer | No | 1 | | - |
| | 50x32mm diam.Hdpe reducer | No | 1 | | - |
| | 63mm diam. Gate valve | No | 1 | | - |
| | 50mm diam. Gate valve | No | 1 | | - |
| | 32mm diam. End cap | No | 1 | | - |
| | 63mm diam Hdpe adaptors | No | 1 | | - |
| | 50mm diam.Hdpe adaptors | No | 1 | | - |
| | ***PENKA & PENKA SCHOOL LINE*** | | | | - |
| | 63 mm diameter Hdpe Couplers | No. | 4 | | - |
| | 32 mm diameter Hdpe Couplers | No. | 4 | | - |
| | 32 mm diameter Hdpe male adaptor | No. | 2 | | - |
| | 32 mm diameter Hdpe end cap | No. | 2 | | - |
| | 63x32mm HdpeTee | No. | 1 | | - |
| | 25 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 63x32mm diameter saddle clamp | No. | 1 | | - |
| | ***MUTARINGWA LINE*** | | | | - |
| | 32 mm diameter Hdpe couplers | No. | 3 | | - |

| | | | | | |
|---|---|---|---|---|---|
| | 25mm dia. Gate valve | No. | 1 | | - |
| | 32 mm dia.Hdpe male adaptor | No. | 1 | | - |
| | 63x32mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | ***Gakuyu TC 1*** | | | | - |
| | 25mm diameter Hdpe couplers | No. | 1 | | - |
| | 25mm dia. Hdpe male adaptor | No. | 1 | | - |
| | 25mm dia. GI Nipple | No. | 1 | | - |
| | 25mm dia. Hdpe end caps | No. | 1 | | - |
| | 20 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 110x25mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | ***Gakuyu TC 2*** | | | | - |
| | 32x25 mm dia. Hdpe reducer | No. | 1 | | - |
| | 32mm dia. Hdpe male adaptor | No. | 1 | | - |
| | 25mm dia. GI Nipple | No. | 1 | | - |
| | 32mm dia. Hdpe end caps | No. | 1 | | - |
| | 25 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 50x32mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | ***Gakuyu TC 3*** | | | | - |
| | 50x32 mm dia. Hdpe reducer | No. | 1 | | - |
| | 32x25 mm dia. Hdpe reducer | No. | 1 | | - |
| | 50mm dia. Hdpe male adaptor | No. | 1 | | - |
| | 40mm dia. GI Nipple | No. | 1 | | - |
| | 32mm dia. Hdpe end caps | No. | 1 | | - |
| | 40 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 110x50mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | ***Gakuyu TC 4*** | | | | - |
| | 50x32 mm dia. Hdpe reducer | No. | 1 | | - |
| | 32x25 mm dia. Hdpe reducer | No. | 1 | | - |

| | | | | | |
|---|---|---|---|---|---|
| | 50mm dia. Hdpe male adaptor | No. | 1 | | - |
| | 40mm dia. GI Nipple | No. | 1 | | - |
| | 32mm dia. Hdpe end caps | No. | 1 | | - |
| | 40 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 110x50mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | `` **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |
| **ITEM NO.** | **DESCRIPTION** | **UNIT** | **QTY** | **RATE (KSh)** | **AMOUNT (KSh)** |
| | ***Gakuyu TC 5*** | | | | |
| | 32x25 mm dia. Hdpe reducer | No. | 1 | | - |
| | 25mm dia. GI Nipple | No. | 1 | | - |
| | 32mm dia. Hdpe adaptor | No. | 1 | | - |
| | 25mm dia. Hdpe end caps | No. | 1 | | - |
| | 25mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 110x32mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | ***Githuthu ini A*** | | | | - |
| | 32x25 mm dia. Hdpe reducer | No. | 1 | | - |
| | 25mm dia. GI Nipple | No. | 1 | | - |
| | 32mm dia. Hdpe couplers | No. | 3 | | - |
| | 25mm dia. Hdpe couplers | No. | 3 | | - |
| | 32mm dia. Hdpe adaptor | No. | 1 | | - |
| | 25mm dia. Hdpe end caps | No. | 1 | | - |
| | 25mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 110x32mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | ***Githuthu ini B*** | | | | - |
| | 32x25 mm dia. Hdpe reducer | No. | 1 | | - |
| | 25mm dia. GI Nipple | No. | 1 | | - |
| | 20mmdia GI Nipple | No. | 1 | | - |

| | | | | | |
|---|---|---|---|---|---|
| | 32mm dia. Hdpe couplers | No. | 2 | | - |
| | 25mm dia. Hdpe couplers | No. | 4 | | - |
| | 32mm dia. Hdpe adaptor | No. | 1 | | - |
| | 32mm dia. Hdpe adaptor | No. | 1 | | - |
| | 32mm dia. Hdpe adaptor | No. | 1 | | - |
| | 32mm dia. Hdpe adaptor | No. | 1 | | - |
| | 25mm dia. Hdpe end caps | No. | 1 | | - |
| | 25mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 25mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 110x32mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | 32x25mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | ***MATHURI LINE*** | | | | - |
| | 50mm diameter Hdpe couplers | No. | 10 | | - |
| | 32mm diameter Hdpe couplers | No. | 3 | | - |
| | 25mm diameter Hdpe couplers | No. | 1 | | - |
| | 50mm dia. Hdpe male adaptor | No. | 1 | | - |
| | 32mm dia. Hdpe male adaptor | No. | 1 | | - |
| | 50x32mm dia. Hdpe Reducer | No. | 1 | | - |
| | 32x25mm dia. Hdpe Reducer | No. | 1 | | - |
| | 40mm dia. GI Nipple | No. | 1 | | - |
| | 25mm dia. GI Nipple | No. | 1 | | - |
| | 25mm diam Gate valve | No. | 1 | | - |
| | 25mm dia. Hdpe end caps | No. | 1 | | - |
| | 40 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 110x50mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | ***Kahuho Baptist*** | | | | - |
| | 50mm diameter Hdpe couplers | No. | 5 | | - |
| | 32mm diameter Hdpe couplers | No. | 8 | | - |

| | | | | | |
|---|---|---|---|---|---|
| | 50mm dia. Hdpe male adaptor | No. | 1 | | - |
| | 50x32mm dia. Hdpe Reducer<br>40mm dia. GI Nipple<br>40 mm diameter Pegler Gate Valve<br>110x50mm diameter Hdpe saddle clamp | No.<br>No.<br>No.<br>No. | 1<br>1<br>1<br>1 | | -<br>-<br>-<br>- |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |
| **ITEM NO.** | **DESCRIPTION** | **UNIT** | **QTY** | **RATE (KShs )** | **AMOUNT (KShs)** |
| | ***Kahuho Baptist 1***<br>32mm diameter Hdpe couplers<br>50x32mm dia. Hdpe Saddle Clamp<br>25mm dia. GI Nipple<br>25 mm diameter Pegler Gate Valve<br>25 mm diameter Pegler Gate Valve<br>32mm dia.Hdpe Adaptor<br>***Kahuho Baptist 2***<br>25 mm diameter Hdpe couplers<br>32x25mm dia. Hdpe Tee<br>20 mm diameter Pegler Gate Valve<br>25mm dia.Hdpe Adaptor<br>***Kahuho Baptist 3***<br>25 mm diameter Hdpe couplers<br>50x25mm dia. Saddle clamp<br>20 mm diameter Pegler Gate Valve<br>25mm dia.Hdpe Adaptor<br>20mm dia.GI nipple<br>***Kibingu line*** | No.<br>No.<br>No.<br>No.<br>No.<br>No.<br><br>No.<br>No.<br>No.<br>No.<br><br>No.<br>No.<br>No.<br>No.<br>No. | 8<br>1<br>1<br>1<br>1<br>1<br><br>8<br>1<br>1<br>2<br><br>3<br>1<br>1<br>1<br>1 | | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- |

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|---|---|---|---|---|---|
| | 50mm diameter Hdpe couplers | No. | 6 | | - |
| | 32mm diameter Hdpe couplers | No. | 4 | | - |
| | 50mm dia. Hdpe male adaptor | No. | 1 | | - |
| | 50x32mm dia. Hdpe Reducer | No. | 1 | | - |
| | 40mm dia. GI Nipple | No. | 1 | | - |
| | 40 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 110x50mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | ***Kibingu 2*** | | | | - |
| | 32mm diameter Hdpe couplers | No. | 5 | | - |
| | 110x32mm dia. Hdpe Saddle Clamp | No. | 1 | | - |
| | 25mm dia. GI Nipple | No. | 1 | | - |
| | 25 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 32mm dia.Hdpe Adaptor | No. | 1 | | - |
| | ***Kibingu 1*** | | | | - |
| | 32mm diameter Hdpe couplers | No. | 9 | | - |
| | 110x32mm dia. Hdpe Saddle Clamp | No. | 1 | | - |
| | 25mm dia. GI Nipple | No. | 1 | | - |
| | 25 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 32mm dia.Hdpe Adaptor | No. | 1 | | - |
| | ***Kandani and Distribution Lines*** | | | | - |
| | 50mm diameter Hdpe couplers | No. | 2 | | - |
| | 32mm diameter Hdpe couplers | No. | 4 | | - |
| | 25mm diameter Hdpe couplers | No. | 4 | | - |
| | 110x50mm dia. Hdpe Saddle Clamp | No. | 1 | | - |
| | 50x25mm dia. Hdpe Saddle Clamp | No. | 1 | | - |
| | 40mm dia. GI Nipple | No. | 1 | | - |
| | 25mm dia. GI Nipple | No. | 1 | | - |
| | 20mm dia. GI Nipple | No. | 1 | | - |

| | | | | | |
|---|---|---|---|---|---|
| | 40 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 25 mm diameter Pegler Gate Valve<br>20 mm diameter Pegler Gate Valve<br>50mm dia.Hdpe Adaptor<br>32mm dia.Hdpe Adaptor<br>25mm dia.Hdpe Adaptor | No.<br>No.<br>No.<br>No.<br>No. | 1<br>3<br>1<br>1<br>1 | | -<br>-<br>-<br>-<br>- |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |
| **ITEM NO.** | **DESCRIPTION** | **UNIT** | **QTY** | **RATE (KShs )** | **AMOUNT (KShs)** |
| | ***Kandani Rehabilitation*** | | | | |
| | 4" valve sockets<br>4" GI Sockets<br>110mm HDPE Male adaptor<br>HDPE Saddle 110X63<br>2" PE double acting airvalves | Nr<br>Nr<br>Nr<br>Nr<br>Nr | 10<br>10<br>14<br>3<br>3 | | -<br>-<br>-<br>-<br>- |
| | ***Kihorwe Line*** | | | | - |
| | 32mm diameter Hdpe couplers<br>110x32mm dia. Hdpe Saddle Clamp<br>25mm dia. GI Nipple<br>25 mm diameter Pegler Gate Valve<br>32mm dia.Hdpe Adaptor | No.<br>No.<br>No.<br>No.<br>No. | 7<br>1<br>1<br>1<br>1 | | -<br>-<br>-<br>-<br>- |
| | ***Kahuho 1 line*** | | | | - |
| | 50mm diameter Hdpe couplers<br>32mm diameter Hdpe couplers<br>32mm dia. Hdpe male adaptor<br>50mm dia. Hdpe male adaptor<br>25mm dia GI Nipple | No.<br>No.<br>No.<br>No.<br>No. | 2<br>2<br>1<br>1<br>1 | | -<br>-<br>-<br>-<br>- |

| | | | | | |
|---|---|---|---|---|---|
| | 40mm dia. GI Nipple | No. | 1 | | - |
| | 25 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 40 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 110x50mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | 50x32mm dia.saddle clamp | No. | 1 | | - |
| | ***Kahuho Gakindu lines*** | | | | - |
| | 50mm diameter Hdpe couplers | No. | 6 | | - |
| | 32mm diameter Hdpe couplers | No. | 7 | | - |
| | 50mm dia. Hdpe male adaptor | No. | 3 | | - |
| | 32mm dia. Hdpe male adaptor | No. | 3 | | - |
| | 25mm dia GI Nipple | No. | 3 | | - |
| | 40mm dia. GI Nipple | No. | 1 | | - |
| | 25 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 40 mm diameter Pegler Gate Valve | No. | 1 | | - |
| | 50x32mm diameter Hdpe saddle clamp | No. | 1 | | - |
| | ***Valves*** | | | | |
| | Supply, handle, deliver to site, fix in place and test inclusive of all fittings as in the Standard drawings . Valves to BS 5163 and EN 1074 Standards.<br><br>Rate for valves shall also include for all necessary fittings (Tees, Spigot pipes etc) as per drawings | | | | |
| | **Air-Valves** | | | | |
| | *Air Valves shall be Anti shock combination air valves, with a built in anti-water hammer non slam surge prevention system.To include an isolation valve of DN 50 mm* | | | | |
| J861.1 | PN16 DN 25 mm | nr | 0 | | - |
| J861.2 | PN16 DN 50 mm | nr | 0 | | - |
| | `` | | | | |

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| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |
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| **ITEM NO.** | **DESCRIPTION** | **UNIT** | **QTY** | **RATE (KShs )** | **AMOUNT (KShs)** |
| | **ANCILLARY WORKS**<br><br>Chambers, ducts, culverts, crossings, thrust and anchor blocks, reinstatement and others as listed and specified in drawings.<br><br>**Note:-** Items for work in this class shall include:-<br>- Excavation, preparation of surfaces, disposal of excavated material, shoring sides of excavation, backfilling and removal of redundant services.<br>- Concrete, masonry blocks, reinforcement, formwork, joints and finishes.<br>- Tips for disposal of excavated material or debris to be identified by the Contractor in liaison with the Local Authority.<br>***In Situ Chambers***<br><br>Provide all materials and construct Valve chamber internal dimensions 1000mm x 1000mm. Include for supply and fixing of lockable cover and step irons, as detailed in drawing | | | | |
| K112.2 | Depth: not exceeding 2.0 m | nr | 30 | | - |
| | ***Road Crossings***<br><br>*Extra-overs for normal pipe laying for road crossing works: to include breaking up and permanent reinstatement of roads and provision of a sleeve as per standard drawings* | | | | |
| K731.1 | Pipe bore:110- 63 mm on gravel road | m | 10 | | - |
| | ***Marker Posts*** | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | *Provide and install RC standard marker posts for:* | | | | |
| K82.4 | Along Pipeline at 300 m spacing and at change of directions, , inscribed "MAJI" and Diameter of the Pipeline | nr | 38 | | - |
| | **CLASS L:- PIPEWORK - SUPPORTS AND PROTECTION, ANCILLARIES TO LAYING AND EXCAVATION** | | | | |
| | *Extras over excavation and backfilling for excavation in Rock. Rate to include carting away and disposal. In pipe trench and chambers (Provisional).* | | | | |
| L111.1 | Excavation in trench for rock class "A" | m³ | 1 | | - |
| L111.2 | Excavation in trench for rock class "B" | m³ | 1 | | - |
| L111.3 | Excavation in trench for rock class "C" | m³ | 1 | | - |
| | **Note**:- Blasting is NOT permitted for Item L11 | | | | |
| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | **Imported Granular Fill (Provisional)** | | | | |
| | *Provide, transport to site and place imported granular material and compact in bed (100 mm thick) and surround to pipes (200 mm thick) as directed/approved by Engineer* | | | | |
| L531 | Surround To pipes nominal bore: n.e. 150 mm | m | 10 | | - |

| | | | | | |
|---|---|---|---|---|---|
| **L54** | **Mass Concrete Surround (Provisional)** | | | | - |
| | - | - | - | - | - |
| L551 | 300mm thick Mass Concrete Surround Class 15/20 to pipe as per Standard Drawings at locations directed by the Engineer. Rate to include for formwork, supports, vibrating, etc. | m | 10 | | - |
| | | | | | |
| | **CLASS X:- MISCELLANEOUS** | | | | |
| | | | | | |
| X51 | Supply and install with item decrypted before, tracable warning tape, permanently imprinted with= "CAUTION WATER PIPE", color= blue, width= 50mm, thickness= 5mm. | m | 18,927 | | - |
| | | | | | |
| X52 | ***Supply of 5000NR Meter relocation and sealing materials*** | | | | - |
| | **Relocation fittings** | | | | |
| X52.1 | Gate valve Pegler original | Nr | 700 | | - |
| X52.2 | Gate valve Pegler original 3/4" | Nr | 200 | | - |
| X52.3 | 1/2" elbows GI | Nr | 4,000 | | - |
| X52.4 | 3/4" elbows GI | Nr | 2,000 | | - |
| X52.5 | PVC Valve sockets 1/2" | Nr | 4,000 | | - |
| X52.6 | PVC Valve sockets 3/4" | Nr | 2,000 | | - |
| X52.7 | GI Union 1/2" | Nr | 1,000 | | - |
| X52.8 | GI Union 3/4" | Nr | 1,000 | | - |
| X52.9 | GI Hex nipple 1/2" | Nr | 1,000 | | - |
| X52.10 | GI Hex nipple 3/4" | Nr | 1,000 | | - |
| X52.11 | GI Meter stands 1/2" 1 ft | Nr | 700 | | - |
| X52.12 | GI Meter stands 3/4" 1 ft | Nr | 400 | | - |
| X52.13 | Meter seals lot 1(high security plastic meter seal meter seal with twisted wire) | Nr | 7,500 | | - |
| X52.14 | Meter seals lot 2(Anti-Tamper Security Coupling Seal) | Nr | 15,000 | | - |
| X52.15 | 1/2" PVC pipe PN 16 | Nr | 50 | | - |
| X52.16 | 3/4" PVC pipe PN 16 | Nr | 50 | | - |

| | | | | | |
|---|---|---|---|---|---|
| X52.17 | 1/2 PPR 100m | Nr | 10 | | - |
| X52.18 | 3/4" PPR 100m | Nr | 7 | | - |
| X52.19 | Solvent Tangit | Litres | 70 | | |
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| | **PAGE TOTAL CARRIED TO COLLECTION PAGE** | | | | - |

| ITEM NO. | DESCRIPTION | UNIT | QTY | RATE (KSh) | AMOUNT (KSh) |
|---|---|---|---|---|---|
| | **COLLECTION PAGE** | | | | |
| 1 | From page 1 | | | | - |
| 2 | From page 2 | | | | - |
| 3 | From page 3 | | | | - |
| 4 | From page 4 | | | | - |
| 5 | From page 5 | | | | - |
| 6 | From page 6 | | | | - |
| 7 | From page 7 | | | | - |
| 8 | From page 8 | | | | - |
| | **TOTAL CARRIED FORWARD TO GRAND SUMMARY SHEET** | | | | - |

**1: General Items**

| *Item no.* | *Description* | *Unit* | *Quantity* | *Rate* | *Amount* |
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| Total for Bill No. 1<br>(carried forward to Summary, p. _____) | | | | | _____ |

Payments under this item shall be made in the following currency proportions:

i) foreign: percent (to be stated by Tenderer)[7].

ii) local: percent (to be stated by Tenderer).

[7] *The Tenderer shall state the percentage in a common foreign currency equivalent required for payment and the exchange rates and official sources used.*

**Bill No. 2: Work items** *(organized appropriately into work sections, such as General Items, earth works, Culverts and Bridges, etc.) in tables as the one below.*

**Bill No 2 -** *(Name of Section E.g. Earthworks)*

| ***Item no.*** | ***Description*** | ***Unit*** | ***Quantity*** | ***Rate*** | ***Amount*** |
|---|---|---|---|---|---|
| | | | | | |
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| Total for Bill No…….. (Carried forward to Summary, p. _____) | | | | | xxx |

Payments under this item shall be made in the following currency proportions:

i) Foreign:_____percent (to be stated by Tenderer)[8].

ii) Local:_____percent (to be stated by Tenderer).

[8]*The Tenderer shall state the percentage in a common foreign currency equivalent required for payment and the exchange rates and official sources used.*

## C. Schedule of Daywork

**Rates [Note to the Procuring**

**Entity:**

i) A "Daywork Schedule" is commonly found in contracts where the likely incidence of unforeseen work cannot be covered by definitive descriptions and approximate quantities in the Bills of Quantities. The preferred alternative is to value the additional work in accordance with the Conditions of Contract. A Daywork Schedule normally has the disadvantage of not being competitive among Tenderers, who may therefore load the rates as signed to some or all the items. If a Daywork Schedule is to be included at all in the tendering documents, it is preferable to include nominal quantities against the items most likely to be used, and to carry the sum of the extended amounts forward into the Tender Summary in order to make the basic Schedule of Daywork Rates competitive.

ii) The total amount assigned to such competitive daywork is normally 3–5 percent of the estimated base Contract Price and is regarded as a Provisional Sum for contingencies to be expended under the direction and at the discretion of the Engineer.]

### 1. General

Reference should be made to Sub-Clause 13.6 of the General Conditions. Work shall not be executed on a day work basis except by written order of the Engineer. Tenderers shall enter basic rates for day work items in the Schedules, which rates shall apply to any quantity of day work ordered by the Engineer. Nominal quantities have been indicated against each item of daywork, and the extended total for Daywork shall be carried forward as a Provisional Sum to the Summary Total Tender Amount. Unless otherwise adjusted, payments for day work shall be subject to price adjustment in accordance with the provisions in the Conditions of Contract.

### 2. Daywork Labor

2.1 In calculating payments due to the Contract or for the execution of day work, the hours for labor will be reckoned from the time of arrival of the labor at the job site to execute the particular item of day work to thetimeofreturnto the original place of departure, but excluding meal breaks and rest periods. Only the time of classes of labor directly doing work ordered by the Engineer and for which they are competent to perform will be measured. The time of gangers (charge hands) actually doing work with the gangs will also be measured but not the time of foremen or other supervisory personnel.

2.2 The Contractor shall be entitled to payment in respect of the total time that labor is employed on daywork, calculated at the basic rates entered by the Contractor in the **Schedule of Daywork Rates: 1. Labor,** together with an additional percentage payment on basic rates representing the Contractor's profit, overheads, etc., as described below:

a) The basic rates for labor shall cover all direct costs to the Contractor, including (but not limited to) the amount of wages paid to such labor, transportation time, overtime, subsistence allowances, and any sums paid to or on behalf of such labor for social benefits in accordance with *[country of Procuring Entity]* law. The basic rates will be payable in local currency only.

b) The additional percentage payment to be quoted by the Tenderer and applied to costs incurred under (a) above shall be deemed to cover the Contractor's profit, overheads, superintendence, liabilities, and insurances and allowances to labor, time keeping, and clerical and office work, the use of consumable stores, water, lighting, and power; the use and repair of stagings, scaffolding, workshops, and stores, portable power tools, manual plant, and tools; supervision by the Contractor's staff, foremen, and other supervisory personnel; and charges incidental to the fore going. Payments under this item shall be made in the following currency proportions:

i) Foreign:_____percent (to be stated by Tenderer)[9].

*ii)* Local:_____percent (to be stated by

Tenderer). [***Note to the Procuring Entity****:*

*This method of indicating profit and overheads separately facilitates the addition of further items of daywork, if needed, the basic costs of which can then be checked more easily. An alternative is to make Daywork rates all- inclusive of the Contractor's overhead and profit, etc., in which case this paragraph and the relevant Daywork Schedule should be modified accordingly*.]

## 3. Daywork Materials

The Contractor shall be entitled to payment in respect of materials used for daywork (except for materials for which the cost is included in the percentage addition to labor costs as detailed hereto fore), at the basic rates entered by the Contractor in the **Schedule of Daywork Rates: 2. Materials,** together with an additional percentage payment on the basic rates to cover overhead charges and profit, as follows:

a) the basic rates for materials shall be calculated on the basis of the invoiced price, freight, insurance, handling expenses, damage, losses, etc., and shall provide for delivery to store for stockpiling at the Site. The basic rates shall be stated in local currency, but payment will be made in the currency or currencies expended upon presentation of supporting documentation.

b) the additional percentage payment shall be quoted by the Tenderer and applied to the equivalent local currency payments made under (a) above. Payments under this item will be made in the following currency proportions:
   i) foreign:____percent (to be stated by the Tenderer)[10];
   ii) local:_____percent (to be stated by the Tenderer);

c) the cost of hauling materials for use on work ordered to be carried out as daywork from the store or stockpile on the Site to the place where it is to be used will be paid in accordance with the terms for Labor and Construction in this schedule.

## 4. Daywork Contractor's Equipment

4.1 The Contractor shall be entitled to payments in respect of Contractor's Equipment already on Site and employed on daywork at the basic rental rates entered by the Contractor in the **Schedule of Daywork Rates: 3. Contractor's Equipment.** Said rates shall be deemed to include due and complete allowance for depreciation, interest, indemnity, and insurance, repairs, maintenance, supplies, fuel, lubricants, and other consumables, and all overhead, profit, and administrative costs related to the use of such equipment.

[***Note to the Procuring Entity****: This is an example of wording to include overhead and profit, etc., in the daywork rates. A separate percentage addition could be used as for labor and materials*.] The cost of drivers, operators, and assistants will be paid for separately as described under the section on Daywork Labor. *[**Note to the Procuring Entity**: An alternative, sometimes adopted for administrative convenience, is to include the cost of drivers, operators, and assistants in the basic rates for Contractor's Equipment. The last sentence of this paragraph 5 should then be modified accordingly.]*

4.2 In calculating the payment due to the Contractor for Contractor's Equipment employed on daywork, only the actual number of working hours will be eligible for payment, except that where applicable and agreed with the Engineer, the traveling time from the part of the Site where the Contractor's Equipment was located when ordered by the Engineer to be employed on daywork and the time for return journey thereto shall be included for payment.

4.3 The basic rental rates for Contractor's Equipment employed on daywork shall be stated in local currency, but payments to the Contractor will be made incurrency proportions, as follows:
   a) Foreign:_____percent (to be stated by the Tenderer)[11].
   b) Local:_____percent (to be stated by the Tenderer).

*[9]TheTenderer shall state the percentage in a common foreign currency equivalent required for payment and the exchange rates and official sources used.* *[10]The Tenderer shall state the percentage in a single foreign currency equivalent and the exchange rates and official sources used.*
*[11]The Tenderer shall state the percentage in a single foreign currency equivalent and the exchange rates and official sources used.*

**Schedule of Daywork Rates: 1. Labor**

| *Item no.* | *Description* | *Unit* | *Nominal quantity* | *Rate* | *Extended amount* |
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| | Subtotal | | | | |
| | Allow ____ percent[a] of Subtotal for Contractor's overhead, profit, etc., in accordance with paragraph 3 (b) above. | | | | |
| | | | | | |
| | Total for Daywork: Labor (Carried forward to Daywork Summary, p. _____) | | | | _____ |

a. To be entered by the Tenderer.

**Schedule of Daywork Rates: 2. Materials**

| *Item no.* | *Description* | *Unit* | *Nominal quantity* | *Rate* | *Extended amount* |
|---|---|---|---|---|---|
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| | Subtotal | | | | |
| | Allow ____ percent of Subtotal for Contractor's overhead, profit, etc., in accordance with paragraph 4 (b) above. | | | | |
| | | | | | |
| | Total for Daywork: Materials (Carried forward to Daywork Summary, p. _____) | | | | _____ |

a. To be entered by the Tenderer.

## Schedule of Daywork Rates: 3. Contractor's Equipment

| *Item no.* | *Description* | *Nominal quantity (hours)* | *Basic hourly rental rate* | *Extended amount* |
|---|---|---|---|---|
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| | Allow _ percent[a] of Subtotal for Contractor's overhead, profit, etc., in accordance with paragraph 5 above. | | | |
| | | | | |
| Total for Daywork: Contractor's Equipment (Carried forward to Daywork Summary, p. _____ ) | | | | _____ |

a. To be entered by the Tenderer.

## Dayworks Summary

| | *Amount*[a] *( )* | *% Foreign* |
|---|---|---|
| 1. Total for Daywork: Labor | | |
| 2. Total for Daywork: Materials | | |
| 3. Total for Daywork: Contractor's Equipment | | |
| Total for Daywork (Provisional Sum) (Carried forward to Tender Summary, p. ___) | _____ | _____ |

a. The Procuring Entity should insert local currency unit.

**Summary of Specified Provisional Sums in the Bills of Quantities**

| *Bill no.* | *Item no.* | *Description* | *Amount* |
|---|---|---|---|
| 1 | | | |
| | | | |
| | | | |
| 2 | | | |
| | | | |
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| 3 | | | |
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| | | | |
| 4 | | | |
| | | | |
| | | | |
| etc. | | | |
| | | | |
| | | | |
| Total for Specified Provisional Sums<br>(Carried forward to Grand Summary (B), p. _____ ) | | | |

**Grand Summary**

| **General Summary** | **Page** | **Amount** |
|---|---|---|
| Bill No. 1: Genera items | | |
| Bill No. 2: Work items | | |
| Bill No. 2: Work items | | |
| Bill No. 2: Work items | | |
| Bill No. 2: Work items, —etc.— | | |
| Subtotal of Bills | (A) | |
| ADD Total for Daywork (Provisional Sum) * | (B) | |
| ADD Specified Provisional Sums in their subtotal of bills[ii] | (C) | [sum] |
| Total of Bills Plus Provisional Sums (A + B + C) [i] | (D) | |
| Add Provisional Sum for Contingency Allowance (if any) [ii] | (E) | [sum] |
| Tender Price (D + E) (Carried forward to Letter of Tender) | (F) | |
| | | |

i) All Provisional Sums are to be expended in whole or in part at the direction and discretion of the Engineer in accordance with +Clause 13.5 of the General Conditions.
ii) To be entered by the Procuring Entity.
* For evaluation purposes, Provisional Sum, other than Daywork will be excluded

## SECTION VI – SPECIFICATIONS

### *AS ATTACHED ANNEX NO. 1*

*[In drafting of the Specification, care must be taken when drafting the Work's Requirements to ensure that the requirements are not restrictive. Recognized international standards should be used as much as possible for the description of goods, materials and workmanship. Where other particular standards are specified, whether national standards or other standards, it should be stated that goods, materials and workmanship meeting other authoritative standards and which promise to ensure equal or higher quality than the standards specified, will also be acceptable. Where a brand name of a product is specified it should always be qualified with the terms "or equivalent".]*

**Notes for preparing Specifications**

1. Specifications must be drafted to present a clear and precise statement of the required standards of materials, and workmanship for tenderers to respond realistically and competitively to the requirements of the Procuring Entity and ensure responsiveness of tenders. The Specifications should require that all materials, plant, and other supplies to be permanently incorporated in the Works be new, unused, of the most recent or current models, and incorporating all recent improvements in design and materials unless provided otherwise in the Contract. Where the Contractor is responsible for the design of any part of the permanent Works, the extent of his obligations must be stated.

2. Specifications from previous similar projects are useful and may not be necessary to re-write specifications for every Works Contract.

3. There are considerable advantages in standardizing **General Specifications** for repetitive Works in recognized public sectors, such as highways, urban housing, irrigation and water supply. The General Specifications should cover all classes of workmanship, materials and equipment commonly involved in constructions, although not necessarily to be used in a particular works contract. Deletions or addenda should then adapt the General Specifications to the particular Works.

4. Care must be taken in drafting Specifications to ensure they are not restrictive. In the Specifications of standards for materials, plant and workmanship, existing Kenya Standards should be used as much as possible, otherwise recognized international standards may also be used.

5. The Procuring Entity should decide whether technical solutions to specified parts of the Works are to be permitted. Alternatives are appropriate in cases where obvious (and potentially less costly) alternatives are possible to the technical solutions indicated in tender documents for certain elements of the Works, taking into consideration the comparative specialized advantage of potential tenderers.

6. The Procuring Entity should provide a description of the selected parts of the Works with appropriate reference to Drawings, Specifications, Bills of Quantities, and Design or Performance criteria, stating that the alternative solutions shall be atleast structurally and functionally equivalent to the basic design parameters and Specifications.

7. Such alternative solutions shall be accompanied by all information necessary for a complete evaluation by the Procuring Entity, including drawings, design calculations, technical specifications, breakdown of prices, proposed construction methodology, and other relevant details. Technical alternatives permitted in this manner shall be considered by the Procuring Entity each on its own merits and independently of whether the tenderer has priced the item as described in the Procuring Entity's design included with the tender documents.

## SECTION VII - DRAWINGS

**Note**: A list of drawings should be inserted here. The actual drawings including Site plans should be annexed in a separate booklet.

***AS ATTACHED ANNEX NO. 2***

## SUPPLEMENTARY INFORMATION

*NOT APPLICABLE*

# PART 3 – CONDITIONS OF CONTRACT AND CONTRACT FORMS

## Section VIII - General Conditions of Contract 1. GENERAL CONDITIONS

## 1. General Provisions

### 1.1 Definitions

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

### 1.1.1 The Contract

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

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

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

**"Drawings"** means the drawings of the Works, as included in the Contract, and any additional and modified drawings issued by (or on behalf of) the Procuring Entity in accordance with the Contract.

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

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

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

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

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

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

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

### 1.1.2 Parties and Persons

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

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

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

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

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

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

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

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

### 1.1.3 Dates, Tests, Periods and Completion

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

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

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

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

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

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

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

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

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

### 1.1.4 Money and Payments

**"Accepted Contract Amount"** means the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects.

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

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

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

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

Certificate].
**"Foreign Currency"** means acurrency in which part (orall) of the Contract Price is payable, but not the Local Currency.

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

**"Local Currency"** means the currency of the Country.

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

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

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

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

### 1.1.5 Works and Goods

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

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

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

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

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

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

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

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

### 1.1.6 Other Definitions

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

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

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

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

**"Notice of Dissatisfaction"** means the notice given by either Party to the other under Sub-Clause 20.4 indicating its dissatisfaction and intention to commence arbitration.

**"Performance Security**" means the security (or securities, if any) under Sub-Clause 4.2 [Performance Security].

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

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

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

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

## 1.2 Interpretation

In the Contract, except where the context requires otherwise:

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

## 1.3 Communications

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

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

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

## 1.4 Law andLanguage

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

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

## 1.5 Priority of Documents

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

a) The Contract Agreement,
b) theLetterofAcceptance,

c) the Particular Conditions–Part A,
d) the Particular Conditions–Part B
e) the General Conditions of Contract
f) the Form of Tender,
g) the Specifications and Bills of Quantities
h) the Drawings, and
i) the Schedules and any other documents forming part of the Contract.

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

**1.6 Contract Agreement**

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

**1.7 Assignment**

Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either Party:
a) May assign the whole or any part with the prior agreement of the other Party, at the sole discretion of such other Party, and
b) May, as security in favor of a Procuring Entity or financial institution, assign its right to any moneys due, or to become due, under the Contract.

**1.8 Care and Supply of Documents**

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

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

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

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

**1.9 Delayed Drawings or Instructions**

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

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

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

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

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

### 1.10 Procuring Entity's Use of Contractor's Documents

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

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

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

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

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

### 1.11 Contractor's Use of Procuring Entity's Documents

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

### 1.12 Confidential Details

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

### 1.13 Compliance with Laws

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

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

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

### 1.14 Joint and Several Liability

If the Contractor constitutes (under applicable Laws) a joint venture, consortium or other unincorporated grouping of two or more persons:

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

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

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

**1.15 Inspections and Audit by the Procuring Entity**

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

**2. THE PROCURING ENTITY**

**2.1 Right of Access to the Site**

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

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

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

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

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

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

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

**2.2 Permits, Licenses or Approvals**

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

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

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

i) Which the Contractor is required to obtain under Sub-Clause 1.13 [Compliance with Laws],
ii) For the delivery of Goods, including clearance through customs, and
iii) For the export of Contractor's Equipment when it is removed from the Site.

**2.3 Procuring Entity's Personnel**

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

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

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

## 2.4 Procuring Entity's Financial Arrangement

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

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

## 2.5 Procuring Entity's Claims

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

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

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

# 3. THE ENGINEER

## 3.1 Engineer's Duties and Authority

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

The Engineer shall have no authority to amend the Contract.
The Engineer may exercise the authority attributable to the Engineer as specified in or necessarily to be implied from the Contract. If the Engineer is required to obtain the approval of the Procuring Entity before exercising a specified authority, the requirements shall be as stated in the Particular Conditions. The Procuring Entity shall promptly inform the Contractor of any change to the authority attributed to the Engineer.

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

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

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

discrepancies and non-compliances; and

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

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

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

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

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

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

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

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

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

## 3.2 Delegation by the Engineer

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

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

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

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

## 3.3 Instructions of the Engineer

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

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

a) Gives an oral instruction,

b) Receives a written confirmation of the instruction, from (or on behalf of) theContractor, within two working days after giving the instruction, and

c) Does not reply by issuing a written rejection and/or instruction within two working days after receiving the confirmation, then the confirmation shall constitute the written instruction of the Engineeror delegated assistant (as the case may be).

### 3.4 Replacement of the Engineer

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

### 3.5 Determinations

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

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

## 4. THE CONTRACTOR

### 4.1 Contractor's General Obligations

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

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

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

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

4.1.5 The Contractor shall, whenever required by the Engineer, submit details of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works. No significant alteration to these arrangements and methods shall be made without this having previously been notified to the Engineer.

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

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

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

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

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

d) Prior to the commencement of the Tests on Completion, the Contractor shall submit to the Engineer the "as- built" documents and, if applicable, operation and maintenance manuals in accordance with the Specification and insufficient detail for the Procuring Entity to operate, maintain, dismantle, reassemble, adjust and repair this part of the Works. Such part shall not be considered to be completed for thev

purposes of taking-over under Sub-Clause 10.1 [Taking Over of the Works and Sections] until these documents and manuals have been submitted to the Engineer.

**4.2 Performance Security**

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

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

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

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

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

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

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

4.2.7 Without limitation to the provisions of the rest of this Sub-Clause, whenever the Engineer determines an addition or are duction to the Contract Price as a result of a change in cost and/or legislation, or as a result of a Variation, amounting to more than 25 percent of the portion of the Contract Price payable in a specific currency, the Contractor shall at the Engineer's request promptly increase, or may decrease, as the case may be, the value of the Performance Security in that currency by an equal percentage.

**4.3 Contractor's Representative**

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

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

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

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

The Contractor's Representative may delegate any powers, functions and authority to any competent person, and may at anytime revoke the delegation. Any delegation or revocation shall not take effect until the Engineer

has received prior notice signed by the Contractor's Representative, naming the person and specifying the powers, functions and authority being delegated or revoked.

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

## 4.4 Subcontractors

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

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

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

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

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

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

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

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

## 4.5 Assignment of Benefit of Subcontract

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

## 4.6 Co-operation

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

a) The Procuring Entity's Personnel,

b) Any other contractors employed by the Procuring Entity, and

c) The personnel of any legally constituted public authorities, who may be employed in the execution on or near the Site of any work not included in the Contract.

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

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

## 4.7 Setting Out

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

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

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

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

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

**4.8 Safety Procedures**

The Contractor shall:

a) Comply with all applicable safety regulations,
b) Take care for the safety of all persons entitled to be on the Site,
c) Use reasonable efforts to keep the Site and Works clear of unnecessary obstructions as to avoid danger to these persons,
d) provide fencing, lighting, guarding and watching of the Works until completion and taking over under Clause10 [Procuring Entity's Taking Over], and
e) Provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and protection of the public and of owners and occupiers of adjacent land.

**4.9 Quality Assurance**

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

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

**4.10 Site Data**

4.10.1 The Procuring Entity shall have made available to the Contractor for his information, prior to the Base Date, all relevant data in the Procuring Entity's possession on sub-surface and hydrological conditions at the Site, including environmental aspects. The Procuring Entity shall similarly make available to the Contract or all such data which come into the Procuring Entity's possession after the Base Date. The Contractor shall be responsible for interpreting all such data.

4.10.2 To the extent which was practicable (taking account of cost and time), the Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Tender or Works. To the same extent, the Contractor shall be deemed to have inspected and examined the Site, its surroundings, the above data and other available information, and to have been satisfied before submitting the Tender as to all relevant matters, including (without limitation):

a) The form and nature of the Site, including sub-surface conditions,
b) The hydrological and climatic conditions,
c) The extent and nature of the work and Goods necessary for the execution and completion of the Works and the remedying of any defects,
d) The Laws, procedures and labor practices of the Country, and
e) The Contractor's requirements for access, accommodation, facilities, personnel, power, transport, water and other services.

**4.11 Sufficiency of the Accepted Contract Amount**

4.11.1 The Contractor shall be deemed to:
a) Have satisfied itself as to the correctness and sufficiency of the Accepted Contract Amount, and
b) Have based the Accepted Contract Amount on the data, interpretations, necessary information, inspections, examinations and satisfaction as to all relevant matters referred to in Sub-Clause 4.10 [Site Data].

4.11.2 Unless otherwise stated in the Contract, the Accepted Contract Amount covers all the Contractor's obligations under the Contract (including those under Provisional Sums, if any) and all things necessary for the proper execution and completion of the Works and the remedying of any defects.

**4.12 Unforeseeable Physical Conditions**

4.12.1 In this Sub-Clause, "physical conditions" means natural physical conditions and man-made and other physical obstructions and pollutants, which the Contractor encounters at the Site when executing the Works, including sub-surface and hydrological conditions but excluding climatic conditions.

4.12.2 If the Contractor encounters adverse physical conditions which he considers to have been Unforeseeable, the ContractorshallgivenoticetotheEngineerassoonaspracticable.

This notice shall describe the physical conditions, so that they can be inspected by the Engineer, and shall set out the reasons why the Contractor considers them to be Unforeseeable. The Contractor shall continue executing the Works, using such proper and reasonable measures as are appropriate for the physical conditions, and shall comply with any instructions which the Engineer may give. If an instruction constitutes a Variation, Clause 13 [Variations and Adjustments] shall apply.

4.12.3 If and to the extent that the Contractor encounters physical conditions which are Unforeseeable, gives such a notice, and suffers delay and/or incurs Cost due to these conditions, the Contractor shall be entitled subject to notice under Sub-Clause 20.1 [Contractor's Claims] to:
a) An extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
b) Payment of any such Cost, which shall be included in the Contract Price.

4.12.4 Upon receiving such notice and inspecting and/or investigating these physical conditions, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) whether and (if so) to what extent these physical conditions were Unforeseeable, and (ii) the matters described in sub-paragraphs (a) and (b) above related to this extent.

4.12.5 However, before additional Cost is finally agreed or determined under sub-paragraph (ii), the Engineer may also review whether other physical conditions in similar parts of the Works (if any) were more favorable than could reasonably have been foreseen when the Contractor submitted the Tender. If and to the extent that thesemore favorable conditions were encountered, the Engineer may proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the reductions in Cost which were due to these conditions, which may be included (as deductions) in the Contract Price and Payment Certificates. However, the net effect of all adjustments under sub-paragraph (b) and all these reductions, for all the physical conditions encountered in similar parts of the Works, shall not result in any reduction in the Contract Price.

4.12.6 The Engineer shall take account of any evidence of the physical conditions foreseen by the Contractor when submitting the Tender, which shall be made available by the Contractor, but shall not be bound by the Contractor's interpretation of any such evidence.

**4.13 Rights of Way and Facilities**

Unless otherwise specified in the Contract the Procuring Entity shall provide effective access to and possession of the Site including special and/or temporary rights-of-way which are necessary for the Works. The Contractor shall obtain, at his risk and cost, any additional rights of way or facilities outside the Site which he may require for the purposes of the Works.

**4.14 Avoidance of Interference**

4.14.1 The Contractor shall not interfere unnecessarily or improperly with:
a) The convenience of the public, or
b) The access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Procuring Entity or of others.

4.14.2 The Contractor shall indemnify and hold the Procuring Entity harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.

**4.15 Access Route**

4.15.1 TheContractorshallbedeemedtohavebeensatisfiedastothesuitabilityandavailabilityofaccessroutestothe SiteatBaseDate.TheContractorshallusereasonableeffortstopreventanyroadorbridgefrombeingdamaged by the Contractor's traffic or by the Contractor's Personnel. These efforts shall include the proper use of appropriatevehiclesandroutes.

4.15.2 Except as otherwise stated in these Conditions:

a) The Contractor shall (as between the Parties) be responsible for any maintenance which may be required for his use of access routes;

b) the Contractor shall provide all necessary signs or directions along access routes, and shall obtain any permission which may be required from the relevant authorities for his use of routes, signs and directions;

c) the Procuring Entity shall not be responsible for any claims which may arise from the use or otherwise of any access route;

d) the Procuring Entity does not guarantee the suitability or availability of particular access routes; and

e) Costs due to non-suitability or non-availability, for the use required by the Contractor, of access routes shall be borne by the Contractor.

**4.16 Transport of Goods**

Unless otherwise stated in the Particular Conditions:

a) The Contractor shall give the Engineer not less than 21 days' notice of the date on which any Plant or a major item of other Goods will be delivered to the Site;

b) The Contractor shall be responsible for packing, loading, transporting, receiving, unloading, storing and protecting all Goods and other things required for the Works; and

c) The Contractor shall indemnify and hold the Procuring Entity harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from the transport of Goods, and shall negotiate and pay all claims arising from their transport.

**4.17 Contractor's Equipment**

The Contractor shall be responsible for all Contractor's Equipment. When brought onto the Site, Contractor's Equipment shall be deemed to be exclusively intended for the execution of the Works. The Contractor shall not remove from the Site any major items of Contractor's Equipment without the consent of the Engineer. However, consent shall not be required for vehicles transporting Goods or Contractor's Personnel off Site.

**4.18 Protection of the Environment**

4.18.1 The Contractor shall take all reasonable steps to protect the environment (both on and off the Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations.

4.18.2 The Contractor shall ensure that emissions, surfaced is charges and effluent from the Contractor's activities shall not exceed the values stated in the Specification or prescribed by applicable Laws.

**4.19 Electricity, Water and Gas**

4.19.1 The Contractor shall, except as stated below, be responsible for the provision of all power, water and other services he may require for his construction activities and to the extent defined in the Specifications, for the tests.

The Contractor shall be entitled to use for the purposes of the Works such supplies of electricity, water, gas and other services as may be available on the Site and of which details and prices are given in the Specification. The Contractor shall, at his risk and cost, provide any apparatus necessary for his use of these services and for measuring the quantities consumed.

4.19.2 The quantities consumed and the amounts due (at these prices) for such services shall be agreed or determined by the Engineer in accordance with Sub-Clause 2.5 [Procuring Entity's Claims] and Sub-Clause 3.5 [Determinations]. The Contractor shall pay these amounts to the Procuring Entity.

## 4.20 Procuring Entity's Equipment and Free-Issue Materials

4.20.1 The Procuring Entity shall make the Procuring Entity's Equipment (if any) available for the use of the Contractor in the execution of the Works in accordance with the details, arrangements and prices stated in the Specification. Unless otherwise stated in the Specification:

a) The Procuring Entity shall be responsible for the Procuring Entity's Equipment, except that

b) The Contractor shall be responsible for each item of Procuring Entity's Equipment whilst any of the Contractor's Personnel is operating it, driving it, directing it or in possession or control of it.

4.20.2 The appropriate quantities and the amounts due (at such stated prices) for the use of Procuring Entity's Equipment shall be agreed or determined by the Engineer in accordance with Sub-Clause 2.5 [Procuring Entity's Claims] and Sub-Clause 3.5 [Determinations]. The Contractor shall pay these amounts to the Procuring Entity.

The Procuring Entity shall supply, free of charge, the "free-issue materials" (if any) in accordance with the details stated in the Specification. The Procuring Entity shall, at his risk and cost, provide these materialsc at the time and place specified in the Contract. The Contractor shall then visually inspect them and shall promptly give notice to the Engineer of any shortage, defect or default in these materials. Unless otherwise agreed by both Parties, the Procuring Entity shall immediately rectify the notified shortage, defect or default.

4.20.3 After this visual inspection, the free-issue materials shall come under the care, custody and control of the Contractor.The Contractor's obligations of inspection, care, custody and control shall not relieve the Procuring Entity of liability for any shortage, defect or default not apparent froma visual inspection.

## 4.21 Progress Reports

4.21.1 Unless otherwise stated in the Particular Conditions, monthly progress reports shall be prepared by the Contractor and submitted to the Engineer in six copies. The first report shall cover the period upto the end of the first calendar month following the Commencement Date. Reports shall be submitted monthly thereafter, each within 7 days after the last day of the period to which it relates.

4.21.2 Reporting shall continue until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

4.21.3 Each report shall include:

a) charts and detailed descriptions of progress, including each stage of design (if any), Contractor's Documents, procurement, manufacture, delivery to Site, construction, erection and testing; andincluding these stages for work by each nominated Subcontractor (as defined in Clause 5 [Nominated Subcontractors]),

b) photographs showing the status of manufacture and of progress on the Site;

c) for the manufacture of each main item of Plant and Materials, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:

   i) commencement of manufacture,

   ii) Contractor's inspections,

   iii) tests, and

   iv) shipment and arrival at the Site;

d) the details described in Sub-Clause 6.10 [Records of Contractor's Personnel and Equipment];

e) copies of quality assurance documents, test results and certificates of Materials;

f) list of notices given under Sub-Clause 2.5 [Procuring Entity's Claims] and notices given under Sub-Clause 20.1 [Contractor's Claims];

g) safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations; and

h) comparisons of actual and planned progress, with details of any events or circumstances which may jeopardize the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.

4.21.4 The Contractor shall provide immediate notification to the Engineer of incidents in the following categories. Full details of such incidents shall be provided to the Engineer within the time frame agreed with the Engineer.

a) confirmed or likely violation of any law or international agreement;

b) any fatality or serious injury;

c) significant adverse effects or damage to private property (e.g. vehicle accident, damage from fly rock, working beyond the boundary);
d) major pollution of drinking water aquifer or damage or destruction of rare or endangered habitat (including protected areas) or species; or
e) any allegation of sexual harassment or sexual misbehavior, child abuse, defilement, or other violations involving children.

**4.22 Security of the Site**

Unless otherwise stated in the Particular Conditions:
a) The Contractor shall be responsible for keeping unauthorized persons off the Site, and
b) Authorized persons shall be limited to the Contractor's Personnel and the Procuring Entity's Personnel; and to any other personnel notified to the Contractor, by the Procuring Entity or the Engineer, as authorized personnel of the Procuring Entity's other contractors on the Site.

**4.23 Contractor's Operations on Site**

4.23.1 The Contractor shall confine his operations to the Site, and to any additional areas which may be obtained by the Contractor and agreed by the Engineer as additional working areas. The Contractor shall take all necessary precautions to keep Contractor's Equipment and Contractor's Personnel within the Site and these additional areas, and to keep them off adjacent land.

During the execution of the Works, the Contractor shall keep the Site free from all unnecessary obstruction and shall store or dispose of any Contractor's Equipment or surplus materials. The Contractor shall clear away and remove from the Site any wreckage, rubbish and Temporary Works which are no longer required.

4.23.2 Upon the issue of a Taking-Over Certificate, the Contractor shall clear away and remove, from that part of the Site and Works to which the Taking-Over Certificate refers, all Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works. The Contractor shall leave that part of the Site and the Works in a clean and safe condition. However, the Contractor may retain on Site, during the Defects Notification Period, such Goods as are required for the Contractor to fulfil obligations under the Contract.

**4.24 Fossils**

4.24.1 All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the Procuring Entity. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.

4.24.2 The Contractor shall, upon discovery of any such finding, promptly give notice to the Engineer, who shall issue instructions for dealing with it. If the Contractor suffers delay and/or incurs Cost from complying with the instructions, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:
a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4 [Extension of Time for Completion], and
b) payment of any such Cost, which shall be included in the Contract Price.

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

**5. NOMINATED SUB CONTRACTORS**

**5.1 Definition of "nominated Subcontractor**

In the Contract, "nominated Subcontractor" means a Subcontractor:
a) Who is stated in the Contract as being a nominated Subcontractor, or
b) whom the Engineer, under Clause 13 [Variations and Adjustments], instructs the Contractor to employ as a Subcontractor subject to Sub-Clause 5.2 [Objection to Notification].

**5.2 Objection to Nomination**

The Contractor shall not be under any obligation to employ a nominated Subcontractor against whom the Contractor raises reasonable objection by notice to the Engineer as soon as practicable, with supporting

particulars. An objection shall be deemed reasonable if it arises from (among other things) any of the following matters, unless the Procuring Entity agrees in writing to indemnify the Contractor against and from the consequences of the matter:

a) there are reasons to believe that the Subcontractor does not have sufficient competence, resources or financial strength;

b) the nominated Subcontract or does not accept to indemnify the Contractor against and from any negligence or misuse of Goods by the nominated Subcontractor, his agents and employees; or

c) the nominated Subcontractor does not accept to enter into a subcontract which specifies that, for the subcontracted work (including design, if any), the nominated Subcontract or shall:

   i) undertake to the Contractor such obligations and liabilities as will enable the Contractor to discharge his obligations and liabilities under the Contract;

   ii) indemnify the Contractor against and from all obligations and liabilities arising under or in connection with the Contract and from the consequences of any failure by the Subcontractor to perform these obligations or to fulfil these liabilities, and

   iii) be paid only if and when the Contractor has received from the Procuring Entity payments for sums due under the Subcontract referred to under Sub-Clause 5.3 [Payment to nominated Subcontractors].

**5.3 Payments to nominated Subcontractors**

The Contractor shall pay to the nominated Subcontractor the amounts shown on the nominated Subcontractor's invoices approved by the Contractor which the Engineer certifies to be due in accordance with the subcontract. These amounts plus other charges shall be included in the Contract Price in accordance with sub-paragraph (b) of Sub-Clause 13.5 [Provisional Sums], except as stated in Sub-Clause 5.4 [Evidence of Payments].

**5.4 Evidence of Payments**

Before issuing a Payment Certificate which includes an amount payable to a nominated Subcontractor, the Engineer may request the Contractor to supply reasonable evidence that the nominated Subcontractor hasreceived all amounts due in accordance with previous Payment Certificates, less applicable deductions for retention or otherwise. Unless the Contractor:

a) Submits this reasonable evidence to the Engineer, or

b) i) satisfies the Engineer in writing that the Contractor is reasonably entitled to withhold or refuse to pay these amounts, and

   ii) submits to the Engineer reasonable evidence that the nominated Subcontractor has been notified of the Contractor's entitlement, then the Procuring Entity may (at his sole discretion) pay, direct to the nominated Subcontractor, partor all of such amounts previously certified (less applicable deductions) as are due to the nominated Subcontractor and for which the Contractor has failed to submit the evidence described in sub-paragraphs (a) or (b) above. The Contractor shall then repay, to the Procuring Entity, the amount which the nominated Subcontractor was directly paid by the Procuring Entity.

**6. STAFF AND LABOR**

**6.1 Engagement of Staff and Labor**

Except as otherwise stated in the Specification, the Contractor shall make arrangements for the engagement of all staff and labor, local or otherwise, and for their payment, feeding, transport, and, when appropriate, housing. The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labor with appropriate qualifications and experience from sources within the Country.

**6.2 Rates of Wages and Conditions of Labor**

6.2.1 The Contractor shall pay rates of wages, and observe conditions of labor, which are not lower than those established for the trade or industry where the work is carried out. If no established rates or conditions are applicable, the Contractor shall pay rates of wages and observe conditions which are not lower than the general level of wages and conditions observed locally by Procuring Entity's whose trade or industry is similar to that of the Contractor.

6.2.2 The Contractor shall inform the Contractor's Personnel about their liability to pay personal income taxes in Kenya in respect of such of their salaries, wages, allowances and any benefits as are subject to tax under the

Laws of Kenya for the time being in force, and the Contractor shall perform such duties in regard to such deductions there of as may be imposed on him by such Laws.

**6.3 Persons in the Service of Procuring Entity**

The Contractor shall not recruit, or attempt to recruit, staff and labor from amongst the Procuring Entity's Personnel.

**6.4 Labor Laws**

6.4.1 The Contractor shall comply with all the relevant labor Laws applicable to the Contractor's Personnel, including Laws relating to their employment, health, safety, welfare, immigration and emigration, and shall allow them all their legal rights.

6.4.2 The Contractor shall require his employees to obey all applicable Laws, including those concerning safety at work.

**6.5 Working Hours**

No work shall be carried out on the Site on locally recognized days of rest, or outside the normal working hours stated in the **SCC**, unless:

a) Otherwise stated in the Contract,
b) The Engineer gives consent, or
c) The work is unavoidable, or necessary for the protection of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer.

**6.6 Facilities for Staff and Labor**

6.6.1 Except as otherwise stated in the Specification, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor's Personnel. The Contractor shall also provide facilities for the Procuring Entity's Personnel as stated in the Specification.

6.6.2 The Contractor shall not permit any of the Contractor's Personnel to maintain any temporary or permanent living quarters within the structures forming part of the Permanent Works.

**6.7 Health and Safety**

6.7.1 The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel. In collaboration with local health authorities, the Contractor shall ensure thatmedical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site and at any accommodation for Contractor's and Procuring Entity's Personnel, and that suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics.

6.7.2 The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the execution of the Works, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.

6.7.3 The Contractor shall send, to the Engineer, details of any accident as soon as practicable after its occurrence. The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Engineer may reasonably require.

6.7.4 HIV-AIDS Prevention. The Contractor shall conduct an HIV-AIDS awareness programme via an approved service provider and shall undertake such other measures as are specified in this Contract to reduce the risk of the transfer of the HIV virus between and among the Contractor's Personnel and the local community, to promote early diagnosis and to assist affected individuals.

**6.8 Contractor's Superintendence**

6.8.1 Throughout the execution of the Works, and as long thereafter as is necessary to fulfil the Contractor's obligations, the Contractor shall provide all necessary superintendence to plan, arrange, direct, manage, inspect and test the work.

6.8.2 Superintendence shall be given by a sufficient number of persons having adequate knowledge of the language

for communications (defined in Sub-Clause 1.4 [Law and Language]) and of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents), for the satisfactory and safe execution of the Works.

**6.9 Contractor's Personnel**

6.9.1 The Contractor's Personnel specified in the **SCC** shall be appropriately qualified, skilled and experienced in their respective trades or occupations. The Engineer may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor's Representative if applicable, who:

a) Persists in any misconduct or lack of care,
b) Carries out duties incompetently or negligently,
c) Fails to conform with any provisions of the Contract,
d) Persists in any conduct which is prejudicial to safety, health, or the protection of the environment, or
e) Based on reasonable evidence, is determined to have engaged in Fraud and Corruption during the execution of the Works.

6.9.2 If appropriate, the Contractor shall then appoint (or cause to be appointed) a suitable replacement person.

**6.10 Records of Contractor's Personnel and Equipment**

The Contractor shall submit, to the Engineer, details showing the number of each class of Contractor's Personnel and of each type of Contractor's Equipment on the Site. Details shall be submitted each calendar month, in a form approved by the Engineer, until the Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

**6.11 Disorderly Conduct**

The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst the Contractor's Personnel, and to preserve peace and protection of persons and property on and near the Site.

**6.12 Foreign Personnel**

6.12.1 The Contractor may bring in to the Country any foreign personnel who are necessary for the execution of the Works to the extent allowed by the applicable Laws. The Contractor shall ensure that these personnel are provided with the required residence visas and work permits. The Procuring Entity will, if requested by the Contractor, use his Lowest endeavors in a timely and expeditious manner to assist the Contract or in obtaining any local, state, national or government permission required for bringing in the Contractor's personnel.

6.12.2 The Contractor shall be responsible for the return of these personnel to the place where they were recruited or to their domicile. In the event of the death in the Country of any of these personnel or members of their families, the Contractor shall similarly be responsible for making the appropriate arrangements for their return or burial.

**6.13 Supply of Foodstuffs**

6.13.1 The Contractor shall arrange for the provision of a sufficient supply of suitable food as may be stated in the Specification at reasonable prices for the Contractor's Personnel for the purposes of or in connection with the Contract.

**6.14 Supply of Water**

The Contractor shall, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of the Contractor's Personnel.

**6.15 Measures against Insect and Pest Nuisance**

The Contractor shall at all times take the necessary precautions to protect the Contractor's Personnel employed on the Site from insect and pest nuisance, and to reduce the danger to their health. The Contractor shall comply with all the regulations of the local health authorities, including use of appropriate insecticide.

**6.16 Alcoholic Liquor or Drugs**

The Contractor shall not, otherwise than in accordance with the Laws of the Country, import, sell, give, barter

or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter or disposal thereof by Contractor's Personnel.

### 6.17 Arms and Ammunition

The Contractor shall not give, barter, or otherwise dispose of, to any person, any arms or ammunition of any kind, or allow Contractor's Personnel to do so.

### 6.18 Festivals and Religious Customs

The Contractor shall respect the Country's recognized festivals, days of rest and religious or other customs.

### 6.19 Funeral Arrangements

The Contractor shall be responsible, to the extent required by local regulations, for making any funeral arrangements for any of his local employees who may die while engaged upon the Works.

### 6.20 Prohibition of Forced or Compulsory Labor

The Contractor shall not employ forced labor, which consists of any work or service, not voluntarily performed, that is exacted from an individual under threat of force or penalty, and includes any kind of involuntary or compulsory labor, such as indentured labor, bonded labor or similar labor-contracting arrangements.

### 6.21 Prohibition of Harmful Child Labor

The Contractor shall not employ children in a manner that is economically exploitative, or is likely to be hazardous, or to interfere with, the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. Where the relevant labor laws of the Country have provisions for employment of minors, the Contract or shall follow those laws applicable to the Contractor. Children below the age of 18 years shall not be employed in dangerous work.

### 6.22 Employment Records of Workers

The Contractor shall keep complete and accurate records of the employment of labor at the Site. The records shall include the names, ages, genders, hours worked and wages paid to all workers. These records shall be summarized on a monthly basis and submitted to the Engineer. These records shall be included in the details to be submitted by the Contractor under Sub-Clause 6.10 [Records of Contractor's Personnel and Equipment].

### 6.23 Workers' Organizations

The Contractor shall comply with laws on workers' rights to form and to join workers' organizations without interference and to bargain collectively.

### 6.24 Non-Discrimination and Equal Opportunity

The Contractor shall not make employment decisions on the basis of personal characteristics unrelated to inherent job requirements. The Contractor shall base the employment relationship on the principle of equal opportunity and fair treatment and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline.

## 7. Plant, Materials and Workmanship

### 7.1 Manner of Execution

The Contractor shall carry out the manufacture of Plant, the production and manufacture of Materials, and all other execution of the Works:

a) In the manner (if any) specified in the Contract,
b) In a proper workman like and careful manner, in accordance with recognized good practice, and
c) With properly equipped facilities and non-hazardous Materials, except as otherwise specified in the Contract.

### 7.2 Samples

The Contractor shall submit the following samples of Materials, and relevant information, to the Engineer for consent prior to using the Materials in or for the Works:

a) manufacturer's standard samples of Materials and samples specified in the Contract, all at the Contractor's cost, and
b) additional samples instructed by the Engineer as a Variation.
Each sample shall be labeled as to origin and intended use in the Works.

**7.3 Inspection**

7.3.1 The Procuring Entity's Personnel shall at all reasonable times:
a) Have full access to all parts of the Site and to all places from which natural Materials are being obtained, and
b) During production, manufacture and construction (at the Site and elsewhere), be entitled to examine, inspect, measure and test the materials and workmanship, and to check the progress of manufacture of Plant and production and manufacture of Materials.

7.3.2 The Contractor shall give the Procuring Entity's Personnel full opportunity to carry out these activities, including providing access, facilities, permissions and safety equipment. No such activity shall relieve the Contractor from any obligation or responsibility.

The Contractor shall give notice to the Engineer whenever any work is ready and before it is covered up, put out of sight, or packaged for storage or transport. The Engineer shall then either carry out the examination, inspection, measurement or testing without unreasonable delay, or promptly give notice to the Contractor that the Engineer does not require to do so. If the Contractor fails to give the notice, he shall, if and when required by the Engineer, uncover the work and thereafter reinstate and make good, all at the Contractor's cost.

**7.4 Testing**

7.4.1 This Sub-Clause shall apply to all tests specified in the Contract, other than the Tests after Completion (if any).

7.4.2 Except as otherwise specified in the Contract, the Contractor shall provide all apparatus, assistance, documents and other information, electricity, equipment, fuel, consumables, instruments, labor, materials, and suitably qualified and experienced staff, as are necessary to carry out the specified tests efficiently. The Contractor shall agree, with the Engineer, the time and place for the specified testing of any Plant, Materials and other parts of the Works.

The Engineer may, under Clause 13 [Variations and Adjustments], vary the location or details of specified tests, or instruct the Contractor to carry out additional tests. If these varied or additional tests show that the tested Plant, Materials or workmanship is not in accordance with the Contract, the cost of carrying out this Variation shall be borne by the Contractor, notwithstanding other provisions of the Contract.

7.4.3 The Engineer shall give the Contractor not less than 24 hours' notice of the Engineer's intention to attend the tests. If the Engineer does not attend at the time and place agreed, the Contractor may proceed with the tests, unless otherwise instructed by the Engineer, and the tests shall then be deemed to have been made in the Engineer'spresence.

If the Contractor suffers delay and/or incurs Cost from complying with these instructions or as a result of a delay for which the Procuring Entity is responsible, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

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

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

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

The Contractor shall promptly forward to the Engineer duly certified reports of the tests. When the specified tests have been passed, the Engineer shall endorse the Contractor's test certificate, or issue a certificate to him, to that effect. If the Engineer has not attended the tests, he shall be deemed to have accepted the readings as accurate.

**7.5 Rejection**

7.5.1 If, as a result of an examination, inspection, measurement or testing, any Plant, Materials or workmanship is found to be defective or otherwise not in accordance with the Contract, the Engineer may reject the Plant, Materials or workmanship by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the defect and ensure that the rejected item complies with the Contract.

7.5.2 If the Engineer requires this Plant, Materials or workmanship to be retested, the tests shall be repeated unde rthe same terms and conditions. If the rejection and retesting cause the Procuring Entity to incur additional

costs, the Contractor shall subject to Sub-Clause 2.5 [Procuring Entity's Claims] pay these costs to the Procuring Entity.

### 7.6 Remedial Work

7.6.1 Notwithstanding any previous test or certification, the Engineer may instruct the Contractor to:

a) remove from the Site and replace any Plant or Materials which is not in accordance with the Contract,

b) remove and re-execute any other work which is not in accordance with the Contract, and

c) execute any work which is urgently required for the safety of the Works, whether because of an accident, unforeseeable event or otherwise.

7.6.2 The Contractor shall comply with the instruction within a reasonable time, which shall be the time (if any) specified in the instruction, or immediately if urgency is specified under sub-paragraph (c).

7.6.3 If the Contractor fails to comply with the instruction, the Procuring Entity shall be entitled to employ and pay other persons to carry out the work. Except to the extent that the Contractor would have been entitled to payment for the work, the Contractor shall subject to Sub-Clause 2.5 [Procuring Entity's Claims] pay to the Procuring Entity all costs arising from this failure.

### 7.7 Ownership of Plant and Materials

Except as otherwise provided in the Contract, each item of Plant and Materials shall, to the extent consistent with the Laws of the Country, become the property of the Procuring Entity at whichever is the earlier of the following times, free from liens and other encumbrances:

a) When it is incorporated in the Works;

b) When the Contractor is paid the corresponding value of the Plant and Materials under Sub-Clause 8.10 [Payment for Plant and Materials in Event of Suspension].

### 7.8 Royalties

Unless otherwise stated in the Specification, the Contractor shall pay all royalties, rents and other payments for:

a) Natural Materials obtained from outside the Site, and

b) The disposal of material from demolitions and excavations and of other surplus material (whether natural or man-made), except to the extent that disposal areas within the Site are specified in the Contract.

## 8. COMMENCEMENT, DELAYS AND SUSPENSION

### 8.1 Commencement of Works

8.1.1 Except as otherwise specified in the Special Conditions of Contract, the Commencement Date shall be the date at which the following precedent conditions have all been fulfilled and the Engineer's notification recording the agreement of both Parties on such fulfilment and instructing to commence the Work is received by the Contractor:

a) Contract by relevant authorities of the Country;

b) delivery to the Contractor of reasonable evidence of the Procuring Entity's financial arrangements (under Sub-Clause 2.4 [Procuring Entity's Financial Arrangements]);

c) signature of the Contract Agreement by both Parties, and if required, approval of the except if otherwise specified in the **SCC**, effective access to and possession of the Site given to the Contractor together with such permission(s) under (a) of Sub-Clause 1.13 [Compliance with Laws] as required for the commencement of the Works

d) receipt by the Contract or of the Advance Payment under Sub-Clause14.2 [Advance Payment] provided that the corresponding Procuring Entity guarantee has been delivered by the Contractor.

8.1.2 If the said Engineer's instruction is not received by the Contractor within 180 days from his receipt of the Letter of Acceptance, the Contractor shall be entitled to terminate the Contract under Sub-Clause 16.2 [Termination by Contractor].

8.1.3 The Contractor shall commence the execution of the Works as soon as is reasonably practicable after the Commencement Date and shall then proceed with the Works with due expedition and without delay.

## 82 Time for Completion

The Contractor shall complete the whole of the Works, and each Section (if any), within the Time for Completion for the Works or Section (as the case may be), including:

a) achieving the passing of the Tests on Completion, and

b) completing all work which is stated in the Contract as being required for the Works or Section to be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [Taking Over of the Works and Sections].

## 83 Programme

83.1 The Contractor shall submit a detailed time programme to the Engineer within 14 days after receiving the notice under Sub-Clause 8.1 [Commencement of Works]. The Contractor shall also submit a revised programme whenever the previous programme is inconsistent with actual progress or with the Contractor's obligations. Each programme shall include:

a) the order in which the Contractor intends to carry out the Works, including the anticipated timing ofeach stage of design (if any), Contractor's Documents, procurement, manufacture of Plant, delivery to Site, construction, erection and testing,

b) each of these stages for work by each nominated Subcontractor (as defined in Clause 5 [Nominated Subcontractors]),

c) the sequence and timing of inspections and tests specified in the Contract, and

d) a supporting report which includes:

   i) a general description of the methods which the Contract or intends to adopt, and of the major stages, in the execution of the Works, and

   ii) details showing the Contractor's reasonable estimate of the number of each class of Contractor's Personnel and of each type of Contractor's Equipment, required on the Site for each major stage.

83.2 Unless the Engineer, within 14 days after receiving a programme, gives notice to the Contractor stating the extent to which it does not comply with the Contract, the Contractor shall proceed in accordance with the programme, subject to his other obligations under the Contract. The Procuring Entity's Personnel shall be entitled to rely upon the programme when planning their activities.

83.3 The Contractor shall promptly give notice to the Engineer of specific probable future events or circumstances which may adversely affect the work, increase the Contract Price or delay the execution of the Works. The Engineer may require the Contractor to submit an estimate of the anticipated effect of the future event or circumstances, and/or a proposal under Sub-Clause 13.3 [Variation Procedure].

83.4 If, at anytime, the Engineer gives notice to the Contractor that a programme fails (to the extent stated) to comply with the Contract or to be consistent with actual progress and the Contractor's stated intentions, the Contractor shall submit a revised programme to the Engineer in accordance with this Sub-Clause.

## 84 Extension of Time for Completion

84.1 The Contractor shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to an extension of the Time for Completion if and to the extent that completion for the purposes of Sub-Clause10.1 [Taking Over of the Works and Sections] is or will be delayed by any of the following causes:

a) a Variation (unless an adjustment to the Time for Completion has been agreed under Sub-Clause 13.3 [Variation Procedure]) or other substantial change in the quantity of an item of work included in the Contract,

b) a cause of delay giving an entitlement to extension of time under a Sub-Clause of these Conditions,

c) exceptionally adverse climatic conditions,

d) Unforeseeable shortages in the availability of personnel or Goods caused by epidemic or governmental actions, or

e) Any delay, impediment or prevention caused by or attributable to the Procuring Entity, the Procuring Entity's Personnel, or the Procuring Entity's other contractors.

84.2 If the Contractor considers itself to be entitled to an extension of the Time for Completion, the Contractor shall give notice to the Engineer in accordance with Sub-Clause 20.1 [Contractor's Claims]. When determining each extension of time under Sub-Clause 20.1, the Engineer shall review previous determinations and may increase, but shall not decrease, the total extension of time.

## 85 Delays Caused by Authorities

If the following conditions apply, namely:

a) The Contractor has diligently followed the procedures laid down by the relevant legally constituted public authorities in the Country,
b) These authorities delay or disrupt the Contractor's work, and
c) The delay or disruption was Unforeseeable, then this delay or disruption will be considered as a cause of delay under sub-paragraph (b) of Sub-Clause 8.4 [Extension of Time for Completion].

**8.6 Rate of Progress**

8.6.1 If, at any time:

a) Actual progress is too slow to complete within the Time for Completion, and/or
b) Progress has fallen (or will fall) behind the current programme under Sub-Clause 8.3 [Programme], other than as a result of a cause listed in Sub-Clause 8.4 [Extension of Time for Completion], then the Engineer may instruct the Contractor to submit, under Sub-Clause 8.3 [Programme], a revised programme and supporting report describing the revised methods which the Contractor proposes to adopt in order to expedite progress and complete within the Time for Completion.

   Unless the Engineer notifies otherwise, the Contractor shall adopt these revised methods, which may require increases in the working hours and/or in the numbers of Contractor's Personnel and/or Goods, at the risk and cost of the Contractor. If these revised methods cause the Procuring Entity to incur additional costs, the Contractor shall subject to notice under Sub-Clause 2.5 [Procuring Entity's Claims] pay these costs to the Procuring Entity, in addition to delay damages (if any) under Sub-Clause 8.7 below.

8.6.2 Additional costs of revised methods including acceleration measures, instructed by the Engineer to reduce delays resulting from causes listed under Sub-Clause 8.4 [Extension of Time for Completion] shall be paid by the Procuring Entity, without generating, however, any other additional payment benefit to the Contractor.

**8.7 Delay Damages**

8.7.1 If the Contractor fails to comply with Sub-Clause 8.2 [Time for Completion], the Contractor shall subject to notice under Sub-Clause 2.5 [Procuring Entity's Claims] pay delay damages to the Procuring Entity for this default. These delay damages shall be the sum stated in the **SCC**, which shall be paid for everyday which shall elapse between the relevant Time for Completion and the datestatedintheTaking-OverCertificate.However, the total amount due under this Sub-Clause shall not exceed the maximum amount of delay damages (if any) stated in the **SCC**.

8.7.2 These delay damages shall be the only damages due from the Contractor for such default, other than in the event of termination under Sub-Clause 15.2 [Termination by Procuring Entity] prior to completion of the Works. These damages shall not relieve the Contractor from his obligation to complete the Works, or from any other duties, obligations or responsibilities which he may have under the Contract.

**8.8 Suspension of Work**

8.8.1 The Engineer may at any time instruct the Contractor to suspend progress of part or all of the Works. During such suspension, the Contractor shall protect, store and secure such part or the Works against any deterioration, loss or damage.

8.8.2 The Engineer may also notify the cause for the suspension. If and to the extent that the cause is notified and is the responsibility of the Contractor, the following Sub-Clauses 8.9, 8.10 and 8.11 shall not apply.

**8.9 Consequences of Suspension**

8.9.1 If the Contractor suffers delay and/or incurs Cost from complying with the Engineer's instructions under Sub-Clause 8.8 [Suspension of Work] and/or from resuming the work, the Contractor shall give notice to the Engineer and shall been titled subject to Sub-Clause 20.1 [Contractor's Claims] to:

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

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

8.9.2 The Contractor shall not be entitled to an extension of time for, or to payment of the Cost incurred in, making

good the consequences of the Contractor's faulty design, workmanship or materials, or of the Contractor's failure to protect, store or secure in accordance with Sub-Clause 8.8 [Suspension of Work].

### 8.10 Payment for Plant and Materials in Event of Suspension

The Contractor shall be entitled to payment of the value (as at the date of suspension) of Plant and/or Materials which have not been delivered to Site, if:

a) the work on Plant or delivery of Plant and/or Materials has been suspended for more than 30 days, and
b) the Contractor has marked the Plant and/or Materials as the Procuring Entity's property in accordance with the Engineer's instructions.

### 8.11 Prolonged Suspension

If the suspension under Sub-Clause 8.8 [Suspension of Work] has continued for more than 84 days, the Contractor may request the Engineer's permission to proceed. If the Engineer does not give permission within 30 days after being requested to do so, the Contractor may, by giving notice to the Engineer, treat the suspension as an omission under Clause 13 [Variations and Adjustments] of the affected part of the Works. If the suspension affects the whole of the Works, the Contractor may give notice of termination under Sub-Clause 16.2 [Termination by Contractor].

### 8.12 Resumption of Work

After the permission or instruction to proceed is given, the Contractor and the Engineer shall jointly examine the Works and the Plant and Materials affected by the suspension. The Contractor shall make good any deterioration or defect in or loss of the Works or Plant or Materials, which has occurred during the suspension after receiving from the Engineer an instruction to this effect under Clause13 [Variations and Adjustments].

## 9. TESTS ON COMPLETION

### 9.1 Contractor's Obligations

9.1.1 The Contractor shall carry out the Tests on Completion in accordance with this Clause and Sub-Clause 7.4 [Testing], after providing the documents in accordance with sub-paragraph (d) of Sub-Clause 4.1 [Contractor's General Obligations].

9.1.2 The Contractor shall give to the Engineer not less than 21 days' notice of the date after which the Contract or will be ready to carry out each of the Tests on Completion. Unless otherwise agreed, Tests on Completion shall be carried out within 14 days after this date, on such day or days as the Engineer shall instruct.

9.1.3 In considering the results of the Tests on Completion, the Engineer shall make allowances for the effect of any use of the Works by the Procuring Entity on the performance or other characteristics of the Works. As soon as the Works, or a Section, have passed any Tests on Completion, the Contractor shall submit a certified report of the results of these Tests to the Engineer.

### 9.2 Delayed Tests

9.2.1 If the Tests on Completion are being unduly delayed by the Procuring Entity, Sub-Clause 7.4 [Testing] (fifth paragraph) and/or Sub-Clause 10.3 [Interference with Tests on Completion] shall be applicable.

If the Tests on Completion are being unduly delayed by the Contractor, the Engineer may by notice require the Contractor to carry out the Tests within 21 days after receiving the notice. The Contractor shall carry out the Tests on such day or days within that period as the Contract or may fix and of which he shall give notice to the Engineer.

If the Contractor fails to carry out the Tests on Completion within the period of 21 days, the Procuring Entity's Personnel may proceed with the Tests at the risk and cost of the Contractor. The Tests on Completion shall then be deemed to have been carried out in the presence of the Contract or and the results of the Tests shall be accepted as accurate.

### 9.3 Retesting

If the Works, or a Section, fail to pass the Tests on Completion, Sub-Clause 7.5 [Rejection] shall apply, and the Engineer or the Contractor may require the failed Tests, and Tests on Completion on any related work, to

be repeated under the same terms and conditions.

### 9.4 Failure to Pass Tests on Completion

9.4.1 If the Works, or a Section, fail to pass the Tests on Completion repeated under Sub-Clause 9.3 [Retesting], the Engineer shall be entitled to:

a) Order further repetition of Tests on Completion under Sub-Clause 9.3;

b) If the failure deprives the Procuring Entity of substantially the whole benefit of the Works or Section, reject the Works or Section (as the case may be), in which event the Procuring Entity shall have the same remedies as are provided in sub-paragraph (c) of Sub-Clause 11.4 [Failure to Remedy Defects]; or

c) Issue a Taking-Over Certificate, if the Procuring Entity so requests.

9.4.2 In the event of sub-paragraph (c), the Contractor shall proceed in accordance with all other obligations under the Contract, and the Contract Price shall be reduced by such amount as shall be appropriate to cover the reduced value to the Procuring Entity as a result of this failure. Unless the relevant reduction for this failure is stated (or its method of calculation is defined) in the Contract, the Procuring Entity may require the reduction to be (i) agreed by both Parties (in full satisfaction of this failure only) and paid before this Taking-Over Certificate is issued, or
(ii) determined and paid under Sub-Clause 2.5 [Procuring Entity's Claims] and Sub-Clause 3.5 [Determinations].

## 10. PROCURING ENTITY'S TAKING OVER

### 10.1 Taking Over of the Works and Sections

10.1.1 Except as stated in Sub-Clause 9.4 [Failure to Pass Tests on Completion], the Works shall be taken over by the Procuring Entity when (i) the Works have been completed in accordance with the Contract, including the matters described in Sub-Clause 8.2 [Time for Completion] and except as allowed in sub-paragraph (a) below, and (ii) a Taking-Over Certificate for the Works has been issued, or is deemed to have been issued in accordance with this Sub-Clause.

10.1.2 The Contract or may apply by notice to the Engineer for a Taking-Over Certificate not earlier than 14 days before the Works will, in the Contractor's opinion, be complete and ready for taking over. If the Works are divided into Sections, the Contract or may similarly apply for a Taking-Over Certificate for each Section.

10.1.3 The Engineer shall, within 30 days after receiving the Contractor's application:

a) issue the Taking-Over Certificate to the Contractor, stating the date on which the Works or Section were completed in accordance with the Contract, except for any minor outstanding work and defects which will not substantially affect the use of the Works or Section for their intended purpose (either until or whilst this work is completed and these defects are remedied); or

b) reject the application, giving reasons and specifying the work required to be done by the Contractor to enable the Taking-Over Certificate to be issued. The Contractor shall then complete this work before issuing a further notice under this Sub-Clause.

10.1.4 If the Engineer fails either to issue the Taking-Over Certificate or to reject the Contractor's application within the period of 30 days, and if the Works or Section (as the case may be) are substantially in accordance with the Contract, the Taking-Over Certificate shall be deemed to have been issued on the last day of that period.

### 10.2 Taking Over of Parts of the Works

10.2.1 The Engineer may, at the sole discretion of the Procuring Entity, issue a Taking-Over Certificate for any part of the Permanent Works.

The Procuring Entity shall not use any part of the Works (other than as a temporary measure which is either specified in the Contract or agreed by both Parties) unless and until the Engineer has issued a Taking-Over Certificate for this part. However, if the Procuring Entity does use any part of the Works before the Taking-Over Certificate isissued:

a) The part which is used shall be deemed to have been taken over as from the date on which it is used,

b) The Contractor shall cease to be liable for the care of such part as from this date, when responsibility shall pass to the Procuring Entity, and

c) If requested by the Contractor, the Engineer shall issue a Taking-Over Certificate for this part.

10.2.2 After the Engineer has issued a Taking-Over Certificate for a part of the Works, the Contractor shall be given the earliest opportunity to take such steps as may be necessary to carry out any outstanding Tests onCompletion. The Contractor shall carry out these Tests on Completion as soon as practicable before the expiry date of the relevant Defects Notification Period.

10.2.3 If the Contractor incurs Cost as a result of the Procuring Entity taking over and/or using a part of the Works, other than such use as is specified in the Contractor agreed by the Contractor, the Contractor shall (i) give notice to the Engineer and (ii) be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to payment of any such Cost-plus profit, which shall be included in the Contract Price. After receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine this Cost and profit.

10.2.4 If a Taking-Over Certificate has been issued for a part of the Works (other than a Section), the delay damages there after for completion of the remainder of the Works shall be reduced. Similarly, the delay damages for the remainder of the Section (if any) in which this part is included shall also be reduced. For any period of delay after the date stated in this Taking-Over Certificate, the proportional reduction in these delay damages shall be calculated as the proportion which the value of the part so certified bears to the value of the Works or Section (as the case may be) as a whole. The Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine these proportions. The provisions of this paragraph shall only apply to the daily rate of delay damages under Sub-Clause 8.7 [Delay Damages] and shall not affect the maximum amount of these damages.

**10.3 Interference with Tests on Completion**

10.3.1 If the Contractor is prevented, for more than 14 days, from carrying out the Tests on Completion by a cause for which the Procuring Entity is responsible, the Procuring Entity shall be deemed to have taken over the Works or Section (as the case may be) on the date when the Tests on Completion would otherwise have been completed.

The Engineer shall then issue a Taking-Over Certificate accordingly, and the Contractor shall carry out the Tests on Completion as soon as practicable, before the expiry date of the Defects Notification Period. The Engineer shall require the Tests on Completion to be carried out by giving 14 days' notice and in accordance with the relevant provisions of the Contract.

10.3.2 If the Contractor suffers delay and/or incurs Cost as a result of this delay in carrying out the Tests on Completion, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

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

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

**10.4 Surfaces Requiring Reinstatement**

Except as otherwise stated in a Taking-Over Certificate, a certificate for a Section or part of the Works shall not be deemed to certify completion of any ground or other surfaces requiring reinstatement.

**11. Defects Liability**

**11.1 Completion of Outstanding Work and Remedying Defects**

11.1.1 In order that the Works and Contractor's Documents, and each Section, shall be in the condition required by the Contract (fair wear and tear excepted) by the expiry date of the relevant Defects Notification Period or as soon as practicable there after, the Contractor shall:

a) complete any work which is outstanding on the date stated in a Taking-Over Certificate, within such reasonable time as is instructed by the Engineer, and

b) execute all work required to remedy defects or damage, as may be notified by (or on behalf of) the Procuring Entity on or before the expiry date of the Defects Notification Period for the Works or Section (as the case may be).

11.1.2 If a defect appears or damage occurs, the Contractor shall be notified accordingly, by (or on behalf of) the Procuring Entity.

**11.2 Cost of Remedying Defects**

11.2.1 All work referred to in sub-paragraph (b) of Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects] shall be executed at the risk and cost of the Contractor, if and to the extent that the work

is attributable to:

a) Any design for which the Contractor is responsible,
b) Plant, Materials or workmanship not being in accordance with the Contract, or
c) Failure by the Contractor to comply with any other obligation.

11.2.2 If and to the extent that such work is attributable to any other cause, the Contractor shall be notified promptly by (or on behalf of) the Procuring Entity, and Sub-Clause 13.3 [Variation Procedure] shall apply.

**11.3 Extension of Defects Notification Period**

11.3.1 The Procuring Entity shall be entitled subject to Sub-Clause 2.5 [Procuring Entity's Claims] to an extension of the Defects Notification Period for the Works or a Section if and to the extent that the Works, Section or a major item of Plant (as the case may be, and after taking over) cannot be used for the purposes for which they are intended by reason of a defect or by reason of damage attributable to the Contractor. However, a Defects Notification Period shall not be extended by more than two years.

11.3.2 If delivery and/or erection of Plant and/or Materials was suspended under Sub-Clause 8.8 [Suspension of Work] orSub-Clause 16.1 [Contractor's Entitlement to Suspend Work], the Contractor's obligations under this Clause shall not apply to any defects or damage occurring more than two years after the Defects Notification Period for the Plant and/or Materials would otherwise have expired.

**11.4 Failure to Remedy Defects**

11.4.1 If the Contractor fails to remedy any defector damage within a reasonable time, a date may be fixed by (or on behalf of) the Procuring Entity, on or by which the defect or damage is to be remedied. The Contractor shall be given reasonable notice of this date.

11.4.2 If the Contractor fails to remedy the defect or damage by this notified date and this remedial work was to be executed at the cost of the Contractor under Sub-Clause 11.2 [Cost of Remedying Defects], the Procuring Entity may (at his option):

a) Carry out the work itself or by others, in a reasonable manner and at the Contractor's cost, but the Contractor shall have no responsibility for this work; and the Contractor shall subject to Sub-Clause 2.5 [Procuring Entity's Claims] pay to the Procuring Entity the costs reasonably incurred by the Procuring Entity in remedying the defect or damage;
b) Require the Engineer to agree or determine a reasonable reduction in the Contract Price in accordance with Sub-Clause3.5 [Determinations]; or
c) If the defect or damage deprives the Procuring Entity of substantially the whole benefit of the Works or any major part of the Works, terminate the Contract as a whole, or in respect of such major part which cannot be put to the intended use.

11.4.3 Without prejudice to any other rights, under the Contractor otherwise, the Procuring Entity shall then be entitled to recover all sums paid for the Works or for such part (as the case may be), plus financing costs and the cost of dismantling the same, clearing the Site and returning Plant and Materials to the Contractor.

**11.5 Removal of Defective Work**

If the defect or damage cannot be remedied expeditiously on the Site and the Procuring Entity gives consent, the Contractor may remove from the Site for the purposes of repair such items of Plant as are defective or damaged. This consent may require the Contractor to increase the amount of the Performance Security by the full replacement cost of these items, or to provide other appropriate security.

**11.6 Further Tests**

11.6.1 If the work of remedying of any defect or damage may affect the performance of the Works, the Engineer may require the repetition of any of the tests described in the Contract. The requirement shall be made by notice within 30 days after the defect or damage is remedied.

11.6.2 These tests shall be carried out in accordance with the terms applicable to the previous tests, except that hey shall be carried out at the risk and cost of the Party liable, under Sub-Clause 11.2 [Cost of Remedying Defects], for the cost of the remedial work.

**11.7 Right of Access**

Until the Performance Certificate has been issued, the Contractor shall have such right of access to the Works as is reasonably required in order to comply with this Clause, except as may be inconsistent with the Procuring Entity's reasonable security restrictions.

### 11.8 Contractor to Search

The Contractor shall, if required by the Engineer, search for the cause of any defect, under the direction of the Engineer. Unless the defect is to be remedied at the cost of the Contractor under Sub-Clause 11.2 [Cost of Remedying Defects], the Cost of the search plus profit shall be agreed or determined by the Engineer in accordance with Sub-Clause 3.5 [Determinations] and shall be included in the Contract Price.

### 11.9 Completion Certificate

11.9.1 Performance of the Contractor's obligations shall not be considered to have been completed until the Engineer has issued the Performance Certificate to the Contractor, stating the date on which the Contractor completed his obligations under the Contract.

11.9.2 The Engineer shall issue the Performance Certificate within 30 days after the latest of the expiry dates of the Defects Notification Periods, or as soon thereafter as the Contractor has supplied all the Contractor's Documents and completed and tested all the Works, including remedying any defects. A copy of the Performance Certificate shall be issued to the Procuring Entity.

11.9.3 Only the Performance Certificate shall be deemed to constitute acceptance of the Works.

### 11.10 Unfulfilled Obligations

After the Performance Certificate has been issued, each Party shall remain liable for the fulfilment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extentof unperformed obligations, the Contract shall be deemed to remain in force.

### 11.11 Clearance of Site

11.11.1 Upon receiving the Performance Certificate, the Contractor shall remove any remaining Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works from the Site.

11.11.2 If all these items have not been removed within 30 days after receipt by the Contractor of the Performance Certificate, the Procuring Entity may sell or otherwise dispose of any remaining items. The Procuring Entity shall be entitled to be paid the costs incurred in connection with, or attributable to, such sale or disposal and restoring the Site.

Any balance of the moneys from the sale shall be paid to the Contractor. If these moneys are less than the Procuring Entity's costs, the Contractor shall pay the outstanding balance to the Procuring Entity.

## 12. MEASUREMENT AND EVALUATION

### 12.1 Works to be Measured

12.1.1 The Works shall be measured, and valued for payment, in accordance with this Clause. The Contractor shall show in each application under Sub-Clauses 14.3 [Application for Interim Payment Certificates], 14.10 [Statement on Completion] and 14.11 [Application for Final Payment Certificate] the quantities and other particulars detailing the amounts which he considers to be entitled under the Contract.

12.1.2 Whenever the Engineer requires any part of the Works to be measured, reasonable notice shall be given to the Contractor's Representative, who shall:

a) promptly either attend or send another qualified representative to assist the Engineer in making the measurement, and

(b) supply any particulars requested by the Engineer.

If the Contractor fails to attend or send a representative, the measurement made by (or on behalf of) the Engineer shall be accepted as accurate.

12.1.3 Except as otherwise stated in the Contract, wherever any Permanent Works are to be measured from records,

these shall be prepared by the Engineer. The Contractor shall, as and when requested, attend to examine and agree the records with the Engineer, and shall sign the same when agreed. If the Contractor does not attend, the records shall be accepted as accurate.

12.1.4 If the Contractor examines and disagrees the records, and/or does not sign them as agreed, then the Contractor shall give notice to the Engineer of the respects in which the records are asserted to be inaccurate. After receiving this notice, the Engineer shall review the records and either confirm or vary them and certify the payment of the undisputed part. If the Contractor does not so give notice to the Engineer within 14 days after being requested to examine the records, they shall be accepted as accurate.

## 12.2 Method of Measurement

Except as otherwise stated in the Contract and notwithstanding local practice:

a) Measurement shall be made of the net actual quantity of each item of the Permanent Works, and
b) The method of measurement shall be in accordance with the Bills of Quantities or other applicable Schedules.

## 12.3 Evaluation

12.3.1 Except as otherwise stated in the Contract, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the Contract Price by evaluating each item of work, applying the measurement agreed or determined in accordance with the above Sub-Clauses 12.1 and 12.2 and the appropriate rate or price for the item.

For each item of work, the appropriate rate or price for the item shall be the rate or price specified for such item in the Contractor, if there is no such item, specified for similar work.

12.3.2 Any item of work included in the Bills of Quantities for which no rate or price was specified shall be considered as included in other rates and prices in the Bills of Quantities and will not be paid for separately.

However, a new rate or price shall be appropriate for an item of work if:

a) I) the measured quantity of the item is changed by more than 25% from the quantity of this item in the Bills of Quantities or another Schedule,
   ii) This change in quantity multiplied by such specified rate fo rthis item exceeds 0.25% of the Accepted Contract Amount,
   iii) This change in quantity directly changes the Cost per unit quantity of this item by more than 1%, and
   iv) This item is not specified in the Contract as a "fixed rate item"; or
b) i) the work is instructed under Clause 13 [Variations and Adjustments],
   ii) no rate or price is specified in the Contract for this item, and
   iii) no specified rate or price is appropriate because the item of work is not of similar character, or is not executed under similar conditions, as any item in the Contract.

12.3.3 Each new rate or price shall be derived from any relevant rates or prices in the Contract, with reasonable adjustments to take account of the matters described in sub-paragraph (a) and/or (b), as applicable. If no rates or prices are relevant for the derivation of a new rate or price, it shall be derived from the reasonable Cost of executing the work, together with profit, taking account of any other relevant matters.

12.3.4 Until such time as an appropriate rate or price is agreed or determined, the Engineer shall determine a provisional rate or price for the purposes of Interim Payment Certificates as soon as the concerned work commences.

12.3.5 Where the contract price is different from the corrected tender price, in order to ensure the contractor is not paid less or more relative to the contract price (*which would be the tender price*), payment valuation certificates and variation orders on omissions and additions valued based on rates in the

Bill of Quantities or schedule of rates in the Tender, will be adjusted by a plus or minus percentage. The percentage already worked out during tender evaluation is worked out as follows: *(corrected tender price–tender price)/tender price X 100*.

### 12.4 Omissions

Whenever the omission of any work forms part (or all) of a Variation, the value of which has not been agreed, if:

a) the Contractor will incur (or has incurred) cost which, if the work had not been omitted, would have been deemed to be covered by a sum forming part of the Accepted Contract Amount;
b) the omission of the work will result (or has resulted) in this sum not forming part of the Contract Price; and
c) this cost is not deemed to be included in the evaluation of any substituted work; then the Contractor shall give notice to the Engineer accordingly, with supporting particulars. Upon receiving this notice, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine this cost, which shall be included in the Contract Price.

## 13. VARIATIONS AND ADJUSTMENTS

### 13.1 Right to Vary

13.1.1 Variations may be initiated by the Engineer at any time prior to issuing the Taking-Over Certificate for the Works, either by an instruction or by a request for the Contractor to submit a proposal.

13.1.2 The Contractor shall execute and be bound by each Variation, unless the Contractor promptly gives notice to the Engineer stating (with supporting particulars) that (i) the Contractor cannot readily obtain the Goods required for the Variation, or (ii) such Variation triggers a substantial change in the sequence or progress of the Works. Upon receiving this notice, the Engineer shall cancel, confirm or vary the instruction.
Each Variation may include:

a) Changes to the quantities of any item of work included in the Contract (however, such changes do not necessarily constitute a Variation),
b) Changes to the quality and other characteristics of any item of work,
c) Changes to the levels, positions and/or dimensions of any part of the Works,
d) Omission of any work unless it is to be carried out by others,
e) Any additional work, Plant, Materials or services necessary for the Permanent Works, including any associated Tests on Completion, boreholes and other testing and exploratory work, or
f) Changes to the sequence or timing of the execution of the Works.

13.1.3 The Contractor shall not make any alteration and/or modification of the Permanent Works, unless and until the Engineer instructs or approves a Variation.

### 13.2 Value Engineering

13.2.1 The Contract or may, at any time, submit to the Engineer a written proposal which (in the Contractor's opinion) will, if adopted, (i) accelerate completion, (ii) reduce the cost to the Procuring Entity of executing, maintaining or operating the Works, (iii) improve the efficiency or value to the Procuring Entity of the completed Works, or (iv) otherwise be of benefit to the Procuring Entity.

13.2.2 The proposal shall be prepared at the cost of the Contract or and shall include the items listed in Sub- Clause 13.3 [Variation Procedure].

If a proposal, which is approved by the Engineer, includes a change in the design of part of the Permanent Works, then unless otherwise agreed by both Parties:

a) The Contractor shall design this part,
b) Sub-paragraphs (a) to (d) of Sub-Clause 4.1 [Contractor's General Obligations] shall apply, and
c) If this change results in a reduction in the contract value of this part, the Engineer shall proceed

in accordance with Sub-Clause 3.5 [Determinations] to agree or determine a fee, which shall be included in the Contract Price. This fee shall be half (50%) of the difference between the following amounts:

i) such reduction in contract value, resulting from the change, excluding adjustments under Sub-Clause 13.7 [Adjustments for Changes in Legislation] and Sub-Clause 13.8 [Adjustments for Changes in Cost], and

ii) the reduction (if any) in the value to the Procuring Entity of the varied works, taking account of any reductions in quality, anticipated life or operational efficiencies.

13.2.3 However, if amount (i) is less than amount (ii), there shall not be a fee.

## 13.3 Variation Procedure

13.3.1 If the Engineer requests a proposal, prior to instructing a Variation, the Contractor shall respond in writing as soon as practicable, either by giving reasons why he cannot comply (if this is the case) or by submitting:

a) a description of the proposed work to be performed and a programme for its execution,

b) the Contractor's proposal for any necessary modifications to the programme according toSub-Clause 8.3 [Programme] and to the Time for Completion, and

c) the Contractor's proposal for evaluation of the Variation.

13.3.2 The Engineer shall, as soon as practicable after receiving such proposal (under Sub-Clause 13.2 [Value Engineering] or otherwise), respond with approval, disapproval or comments. The Contractor shall not delay any work whilst awaiting a response.

13.3.3 Each instruction to execute a Variation, with any requirements for the recording of Costs, shall be issued by the Engineer to the Contractor, who shall acknowledge receipt.

Each Variation shall be evaluated in accordance with Clause 12 [Measurement and Evaluation], unless the Engineer instructs or approves otherwise in accordance with this Clause.

## 13.4 Payment in Applicable Currencies

If the Contract provides for payment of the Contract Price in more than one currency, then whenever an adjustment is agreed, approved or determined as stated above, the amount payable in each of the applicable currencies shall be specified. For this purpose, reference shall be made to the actual or expected currency proportions of the Cost of the varied work, and to the proportions of various currencies specified for payment of the Contract Price.

## 13.5 Provisional Sums

13.5.1 Each Provisional Sum shall only be used, in whole or in part, in accordance with the Engineer's instructions, and the Contract Price shall be adjusted accordingly. The total sum paid to the Contractor shall include only such amounts, for the work, supplies or services to which the Provisional Sum relates, as the Engineer shall have instructed. For each Provisional Sum, the Engineer may instruct:

a) Work to be executed (including Plant, Materials or services to be supplied) by the Contractor and valued under Sub-Clause 13.3 [Variation Procedure]; and/or

b) Plant, Materials or services to be purchased by the Contractor, from a nominated Subcontractor (as defined in Clause 5 [Nominated Subcontractors]) or otherwise; and for which there shall be included in the Contract Price:

i) The actual amounts paid (or due to be paid) by the Contractor, and

ii) A sum for overhead charges and profit, calculated as a percentage of these actual amounts by applying the relevant percentage rate (if any) stated in the appropriate Schedule.

iii) If there is no such rate, the percentage rate stated in the **SCC** shall be applied.

13.5.2 The Contractor shall, when required by the Engineer, produce quotations, invoices, vouchers and accounts or receipts in substantiation.

## 13.6 Daywork

13.6.1 For work of a minor or incidental nature, the Engineer may instruct that a Variation shall be executed on a daywork basis. The work shall then be valued in accordance with the Daywork Schedule included in the Contract, and the following procedure shall apply. If a Daywork Schedule is not included in the Contract, this Sub-Clauses hall nota pply.

Before ordering Goods for the work, the Contractor shall submit quotations to the Engineer. When applying for payment, the Contractor shall submit invoices, vouchers and accounts or receipts for any Goods.

13.6.2 Except for any items for which the Daywork Schedule specifies that payment is not due, the Contractor shall deliver each day to the Engineer accurate statements in duplicate which shall include the following details of the resources used in executing the previous day's work:

a) The names, occupations and time of Contractor's Personnel,
b) The identification, type and time of Contractor's Equipment and Temporary Works, and
c) The quantities and types of Plant and Materials used.

13.6.3 One copy of each statement will, if correct, or when agreed, be signed by the Engineer and returned to the Contractor. The Contractor shall then submit priced statements of these resources to the Engineer, prior to their inclusion in the next Statement under Sub-Clause 14.3 [Application for Interim Payment Certificates].

## 13.7 Adjustments for Changes in Legislation

13.7.1 The Contract Price shall be adjusted to take account of any increase or decrease in Costresulting from a change in the Laws of the Country (including the introduction of new Laws and the repeal or modification of existing Laws) or in the judicial or official governmental interpretation of such Laws, made after the Base Date, which affect the Contractor in the performance of obligations under the Contract.

13.7.2 If the Contract or suffers (or will suffer) delay and/or incurs (or will incur) additional Cost as a result of these changes in the Laws or in such interpretations, made after the Base Date, the Contractorshall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

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

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

13.7.3 Not withstanding the foregoing, the Contractor shall not be entitled to an extension of time if the relevant delay has already been taken into account in the determination of a previous extension of time and such Cost shall not be separately paid if the same shall already have been taken into account in the indexing of any inputs to the table of adjustment data in accordance with the provisions of Sub-Clause
13.8 [Adjustments for Changes in Cost].

## 13.8 Adjustments for Changes in Cost

13.8.1 In this Sub-Clause, “table of adjustment data” means the completed table of adjustment data for local and foreign currencies included in the Schedules. If there is no such table of adjustment data, this Sub- Clause shall not apply.

13.8.2 If this Sub-Clause applies, the amounts payable to the Contractor shall be adjusted for rises or falls in the cost of labor, Goods and other inputs to the Works, by the addition or deduction of the amounts determined by the formulae prescribed in this Sub-Clause. To the extent that full compensation for any rise or fall in Costs is not covered by the provisions of this or other Clauses, the Accepted Contract Amount shall be deemed to have included amounts to cover the contingency of other rises and falls in costs.

13.8.3 The adjustment to be applied to the amount otherwise payable to the Contractor, as valued in accordance with the appropriate Schedule and certified in Payment Certificates, shall be determined from formulae for each of the currencies in which the Contract Price is payable. No adjustment is to be applied to work valued on the basis of Cost or current prices. The formulae shall be of the following general type:

Pn = a + b Ln/ Lo + c En/Eo + d Mn/Mo + ..... where:

"Pn" is the adjustment multiplier to be applied to the estimated contract value in the relevant currency of the work carried out in period "n", this period being a month unless otherwise stated in the **SCC**;

"a" is a fixed coefficient, stated in the relevant table of adjustment data, representing the non-adjustable portion in contractual payments;

"b", "c", "d", … are coefficients representing the estimated proportion of each cost element related to the execution of the Works, as stated in the relevant table of adjustment data; such tabulated cost elements may be indicative of resources such as labor, equipment and materials;

"Ln", "En", "Mn", … are the current cost indices or reference prices for period "n", expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the date 49 days prior to the last day of the period (to which the particular Payment Certificate relates); and

"Lo", "Eo", "Mo" … are the base cost indices or reference prices, expressed in the relevant currency of payment, each of which is applicable to the relevant tabulated cost element on the Base Date.

13.8.4 The cost indices or reference prices stated in the table of adjustment data shall be used. If their source is in doubt, it shall be determined by the Engineer. For this purpose, reference shall be made to the values of the indices at stated dates (quoted in the fourth and fifth columns respectively of the table) for the purposes of clarification of the source; although these dates (and thus these values) may not correspond to the base cost indices.

13.8.5 In cases where the "currency of index" is not the relevant currency of payment, each index shall be converted into the relevant currency of payment at the selling rate, established by the central Procuring Entity of the Country, of this relevant currency on the above date for which the index is required to be applicable.

13.8.6 Until such time as each current cost index is available, the Engineer shall determine a provisional index for the issue of Interim Payment Certificates. When a current cost index is available, the adjustment shall be recalculated accordingly.

13.8.7 If the Contractor fails to complete the Works within the Time for Completion, adjustment of prices thereafter shall be made using either (i) each index or price applicable on the date 49 days prior to the expiry of the Time for Completion of the Works, or (ii) the current index or price, which ever is more favorable to the Procuring Entity.

13.8.8 The weightings (coefficients) for each of the factors of cost stated in the table(s) of adjustment data shall only be adjusted if they have been rendered unreasonable, unbalanced or inapplicable, as a result of Variations.

## 14. CONTRACT PRICE AND PAYMENT

## 14.1 The Contract Price

14.1.1 Unless otherwise stated in the Particular Conditions:

a) the Contract Price shall be agreed or determined under Sub-Clause 12.3 [Evaluation] and be subject to adjustments in accordance with the Contract;

b) the Contractor shall pay all taxes, duties and fees required to be paid by him under the Contract, and the Contract Price shall not be adjusted for any of these costs except as stated in Sub-Clause 13.7 [Adjustments for Changes in Legislation];

c) any quantities which may be set out in the Bills of Quantities or other Schedule are estimated quantities and are not to be taken as the actual and correct quantities:

i) of the Works which the Contractor is required to execute, or

ii) for the purposes of Clause 12 [Measurement and Evaluation]; and

d) the Contractor shall submit to the Engineer, within 30 days after the Commencement Date, a proposed breakdown of each lumpsum price in the Schedules.

14.1.2 The Engineer may take account of the breakdown when preparing Payment Certificates, but shall not be bound by it.

14.1.3 Not withstanding the provisions of subparagraph (b), Contractor's Equipment, including essential spare parts there for, imported by the Contractor for the sole purpose of executing the Contract shall be exempt from the payment of import duties and taxes upon importation.

## 14.2 Advance Payment

14.2.1 The Procuring Entity shall make an advance payment, as an interest- free loan for mobilization and cashflow support, when the Contractor submits a guarantee in accordance with this Sub-Clause. The total advance payment, the number and timing of instalments (if more than one), and the applicable currencies and proportions, shall be as stated in the **SCC**. Unless and until the Procuring Entity receives this guarantee, or if the total advance payment is not stated in the **SCC**, this Sub-Clause shall not apply.

14.2.2 The Engineer shall deliver to the Procuring Entity and to the Contractor an Interim Payment Certificate for the advance payment or its first instalment after receiving a Statement (under Sub-Clause 14.3 [Application for Interim Payment Certificates]) and after the Procuring Entity receives (i) the Performance Security in accordance with Sub-Clause 4.2 [Performance Security] and (ii) a guarantee in amounts and currencies equal to the advance payment. This guarantee shall be issued by a reputable Procuring Entity or financial institution selected by the Contractor and shall be in the form annexed to the Particular Conditions or in another form approved by the Procuring Entity.

14.2.3 The Contractor shall ensure that the guarantee is valid and enforceable until the advance payment has been repaid, but its amount shall be progressively reduced by the amount repaid by the Contractor as indicated in the Payment Certificates. If the terms of the guarantee specify its expiry date, and the advance payment has not been repaid by the date 30 days prior to the expiry date, the Contractor shall extend the validity of the guarantee until the advance payment has been repaid.

14.2.4 Unless stated otherwise in the SCC, the advance payment shall be repaid through percentage deductions from the interim payments determined by the Engineer in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates], as follows:

a) Deductions shall commence in the next interim Payment Certificate following that in which the total of all certified interim payments (excluding the advance payment and deductions and repayments of retention) exceeds 30 percent (30%) of the Accepted Contract Amount less Provisional Sums; and

b) Deductions shall be made at the amortization rate stated in the **SCC** of the amount of each Interim Payment Certificate (excluding the advance payment and deductions for its repayments as well as deductions for retention money) in the currencies and proportions of the advance payment until such time as the advance payment has been repaid; provided that the advance payment shall be completely repaid prior to the time when 90 percent (90%) of the Accepted Contract Amount less Provisional Sums has been certified for payment.

14.2.5 If the advance payment has not been repaid prior to the issue of the Taking-Over Certificate for the Works or prior to termination under Clause 15 [Termination by Procuring Entity], Clause 16 [Suspension and Termination by Contractor] or Clause 19 [Force Majeure] (as the case may be), the whole of the balance then outstanding shall immediately become due and in case of termination under Clause 15 [Termination by Procuring Entity], except for Sub-Clause 15.5 [Procuring Entity's Entitlement to Termination for Convenience], payable by the Contractor to the Procuring Entity.

**14.3 Application for Interim Payment Certificates**

14.3.1 The Contractor shall submit a Statement in six copies to the Engineer after the end of each month, in aform approved by the Engineer, showing in detail the amounts to which the Contractor considers itself to been titled, together with supporting documents which shall include the report on the progress during this month in accordance with Sub-Clause 4.21 [Progress Reports].

14.3.2 The Statement shall include the following items, as applicable, which shall be expressed in the various currencies in which the Contract Price is payable, in the sequence listed:

a) the estimated contract value of the Works executed and the Contractor's Documents produced up to the end of the month (including Variations but excluding items described in sub-paragraphs (b) to (g) below);
b) any amounts to be added and deducted for changes in legislation and changes in cost, in accordance with Sub-Clause 13.7 [Adjustments for Changes in Legislation] and Sub-Clause 13.8 [Adjustments for Changes in Cost];
c) any amount to be deducted for retention, calculated by applying the percentage of retention stated in the **SCC** to the total of the above amounts, until the amount so retained by the Procuring Entity reaches the limit of Retention Money (if any) stated in the **SCC**;
d) any amounts to be added for the advance payment and (if more than one instalment) and to be deducted for its repayments in accordance with Sub-Clause 14.2 [Advance Payment];
e) any amounts to be added and deducted for Plant and Materials in accordance with Sub-Clause14.5[Plant and Materials intended for the Works];
f) any other additions or deductions which may have become due under the Contract or otherwise, including those under Clause 20 [Claims, Disputes and Arbitration]; and
g) the deduction of amounts certified in all previous Payment Certificates.

14.3.3 Where the contract price is different from the corrected tender price, in order to ensure the contractor is not paid less or more relative to the contract price (*which would be the tender price*), payment valuation certificates and variation orders on omissions and additions valued based on rates in the Bill of Quantities or schedule of rates in the Tender, will be adjusted by a plus or minus percentage. The percentage already worked out during tender evaluation is worked out as follows: *(corrected tender price–tender price)/tender priceX100*.

**14.4 Schedule of Payments**

14.4.1 If the Contract includes a schedule of payments specifying the instalments in which the Contract Price will be paid, then unless otherwise stated in this schedule:

a) The instalments quoted in this schedule of payments shall be the estimated contract values for the purposes of sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates];
b) Sub-Clause14.5[Plant and Materials intended for the Works] shall not apply; and
c) If these instalments are not defined by reference to the actual progress achieved in executing the Works, and if actual progress is found to be less or more than that on which this schedule of payments was based, then the Engineer may proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine revised instalments, which shall take account of the extent to which progress is less or more than that on which the instalments were previously based.

14.4.2 If the Contract does not include a schedule of payments, the Contractor shall submit non-binding estimates of the payments which he expects to become due during each quarterly period. The first estimate shall be submitted within 42 days after the Commencement Date. Revised estimates shall be submitted at quarterly intervals, until the Taking-Over Certificate has been issued for the Works.

**14.5 Plant and Materials intended for the Works** *(see SCC for lists)*

14.5.1 If this Sub-Clause applies, Interim Payment Certificates shall include, under sub-paragraph (e) of Sub-Clause 14.3, (i) an amount for Plant and Materials which have been sent to the Site for incorporation in the Permanent Works, and (ii) a reduction when the contract value of such Plant and Materials is included as part of the Permanent Works under sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates].

14.5.2 If the lists referred to in sub-paragraphs (b) (i) or (c) (i) below are not included in the Schedules, this Sub-Clause shall not apply. The Engineer shall determine and certify each addition if the following conditions are satisfied:

a) The Contractor has:
   i) Kept satisfactory records (including the orders, receipts, Costs and use of Plant and Materials) which are available for inspection, and
   ii) Submitted a statement of the Cost of acquiring and delivering the Plant and Materials to the Site, supported by satisfactory evidence; and either:

b) The relevant Plant and Materials:

   i) Are those listed in the Schedules for payment when shipped,

   ii) Have been shipped to the Country, enroute to the Site, in accordance with the Contract; and

   iii) are described in a clean shipped bill of lading or other evidence of shipment, which has been submitted to the Engineer together with evidence of payment of freight and insurance, any other documents reasonably required, and an Procuring Entity guarantee in a form and issued by an entity approved by the Procuring Entity in amounts and currencies equal to the amount due under this Sub-Clause: this guarantee may be in a similar form to the form referred to in Sub-Clause 14.2[Advance Payment] and shall be valid until the Plant and Materials are properly stored on Site and protected against loss, damage or deterioration;

c) the relevant Plant and Materials:

   i) are those listed in the Schedules for payment when delivered to the Site, and

   ii) have been delivered to and are properly stored on the Site, are protected against loss, damage or deterioration, and appear to be in accordance with the Contract.

14.5.3 The additional amount to be certified shall be the equivalent of eighty percent (80%) of the Engineer's determination of the cost of the Plant and Materials (including delivery to Site), taking account of the documents mentioned in this Sub-Clause and of the contract value of the Plant and Materials.

14.5.4 The currencies for this additional amount shall be the same as those in which payment will become due when the contract value is included under sub-paragraph (a) of Sub-Clause 14.3 [Application for Interim Payment Certificates]. At that time, the Payment Certificate shall include the applicable reduction which shall be equivalent to, and in the same currencies and proportions as, this additional amount for the relevant Plant and Materials.

**14.6 Issue of Interim Payment Certificates**

14.6.1 No amount will be certified or paid until the Procuring Entity has received and approved the Performance Security. Thereafter, the Engineer shall, within 30 days after receiving a Statement and supporting documents, deliver to the Procuring Entity and to the Contractor an Interim Payment Certificate which shall state the amount which the Engineer fairly determines to be due, with all supporting particulars for any reduction or withholding made

However, prior to issuing the Taking-Over Certificate for the Works, the Engineer shall not be bound to issue an Interim Payment Certificate in an amount which would (after retention and other deductions) be less than the minimum amount of Interim Payment Certificates (if any) stated in the **SCC**. In this event, the Engineer shall give notice to the Contractor accordingly.

14.6.2 An Interim Payment Certificate shall not be withheld for any other reason, although:
a) if anything supplied or work done by the Contractor is not in accordance with the Contract, the cost of rectification or replacement may be withheld until rectification or replacement has been completed; and/or
b) if the Contractor was or is failing to perform any work or obligation in accordance with the Contract, and had been so notified by the Engineer, the value of this work or obligation may be withheld until the work or obligation has been performed.

14.6.3 The Engineer may in any Payment Certificate make any correction or modification that should properly be made to any previous Payment Certificate. A Payment Certificate shall not be deemed to indicate the Engineer's acceptance, approval, consent or satisfaction.

**14.7 Payment**

14.7.1 The Procuring Entity shall pay to the Contractor:
a) The first instalment of the advance payment within 42 days after issuing the Letter of Acceptance or within 21 days after receiving the documents in accordance with Sub-Clause 4.2 [Performance Security] and Sub-Clause 14.2 [Advance Payment], whichever is later;

b) the amount certified in each Interim Payment Certificate within 56 days after the Engineer receives the Statement and supporting documents; or, at a time when the Procuring Entity's loan or credit (from which part of the payments to the Contractor is being made) is suspended, the amount shown on any statement submitted by the Contractor within 14 days after such statement is submitted, any discrepancy being rectified in the next payment to the Contractor; and

c) the amount certified in the Final Payment Certificate within 56 days after the Procuring Entity receives this Payment Certificate; or, at a time when the Procuring Entity's loan or credit (from which part of the payments to the Contractor is being made) is suspended, the undisputed amount shown in the Final Statement within 56 days after the date of notification of the suspension in accordance with Sub-Clause 16.2 [Termination by Contractor].

14.7.2 Payment of the amount due in each currency shall be made in to the Procuring Entity account, nominated by the Contractor, in the payment country (for this currency) specified in the Contract.

**14.8 Delayed Payment**

14.8.1 If the Contractor does not receive payment in accordance with Sub-Clause 14.7 [Payment], the Contractor shall be entitled to receive financing charges compounded monthly on the amount unpaid during the period of delay. This period shall be deemed to commence on the date for payment specified in Sub-Clause 14.7 [Payment], irrespective (in the case of its sub-paragraph (b)) of the date on which any Interim Payment Certificate is issued.

14.8.2 Unless otherwise stated in the Particular Conditions, these financing charges shall be calculated at the annual rate of three percentage points above the discount rate of the central Procuring Entity in the country of the currency of payment, or if not available, the inter-Procuring Entity offered rate, and shall be paid in such currency.

The Contractor shall be entitled to this payment without formal notice or certification, and without prejudice to any other right or remedy.

**14.9 Payment of Retention Money**

14.9.1 When the Taking-Over Certificate has been issued for the Works, the first half of the Retention Money shall be certified by the Engineer for payment to the Contractor. If a Taking-Over Certificate is issued for a Section or part of the Works, a proportion of the Retention Money shall be certified and paid. This proportion shall be half (50%) of the proportion calculated by dividing the estimated contract value of the Section or part, by the estimated final Contract Price.

14.9.2 Promptly after the latest of the expiry dates of the Defects Notification Periods, the outstanding balance of the Retention Money shall be certified by the Engineer for payment to the Contractor. If a Taking-Over Certificate was issued for a Section, a proportion of the second half of the Retention Money shall be certified and paid promptly after the expiry date of the Defects Notification Period for the Section. This proportion shall be half (50%) of the proportion calculated by dividing the estimated contract value of the Section by the estimated final Contract Price.

14.9.3 However, if any work remains to be executed under Clause 11 [Defects Liability], the Engineer shall be entitled to withhold certification of the estimated cost of this work until it has been executed.

14.9.4 When calculating these proportions, no account shall be taken of any adjustments under Sub-Clause 13.7 [Adjustments for Changes in Legislation] and Sub-Clause 13.8 [Adjustments for Changes in Cost].

14.9.5 Unless otherwise stated in the Particular Conditions, when the Taking-Over Certificate has been issued for the Works and the first half of the Retention Money has been certified for payment by the Engineer, the Contractor shall be entitled to substitute a guarantee, in the form annexed to the Particular Conditions or in another form approved by the Procuring Entity and issued by a reputable Procuring Entity or financial institution selected by the Contractor, for the second half of the Retention Money. The Contractor shall ensure that the guarantee is in the amounts and currencies of the second half of the Retention Money and is valid and enforceable until the Contract or has executed and completed the Works and remedied any defects, as specified for the Performance Security in Sub-Clause 4.2. On receipt by the Procuring Entity of the required guarantee, the Engineer shall certify and the Procuring Entity shall pay the second half of the Retention Money. The release of the second half of the Retention Money against a guarantee shall then be in lieu of the release under the second paragraph of this Sub-Clause. The Procuring Entity shall return the guarantee to the Contractor within 21 days after receiving a copy of the Performance Certificate.

14.9.6 If the Performance Security required under Sub-Clause 4.2 is in the form of a demand guarantee, and the amount guaranteed under it when the Taking-Over Certificate is issued is more than half of the Retention Money, then the Retention Money guarantee will not be required. If the amount guaranteed under the Performance Security when the Taking-Over Certificate is issued is less than half of the Retention Money, the Retention Money guarantee will only be required for the difference between half of the Retention Money and the amount guaranteed under the Performance Security.

**14.10 Statement at Completion**

Within 84 days after receiving the Taking-Over Certificate for the Works, the Contractor shall submit to the Engineer six copies of a Statement at completion with supporting documents, in accordance with Sub-Clause
14.3 [Application for Interim Payment Certificates], showing:

a) the value of all work done in accordance with the Contract up to the date stated in the Taking-Over Certificate for the Works,
b) any further sums which the Contractor considers to be due, and
c) an estimate of any other amounts which the Contractor considers will become due to him under the Contract. Estimated amounts shall be shown separately in this Statement at completion.

The Engineer shall then certify in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates].

**14.11 Application for Final Payment Certificate**

14.11.1 Within 56 days after receiving the Performance Certificate, the Contractor shall submit, to the Engineer, six copies of a draft final statement with supporting documents showing in detail in a form approved by the Engineer:

a) The value of all work done in accordance with the Contract, and
b) Any further sums which the Contractor considers to be due to him under the Contractor otherwise.

14.11.2 If the Engineer disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Engineer may reasonably require within 30 days from receipt of said draft and shall make such changes in the draft as may be agreed between them. The Contractor shall then prepare and submit to the Engineer the final statement as agreed. This agreed statement is referred to in these Conditions as the "Final Statement".

14.11.3 However, if, following discussions between the Engineer and the Contractor and any changes to the draft final statement which are agreed, it becomes evident that a dispute exists, the Engineer shall deliver to the Procuring Entity (with a copy to the Contractor) an Interim Payment Certificate for the agreed parts of the draft final statement. Thereafter, if the dispute is finally resolved under Sub-Clause 20.4 [Obtaining Dispute Board's Decision] or Sub-Clause 20.5 [Amicable Settlement], the Contractor shall then prepare and submit to the Procuring Entity (with a copy to the Engineer) a Final Statement.

**14.12 Discharge**

When submitting the Final Statement, the Contractor shall submit a discharge which confirms that the total of the Final Statement represents full and final settlement of all moneys due to the Contractor under or in connection with the Contract. This discharge may state that it becomes effective when the Contractor has received the Performance Security and the outstanding balance of this total, in which event the discharge shall be effective on such date.

**14.13 Issue of Final Payment Certificate**

14.13.1 Within 30 days after receiving the Final Statement and discharge in accordance with Sub-Clause 14.11 [Application for Final Payment Certificate] and Sub-Clause 14.12 [Discharge], the Engineer shall deliver, to the Procuring Entity and to the Contractor, the Final Payment Certificate which shall state:

(a) The amount which he fairly determines is finally due, and
(b) After giving credit to the Procuring Entity for all amounts previously paid by the Procuring Entity and for all sums to which the Procuring Entity is entitled, the balance (if any) due from the Procuring Entity to the Contractor or from the Contractor to the Procuring Entity, as the case may be.

14.13.1 If the Contractor has not applied for a Final Payment Certificate in accordance with Sub-Clause 14.11 [Application for Final Payment Certificate] and Sub-Clause 14.12 [Discharge], the Engineer shall request the Contractor to do so. If the Contractor fails to submit an application within a period of 30 days, the

Engineer shall issue the Final Payment Certificate for such amount as he fairly determines to be due.

### 14.14 Cessation of Procuring Entity's Liability

14.14.1 The Procuring Entity shall not be liable to the Contractor for any matter or thing under or in connection with the Contract or execution of the Works, except to the extent that the Contractor shall have included an amount expressly for it:

a) In the Final Statement and also
b) (Except for matters or things arising after the issue of the Taking-Over Certificate for the Works) in the Statement at completion described in Sub-Clause 14.10[Statement at Completion].

14.14.2 However, this Sub-Clause shall not limit the Procuring Entity's liability under his indemnification obligations, or the Procuring Entity's liability in any case of fraud, deliberate default or reckless misconduct by the Procuring Entity.

### 14.15 Currencies of Payment

The Contract Price shall be paid in the currency or currencies named in the Schedule of Payment Currencies. If more than one currency is so named, payments shall be made as follows:

a) If the Accepted Contract Amount was expressed in Local Currency only:
   (i) The proportions or amounts of the Local and Foreign Currencies, and the fixed rates of exchange to be used for calculating the payments, shall be as stated in the Schedule of Payment Currencies, except as otherwise agreed by both Parties;
   ii) payments and deductions under Sub-Clause 13.5 [Provisional Sums] and Sub-Clause 13.7 [Adjustments for Changes in Legislation] shall be made in the applicable currencies and proportions; and
   iii) other payments and deductions under sub-paragraphs (a) to (d) of Sub-Clause 14.3 [Application for Interim Payment Certificates] shall be made in the currencies and proportions specified in sub-paragraph (a) (i) above;
b) payment of the damages specified in the **SCC**, shall be made in the currencies and proportions specified in the Schedule of Payment Currencies;
c) other payments to the Procuring Entity by the Contractor shall be made in the currency in which the sum was expended by the Procuring Entity, or in such currency as may be agreed by both Parties;
d) if any amount payable by the Contractor to the Procuring Entity in a particular currency exceeds the sum payable by the Procuring Entity to the Contractor in that currency, the Procuring Entity may recover the balance of this amount from the sums otherwise payable to the Contractor in other currencies; and
e) if no rates of exchange are stated in the Schedule of Payment Currencies, they shall be those prevailing on the Base Date and determined by the central Procuring Entity of the Country.

## 15. TERMINATION BY PROCURING ENTITY

### 15.1 Notice to Correct

If the Contractor fails to carry out any obligation under the Contract, the Engineer may by notice require the Contractor to make good the failure and to remedy it within a specified reasonable time.

### 15.2 Termination by Procuring Entity

15.2.1 The Procuring Entity shall be entitled to terminate the Contract if the Contractor:

a) fails to comply with Sub-Clause 4.2 [Performance Security] or with a notice under Sub-Clause 15.1 [Notice to Correct],
b) abandons the Works or otherwise plainly demonstrates the intention not to continue performance of his obligations under the Contract,
c) without reasonable excuse fails:
   (i) to proceed with the Works in accordance with Clause 8 [Commencement, Delays and Suspension], or
   ii) to comply with a notice issued under Sub-Clause 7.5 [Rejection] or Sub- Clause 7.6 [Remedial Work], within 30 days after receiving it,
d) subcontracts the whole of the Works or as signs the Contract without the required agreement,
e) becomes bankrupt or insolvent, goes into liquidation, has a receiving or administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager

for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events, or

f) gives or offers to give (directly or indirectly) to any person any bribe, gift, gratuity, commission or other thing of value, as an inducement or reward:
   i) for doing or forbearing to do any action in relation to the Contract, or
   ii) for showing or for bearing to show favor or disfavor to any person in relation to the Contract, or if any of the Contractor's Personnel, agents or Subcontractors gives or offers to give (directly or indirectly) to any person any such inducement or reward as is described in this sub-paragraph (f). However, lawful inducements and rewards to Contractor's Personnel shall not entitle termination, or

g) based on reasonable evidence, has engaged in Fraud and Corruption as defined in paragraph 2.2 of the Appendix B to these General Conditions, in competing for or in executing the Contract.

15.2.2 In any of these events or circumstances, the Procuring Entity may, upon giving 14 days' notice to the Contractor, terminate the Contract and expel the Contractor from the Site. However, in the case of sub-paragraph (e) or (f) or (g), the Procuring Entity may by notice terminate the Contract immediately.

15.2.3 The Procuring Entity's election to terminate the Contract shall not prejudice any other rights of the Procuring Entity, under the Contract or otherwise.

The Contractor shall then leave the Site and deliver any required Goods, all Contractor's Documents, and other design documents made by or for him, to the Engineer. However, the Contractor shall use his lowest efforts to comply immediately with any reasonable instructions included in the notice (i) for the assignment of any subcontract, and (ii) for the protection of life or property or for the safety of the Works.

After termination, the Procuring Entity may complete the Works and/or arrange for any other entities to do so. The Procuring Entity and these entities may then use any Goods, Contractor's Documents and other design documents made by or on behalf of the Contractor.

The Procuring Entity shall then give notice that the Contractor's Equipment and Temporary Works will be released to the Contractor at or near the Site. The Contractor shall promptly arrange their removal, at the risk and cost of the Contractor. However, if by this time the Contractor has failed to make a payment due to the Procuring Entity, these items may be sold by the Procuring Entity in order to recover this payment. Any balance of the proceeds shall then be paid to the Contractor.

## 15.3 Valuation at Date of Termination

As soon as practicable after a notice of termination under Sub-Clause 15.2 [Termination by Procuring Entity] has taken effect, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine the value of the Works, Goods and Contractor's Documents, and any other sums due to the Contractor for work executed in accordance with the Contract.

## 15.4 Payment after Termination

After a notice of termination under Sub-Clause 15.2 [Termination by Procuring Entity] has taken effect, the Procuring Entity may:

a) Proceed in accordance with Sub-Clause 2.5 [Procuring Entity's Claims],

b) Withhold further payments to the Contractor until the costs of execution, completion and remedying of any defects, damages for delay in completion (if any), and all other costs incurred by the Procuring Entity, have been established, and/or

c) Recover from the Contractor any losses and damages incurred by the Procuring Entity and any extra costs of completing the Works, after allowing for any sum due to the Contractor under Sub-Clause 15.3 [Valuation at Date of Termination]. After recovering any such losses, damages and extra costs, the Procuring Entity shall pay any balance to the Contractor.

## 15.5 Procuring Entity's Entitlement to Termination for Convenience

15.5.1 The Procuring Entity shall be entitled to terminate the Contract, at any time for the Procuring Entity's convenience, by giving notice of such termination to the Contractor. The termination shall take effect 30 days after the later of the dates on which the Contractor receives this notice or the Procuring Entity returns the Performance Security. The Procuring Entity shall not terminate the Contract under this Sub-Clause in order to execute the Works itself or to arrange for the Works to be executed by another contractor or to avoid a termination of the Contract by the Contractor under Clause 16.2[Termination by Contractor].

15.5.2 After this termination, the Contractor shall proceed in accordance with Sub-Clause 16.3 [Cessation of Work and Removal of Contractor's Equipment] and shall be paid in accordance with Sub-Clause 16.4 [Payment on Termination].

### 15.6 Fraud and Corruption

The Procuring Entity requires compliance with the national law and regulations against corruption. All available sanctions will apply where corruption is detected.

## 16. SUSPENSION AND TERMINATION BY CONTRACTOR

### 16.1 Contractor's Entitlement to Suspend Work

16.1.1 If the Engineer fails to certify in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates] or the Procuring Entity fails to comply with Sub-Clause 2.4 [Procuring Entity's Financial Arrangements] or Sub- Clause 14.7 [Payment], the Contractor may, after giving not less than 21days' notice to the Procuring Entity, suspend work (or reduce the rate of work) unless and until the Contractor has received the Payment Certificate, reasonable evidence or payment, as the case may be and as described in the notice.

16.1.2 Not withstanding the above, if the Procuring Entity has suspended disbursements under the loan or credit from which payments to the Contractor are being made, in whole or in part, for the execution of the Works, and no alternative funds are available as provided for in Sub-Clause 2.4 [Procuring Entity's Financial Arrangements], the Contractor may by notice suspend work or reduce the rate of work at any time, but not less than 7 days after the Procuring Entity having received the suspension notification from the Procuring Entity.

16.1.3 The Contractor's action shall not prejudice his entitlements to financing charges under Sub-Clause 14.8 [Delayed Payment] and to termination under Sub-Clause 16.2[Termination by Contractor].

16.1.4 If the Contractor subsequently receives such Payment Certificate, evidence or payment (as described in the relevant Sub-Clause and in the above notice) before giving a notice of termination, the Contractor shall resume normal working as soon as is reasonably practicable.

16.1.5 If the Contractor suffers delay and/or incurs Cost as a result of suspending work (or reducing the rate of work) in accordance with this Sub-Clause, the Contractor shall give notice to the Engineer and shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

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

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

### 16.2 Termination by Contractor

16.2.1 The Contractor shall be entitled to terminate the Contract if:

a) the Contractor does not receive the reasonable evidence within 42 days after giving notice under Sub-Clause 16.1 [Contractor's Entitlement to Suspend Work] in respect of a failure to comply with Sub-Clause 2.4 [Procuring Entity's Financial Arrangements],
b) the Engineer fails, within 56 days after receiving a Statement and supporting documents, to issue the relevant Payment Certificate,
c) the Contractor does not receive the amount due under an Interim Payment Certificate within 42 days after the expiry of the time stated in Sub-Clause 14.7 [Payment] within which payment is to be made (except for deductions in accordance with Sub-Clause 2.5 [Procuring Entity's Claims]),
d) the Procuring Entity substantially fails to perform his obligations under the Contract in such manner as to materially and adversely affect the economic balance of the Contract and/or the ability of the Contractor to perform the Contract,
e) the Procuring Entity fails to comply with Sub-Clause 1.6 [Contract Agreement] or Sub-Clause 1.7 [Assignment],
f) a prolonged suspension affects the whole of the Works as described in Sub-Clause 8.11 [Prolonged Suspension], or
g) the Procuring Entity becomes bankrupt or insolvent, goes into liquidation, has a receiving or

administration order made against him, compounds with his creditors, or carries on business under a receiver, trustee or manager for the benefit of his creditors, or if any act is done or event occurs which (under applicable Laws) has a similar effect to any of these acts or events.

h) The Contractor does not receive the Engineer's instruction recording the agreement of both Parties on the fulfilment of the conditions for the Commencement of Works under Sub-Clause 8.1 [Commencement of Works.

16.2.2 In any of these events or circumstances, the Contractor may, upon giving 14 days' notice to the Procuring Entity, terminate the Contract. However, in the case of sub-paragraph (f) or (g), the Contractor may by notice terminate the Contract immediately.

16.2.3 In the event the Procuring Entity suspends the loan or credit from which part or whole of the payments to the Contractor are being made, if the Contractor has not received the sums due to him upon expiration of the14 days referred to in Sub-Clause 14.7 [Payment] for payments under Interim Payment Certificates, the Contractor may, without prejudice to the Contractor's entitlement to financing charges under Sub-Clause14.8 [Delayed Payment], take one of the following actions, namely (i) suspend work or reduce the rate of work under Sub-Clause 16.1 above, or (ii) terminate the Contract by giving notice to the Procuring Entity, with a copy to the Engineer, such termination to take effect 14 days after the giving of the notice.

The Contractor's election to terminate the Contract shall not prejudice any other rights of the Contractor, under the Contract or otherwise.

### 16.3 Cessation of Work and Removal of Contractor's Equipment

After a notice of termination under Sub-Clause 15.5 [Procuring Entity's Entitlement to Termination for Convenience], Sub-Clause 16.2 [Termination by Contractor] or Sub-Clause 19.6 [Optional Termination, Payment and Release] has taken effect, the Contractor shall promptly:

a) Cease all further work, except for such work as may have been instructed by the Engineer for the protection of life or property or for the safety of the Works,

b) Handover Contractor's Documents, Plant, Materials and other work, for which the Contractor has received payment, and

c) Remove all other Goods from the Site, except as necessary for safety, and leave the Site.

### 16.4 Payment on Termination

After a notice of termination under Sub-Clause 16.2 [Termination by Contractor] has taken effect, the Procuring Entity shall promptly:

a) Return the Performance Security to the Contractor,

b) Pay the Contractor in accordance with Sub-Clause 19.6 [Optional Termination, Payment and Release], and

c) Pay to the Contractor the amount of any loss or damage sustained by the Contractor as a result of this termination.

## 17. RISK AND RESPONSIBILITY

### 17.1 Indemnities

17.1.1 The Contractor shall indemnify and hold harmless the Procuring Entity, the Procuring Entity's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of:

(a) Bodily injury, sickness, disease or death, of any person whatsoever arising out of or in the course of or by reason of the Contractor's design (if any), the execution and completion of the Works and the remedying of any defects, unless attributable to any negligence, willful actor breach of the Contract by the Procuring Entity, the Procuring Entity's Personnel, or any of the irrespective agents, and

(b) Damage to or loss of any property, real or personal (other than the Works), to the extent that such damage or loss arises out of or in the course of or by reason of the Contractor's design (if any), the execution and completion of the Works and the remedying of any defects, unless and to the extent that any such damage or

loss is attributable to any negligence, willful act or breach of the Contract by the Procuring Entity, the Procuring Entity's Personnel, the irrespective agents, or any one directly or indirectly employed by any of them.

17.1.2 The Procuring Entity shall indemnify and hold harmless the Contractor, the Contractor's Personnel, and their respective agents, against and from all claims, damages, losses and expenses (including legal fees and expenses) in respect of (1) bodily injury, sickness, disease or death, which is attributable to any negligence, willful act or breach of the Contract by the Procuring Entity, the Procuring Entity's Personnel, or any of their respective agents, and (2) the matters for which liability may be excluded from insurance cover, as described in sub-paragraphs (d)(i), (ii) and (iii) of Sub-Clause 18.3 [Insurance Against Injury to Persons and Damage to Property].

## 17.2 Contractor's Care of the Works

17.2.1 The Contractor shall take full responsibility for the care of the Works and Goods from the Commencement Date until the Taking-Over Certificate is issued (or is deemed to be issued under Sub-Clause 10.1 [Taking Over of the Works and Sections]) for the Works, when responsibility for the care of the Works shall pass to the Procuring Entity. If a Taking-Over Certificate is issued (or is so deemed to be issued) for any Section or part of the Works, responsibility for the care of the Section or part shall then pass to the Procuring Entity.

17.2.2 After responsibility has accordingly passed to the Procuring Entity, the Contractor shall take responsibility for the care of any work which is outstanding on the date stated in a Taking-Over Certificate, until this outstanding work has been completed.

17.2.3 If any loss or damage happens to the Works, Goods or Contractor's Documents during the period when the Contractor is responsible for their care, from any cause not listed in Sub-Clause 17.3 [Procuring Entity's Risks], the Contractor shall rectify the loss or damage at the Contractor's risk and cost, so that the Works, Goods and Contractor's Documents conform with the Contract.

17.2.4 The Contractor shall be liable for any loss or damage caused by any actions performed by the Contractor after a Taking-Over Certificate has been issued. The Contractor shall also be liable for any loss or damage which occurs after a Taking-Over Certificate has been issued and which arose from a previous event for which the Contractor was liable.

## 17.3 Procuring Entity's Risks

The risks referred to in Sub-Clause 17.4 [Consequences of Procuring Entity's Risks] below, insofar as they directly affect the execution of the Works in the Country, are:

a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
b) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war, within the Country,
c) riot, commotion or disorder within the Country by persons other than the Contractor's Personnel,
d) munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, within the Country, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity,
e) pressure waves caused by aircraft or other aerial devices traveling at sonic or supersonic speeds,
f) use or occupation by the Procuring Entity of any part of the Permanent Works, except as may be specified in the Contract,
g) design of any part of the Works by the Procuring Entity's Personnel or by others for whom the Procuring Entity is responsible, and
h) any operation of the forces of nature which is Unforeseeable or against which an experienced contractor could not reasonably have been expected to have taken adequate preventive precautions.

## 17.4 Consequences of Procuring Entity's Risks

17.4.1 If and to the extent that any of the risks listed in Sub-Clause 17.3 above results in loss or damage to the Works, Goods or Contractor's Documents, the Contractor shall promptly give notice to the Engineer and shall rectify this loss or damage to the extent required by the Engineer.

17.4.2 If the Contractor suffers delay and/or incurs Cost from rectifying this loss or damage, the Contractor shall give a further notice to the Engineer and shall be entitled subject to Sub-Clause 20.1[Contractor's Claims] to:

a) an extension of time for any such delay, if completion is or will be delayed, under Sub-Clause 8.4

[Extension of Time for Completion], and

b) payment of any such Cost, which shall be included in the Contract Price. In the case of sub-paragraphs (f) and (g) of Sub-Clause 17.3 [Procuring Entity's Risks], Cost plus profit shall be payable.

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

### 17.5 Intellectual and Industrial Property Rights

17.5.1 In this Sub-Clause, "infringement" means an infringement (or alleged infringement) of any patent, registered design, copyright, trademark, tradename, trade secret or other intellectual or industrial property right relating to the Works; and "claim" means a claim (or proceedings pursuing a claim) alleging an infringement.

17.5.2 Whenever a Party does not give notice to the other Party of any claim within 30 days of receiving the claim, the first Party shall be deemed to have waived any right to indemnity under this Sub-Clause.

17.5.3 The Procuring Entity shall indemnify and hold the Contractor harmless against and from any claim alleging an infringement which is or was:

a) An unavoidable result of the Contractor's compliance with the Contract, or

b) A result of any Works being used by the Procuring Entity:

i) For a purpose other than that indicated by, or reasonably to be inferred from, the

ii) Contract, or

iii) In conjunction with anything not supplied by the Contractor, unless such use was disclosed to the Contractor prior to the Base Date or is stated in the Contract.

17.5.4 The Contractor shall indemnify and hold the Procuring Entity harmless against and from any other claim which arises out of or in relation to (i) the manufacture, use, sale or import of any Goods, or (ii) any design for which the Contractor is responsible.

17.5.5 If a Party is entitled to be indemnified under this Sub-Clause, the indemnifying Party may (at its cost) conduct negotiations for the settlement of the claim, and any litigation or arbitration which may arise from it. The other Party shall, at the request and cost of the indemnifying Party, assist in contesting the claim. This other Party (and its Personnel) shall not make any admission which might be prejudicial to the indemnifying Party, unless the indemnifying Party failed to take over the conduct of any negotiations, litigation or arbitration upon being requested to do so by such other Party.

### 17.6 Limitation of Liability

17.6.1 Neither Party shall be liable to the other Party for loss of use of any Works, loss of profit, loss of any contractor for any indirect or consequential loss or damage which may be suffered by the other Party in connection with the Contract, other than as specifically provided in Sub-Clause 8.7 [Delay Damages]; Sub-Clause 11.2 [Cost of Remedying Defects]; Sub-Clause 15.4 [Payment after Termination]; Sub-Clause 16.4 [Payment on Termination]; Sub-Clause17.1 [Indemnities]; Sub-Clause 17.4 (b) [Consequences of Procuring Entity's Risks] and Sub-Clause 17.5[Intellectual and Industrial Property Rights].

17.6.2 The total liability of the Contractor to the Procuring Entity, under or in connection with the Contract other than under Sub-Clause 4.19 [Electricity, Water and Gas], Sub-Clause 4.20 [Procuring Entity's Equipment and Free- Issue Materials], Sub-Clause 17.1 [Indemnities] and Sub-Clause 17.5 [Intellectual and Industrial Property Rights], shall not exceed the sum resulting from the application of a multiplier (less or greater than one) to the Accepted Contract Amount, as stated in the **SCC**, or (if such multiplier or other sum is not so stated) the Accepted Contract Amount.

17.6.3 This Sub-Clause shall not limit liability in any case of fraud, deliberate default or reckless misconduct by the defaulting Party.

### 17.7 Use of Procuring Entity's Accommodation/Facilities

17.7.1 The Contractor shall take full responsibility for the care of the Procuring Entity provided accommodation and facilities, if any, as detailed in the Specification, from the respective dates of hand-over to the Contract or until cessation of occupation (where hand-over or cessation of occupation may take place after the date stated in the Taking-Over Certificate for the Works).

17.7.2 If any loss or damage happens to any of the above items while the Contractor is responsible for their care arising from any cause whatsoever other than those for which the Procuring Entity is liable, the Contractor shall, at his own cost, rectify the loss or damage to the satisfaction of the Engineer.

## 18. INSURANCE

### 18.1 General Requirements for Insurances

18.1.1 In this Clause, "insuring Party" means, for each type of insurance, the Party responsible for effecting and maintaining the insurance specified in the relevant Sub-Clause.

18.1.2 Wherever the Contractor is the insuring Party, each insurance shall be effected with insurers and in terms approved by the Procuring Entity. These terms shall be consistent with any terms agreed by both Parties before the date of the Letter of Acceptance. This agreement of terms shall take precedence over the provisions of this Clause.

18.1.3 Wherever the Procuring Entity is the insuring Party, each insurance shall be effected with insurers and in terms acceptable to the Contractor. These terms shall be consistent with any terms agreed by both Parties before the date of the Letter of Acceptance. This agreement of terms shall take precedence over the provisions of this Clause.

18.1.4 If a policy is required to indemnify joint insured, the cover shall apply separately to each insured as though a separate policy had been issued for each of the joint insured. If a policy indemnifies additional joint insured, namely in addition to the insured specified in this Clause, (i) the Contractor shall act under the policy on behalf of these additional joint insured except that the Procuring Entity shall act for Procuring Entity's Personnel, (ii) additional joint insured shall not be entitled to receive payments directly from the insurer or to have any other direct dealings with the insurer, and (iii) the insuring Party shall require all additional joint insured to comply with the conditions stipulated in the policy.

18.1.5 Each policy insuring against loss or damage shall provide for payments to be made in the currencies required to rectify the loss or damage. Payments received from insurers shall be used for the rectification of the loss or damage.

18.1.6 The relevant insuring Party shall, within the respective periods stated in the **SCC** (calculated from the Commencement Date), submit to the other Party:

a) Evidence that the insurances described in this Clause have been effected, and

b) Copies of the policies for the insurances described in Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment] and Sub-Clause 18.3 [Insurance against Injury to Persons and Damage to Property].

18.1.7 When each premium is paid, the insuring Party shall submit evidence of payment to the other Party. Whenever evidence or policies are submitted, the insuring Party shall also give notice to the Engineer.

18.1.8 Each Party shall comply with the conditions stipulated in each of the insurance policies. The insuring Party shall keep the insurers informed of any relevant changes to the execution of the Works and ensure that insurance is maintained in accordance with this Clause.

Neither Party shall make any material alteration to the terms of any insurance without the prior approval of the other Party. If an insurer makes (or attempts to make) any alteration, the Party first notified by the insurer shall promptly give notice to the other Party.

18.1.9 The insuring Party fails to effect and keep in force any of the insurances it is required to effect and maintain under the Contract or fails to provide satisfactory evidence and copies of policies in accordance with this Sub- Clause, the other Party may (at its option and without prejudice to any other right or remedy) effect insurance for the relevant coverage and pay the premiums due. The insuring Party shall pay the amount of these premiums to the other Party, and the Contract Price shall be adjusted accordingly.

18.1.10 Nothing in this Clause limits the obligations, liabilities or responsibilities of the Contractor or the Procuring Entity, under the other terms of the Contractor otherwise. Any amounts not insured or not recovered from the insurers shall be borne by the Contractor and/or the Procuring Entity in accordance with these obligations, liabilities or responsibilities. However, if the insuring Party fails to effect and keep in force an insurance which is available and which it is required to effect and maintain under the Contract, and the other Party neither approves the omission nor effects insurance for the coverage relevant to this default, any moneys which should have been recoverable under this insurance shall be paid by the insuring Party.

18.1.11 Payments by one Party to the other Party shall be subject to Sub-Clause 2.5 [Procuring Entity's Claims] or Sub- Clause 20.1[Contractor's Claims], as applicable.

18.1.12 The Contractor shall be entitled to place all insurance relating to the Contract (including, but not limited to the insurance referred to Clause18) with insurers from any eligible source country.

**18.2 Insurance for Works and Contractor's Equipment**

18.2.1 The insuring Party shall insure the Works, Plant, Materials and Contractor's Documents for not less than the full reinstatement cost including the costs of demolition, removal of debris and professional fees and profit. This insurance shall be effective from the date by which the evidence is to be submitted under sub-paragraph (a) of Sub-Clause 18.1 [General Requirements for Insurances], until the date of issue of the Taking-Over Certificate for the Works.

18.2.2 The insuring Party shall maintain this insurance to provide cover until the date of issue of the Performance Certificate, for loss or damage for which the Contractor is liable arising from a cause occurring prior to the issue of the Taking-Over Certificate, and for loss or damage caused by the Contractor in the course of any other operations (including those under Clause 11 [Defects Liability]).

18.2.3 The insuring Party shall insure the Contractor's Equipment for not less than the full replacement value, including delivery to Site. For each item of Contractor's Equipment, the insurance shall be effective while it is being transported to the Site and until it is no longer required as Contractor's Equipment.

18.2.4 Unless otherwise stated in the Particular Conditions, insurances under this Sub-Clause:

a) Shall be effected and maintained by the Contractor as insuring Party,

b) shall be in the joint names of the Parties, who shall be jointly entitled to receive payments from the insurers, payments being held or allocated to the Party actually bearing the costs of rectifying the loss or damage,

c) shall cover all loss and damage from any cause not listed in Sub-Clause 17.3 [Procuring Entity's Risks],

d) shall also cover, to the extent specifically required in the tendering documents of the Contract, loss or damage to a part of the Works which is attributable to the use or occupation by the Procuring Entity of another part of the Works, and loss or damage from the risks listed in sub-paragraphs (c), (g) and (h) of Sub-Clause 17.3 [Procuring Entity's Risks], excluding (in each case) risks which are not insurable at commercially reasonable terms, with deductibles per occurrence of not more than the amount stated in the **SCC**(if an amount is not so stated, this sub-paragraph (d) shall not apply), and

e) may however exclude loss of, damage to, and reinstatement of:

   i) a part of the Works which is in a defective condition due to a defect in its design, materials or workmanship (but cover shall include any other parts which are lost or damaged as a direct result of this defective condition and not as described in sub-paragraph (ii) below),

   ii) a part of the Works which is lost or damaged in order to reinstate any other part of the Works if this other part is in a defective condition due to a defect in its design, materials or workmanship,

   iii) a part of the Works which has been taken over by the Procuring Entity, except to the extent that the Contractor is liable for the loss or damage, and

   iv) Goods while they are not in the Country, subject to Sub-Clause 14.5 [Plant and Materials intended for the Works].

18.2.5 If, more than one year after the Base Date, the cover described in sub-paragraph (d) above ceases to be available at commercially reasonable terms, the Contractor shall (as insuring Party) give notice to the Procuring Entity, with supporting particulars. The Procuring Entity shall then (i) be entitled subject to Sub-Clause 2.5 [Procuring Entity's Claims] to payment of an amount equivalent to such commercially reasonable terms as the Contractor should have expected to have paid for such cover, and (ii) be deemed, unless he obtains the cover at commercially reasonable terms, to have approved the omission under Sub-Clause 18.1 [General Requirements for Insurances].

**18.3 Insurance against Injury to Persons and Damage to Property**

18.3.1 The insuring Party shall insure against each Party's liability for any loss, damage, death or bodily injury which may occur to any physical property (except things insured under Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment]) or to any person (except persons insured under Sub-Clause 18.4 [Insurance for Contractor's Personnel]), which may arise out of the Contractor's performance of the Contract and occurring before the issue of the Performance Certificate.

18.3.2 This insurance shall be for a limit per occurrence of not less than the amount stated in the **SCC**, with no limit on the number of occurrences. If an amount is not stated in the **SCC**, this Sub-Clause shall not apply. Unless otherwise stated in the Particular Conditions, the insurances specified in this Sub-Clause:

a) Shall be effected and maintained by the Contractor as insuring Party,
b) Shall be in the joint names of the Parties,
c) Shall be extended to cover liability for all loss and damage to the Procuring Entity's property (except things insured under Sub-Clause 18.2) arising out of the Contractor's performance of the Contract, and
d) May however exclude liability to the extent that it arises from:
   i) The Procuring Entity's right to have the Permanent Works executed on, over, under, in or through any land, and to occupy this land for the Permanent Works,
   ii) damage which is an unavoidable result of the Contractor's obligations to execute the Works and remedy any defects, and
   iii) a cause listed in Sub-Clause 17.3 [Procuring Entity's Risks], except to the extent that cover is available at commercially reasonable terms.

**18.4 Insurance for Contractor's Personnel**

18.4.1 The Contract or shall effect and maintain insurance against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel.

18.4.2 The insurance shall cover the Procuring Entity and the Engineer against liability for claims, damages, losses and expenses (including legal fees and expenses) arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Procuring Entity or of the Procuring Entity's Personnel.

18.4.3 The insurance shall be maintained in full force and effect during the whole time that these personnel are assisting in the execution of the Works. For a Subcontractor's employees, the insurance may be effected by the Subcontractor, but the Contractor shall be responsible for compliance with this Clause.

## 19. FORCE MAJEURE

**19.1 Definition of Force Majeure**

19.1.1 In this Clause, "Force Majeure" means an exceptional event or circumstance:
a) Which is beyond a Party's control,
b) Which such Party could not reasonably have provided against before entering into the Contract,
c) Which, having arisen, such Party could not reasonably have avoided or overcome, and
d) Which is not substantially attributable to the other Party.

19.1.2 Force Majeure may include, but is not limited to, exceptional events or circumstances of the kind listed below, so long as conditions (a) to (d) above are satisfied:
   i) war, hostilities (whether war be declared or not), invasion, act of foreign enemies,
   ii) rebellion, terrorism, sabotage by persons other than the Contractor's Personnel, revolution, insurrection, military or usurped power, or civil war,
   iii) riot, commotion, disorder, strike or lock out by persons other than the Contractor's Personnel,
   iv) munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio-activity, and
   v) natural catastrophes such as earthquake, hurricane, typhoon or volcanic activity.

**19.2 Notice of Force Majeure**

19.2.1 If a Party is or will be prevented from performing its substantial obligations under the Contract by Force Majeure, then it shall give notice to the other Party of the event or circumstances constituting the Force Majeure and shall specify the obligations, the performance of which is or will be prevented. The notice shall be given within 14 days after the Party became aware, or should have become aware, of the relevant event or circumstance constituting Force Majeure.

19.2.2 The Party shall, having given notice, be excused performance of its obligations for so long as such Force Majeure prevents it from performing them.

Notwithstanding any other provision of this Clause, Force Majeure shall not apply to obligations of either Party to make payments to the other Party under the Contract.

**19.3 Duty to Minimize Delay**

Each Party shall at all times use all reasonable endeavors to minimize any delay in the performance of the Contract as a result of Force Majeure. A Party shall give notice to the other Party when it ceases to be affected by the Force Majeure.

**19.4 Consequences of Force Majeure**

19.4.1 If the Contractor is prevented from performing his substantial obligations under the Contract by Force Majeure of which notice has been given under Sub-Clause 19.2 [Notice of Force Majeure], and suffers delay and/or incurs Cost by reason of such Force Majeure, the Contractor shall be entitled subject to Sub-Clause 20.1 [Contractor's Claims] to:

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

b) if the event or circumstance is of the kind described in sub-paragraphs (i) to (iv) of Sub-Clause 19.1 [Definition of Force Majeure] and, in sub-paragraphs (ii) to (iv), occurs in the Country, payment of any such Cost, including the costs of rectifying or replacing the Works and/or Goods damaged or destroyed by Force Majeure, to the extent they are not indemnified through the insurance policy referred to in Sub-Clause 18.2 [Insurance for Works and Contractor's Equipment].

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

**19.5 Force Majeure Affecting Subcontractor**

If any Subcontractor is entitled under any contract or agreement relating to the Works to relief from force majeure on terms additional to or broader than those specified in this Clause, such additional or broader force majeure events or circumstances shall not excuse the Contractor's non-performance or entitle him to relief under this Clause.

**19.6 Optional Termination, Payment and Release**

If the execution of substantially all the Works in progress is prevented for a continuous period of 84 days by reason of Force Majeure of which notice has been given under Sub-Clause 19.2 [Notice of Force Majeure], or for multiple periods which total more than 140 days due to the same notified Force Majeure, then either Party may give to the other Party a notice of termination of the Contract. In this event, the termination shall take effect 7 days after the notice is given, and the Contractor shall proceed in accordance with Sub-Clause 16.3 [Cessation of Work and Removal of Contractor's Equipment].

Upon such termination, the Engineer shall determine the value of the work done and issue a Payment Certificate which shall include:

a) The amounts payable for any work carried out for which a price is stated in the Contract;

b) The Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery: this Plant and Materials shall become the property of (and be at the risk of) the Procuring Entity when paid for by the Procuring Entity, and the Contractor shall place the same at the Procuring Entity's disposal;

c) other Cost or liabilities which in the circumstances were reasonably and necessarily incurred by the Contractor in the expectation of completing the Works;

d) the Cost of removal of Temporary Works and Contractor's Equipment from the Site and there turn of these items to the Contractor's works in his country (or to any other destinationa tno greater cost);and

e) the Cost of repatriation of the Contractor's staff and labor employed wholly in connection with the Works at the date of termination.

**19.7 Release from Performance**

Notwithstanding any other provision of this Clause, if any event or circumstance outside the control of the Parties (including, but not limited to, Force Majeure) arises which makes it impossible or unlawful for either or both Parties to fulfil its or their contractual obligations or which, under the law governing the Contract, entitles the Parties to be released from further performance of the Contract, then upon notice by either Party

to the other Party of such event or circumstance:

a) The Parties shall be discharged from further performance, without prejudice to the rights of either Party in respect of any previous breach of the Contract, and

b) The sum payable by the Procuring Entity to the Contractor shall be the same as would have been payable under Sub-Clause 19.6 [Optional Termination, Payment and Release] if the Contract had been terminated under Sub-Clause 19.6.

## 20. CLAIMS, DISPUTES AND ARBITRATION

### 20.1 Contractor's Claims

20.1.1 If the Contractor considers itself to be entitled to any extension of the Time for Completion and/or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall give Notice to the Engineer, describing the event or circumstance giving rise to the claim. The notice shall be given as soon as practicable, and not later than 30 days after the Contractor became aware, or should have become aware, of the event or circumstance.

20.1.2 IftheContractorfailstogivenoticeofaclaimwithinsuchperiodof30days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Procuring Entity shall be discharged from all liability in connection with the claim. Otherwise, the following provisions of this Sub-Clause shall apply.

20.1.3 The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.

20.1.3 The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at another location acceptable to the Engineer. Without admitting the Procuring Entity's liability, the Engineer may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Engineer to inspect all these records, and shall (if instructed) submit copies to the Engineer.

20.1.4 Within 42 days after the Contractor became aware (or should have become aware) of the event or circumstance giving rise to the claim, or within such other period as may be proposed by the Contractor and approved by the Engineer, the Contractor shall send to the Engineer a fully detailed claim which includes full supporting particulars of the basis of the claim and of the extension of time and/or additional payment claimed. If the event or circumstance giving rise to the claim has a continuing effect:

a) This fully detailed claim shall be considered as interim;

b) The Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed, and such further particulars as the Engineer may reasonably require; and

c) The Contractor shall send a final claim within 30 days after the end of the effects resulting from the event or circumstance, or within such other period as may be proposed by the Contractor and approved by the Engineer.

20.1.5 Within 42 days after receiving a Notice of a claim or any further particulars supporting a previous claim, or within such other period as may be proposed by the Engineer and approved by the Contractor, the Engineer shall respond with approval, or with disapproval and detailed comments. He may also request any necessary further particulars, but shall nevertheless give his response on the principles of the claim within the above defined time period.

20.1.6 Within the above defined period of 42 days, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with Sub-Clause 8.4 [Extension of Time for Completion], and/or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.

20.1.7 Each Payment Certificate shall include such additional payment for any claim as has been reasonably substantiated as due under the relevant provision of the Contract. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim, the Contractor shall only be entitled to payment for such part of the claim as he has been able to substantiate.

20.1.8 If the Engineer does not respond within the time frame defined in this Clause, either Party may consider that the claim is rejected by the Engineer and any of the Parties may refer to Arbitration in accordance with Sub-

Clause 20.4 [Arbitration].

20.1.9 The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply toa claim. If the Contractor fails to comply with this or another Sub-Clause in relation to any claim, any extension of time and/or additional payment shall take account of the extent (if any) to which the failure has prevented or prejudiced proper investigation of the claim, unless the claim is excluded under the second paragraph of Sub- Clause 20.3 (f).

**20.2 Amicable Settlement**

Where a notice of a claim has been given, both Parties shall attempt to settle the dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, the Party giving a notice of a claim in accordance with Sub-Clause 20.1 above should move to commence arbitration after the fifty-sixth day from the day on which a notice of a claim was given, even if no attempt at an amicable settlement has been made.

**20.3 Matters that may be referred to arbitration**

Notwithstanding anything stated herein the following matters may be referred to arbitration before the practical completion of the Works or abandonment of the Works or termination of the Contract by either party:

a) The appointment of a replacement Engineer upon the said person ceasing to act.
b) Whether or not the issue of an instruction by the Engineer is empowered by these Conditions.
c) Whether or not a certificate has been improperly withheld or is not in accordance with these Conditions.
e) Any dispute arising in respect of war risks or war damage.
f) All other matters shall only be referred to arbitration after the completion or alleged completion of the Works or termination or alleged termination of the Contract, unless the Procuring Entity and the Contract or agree otherwise in writing.

**20.4 Arbitration**

20.4.1 Any claim or dispute between the Parties arising out of or in connection with the Contract not settled amicably in accordance with Sub-Clause 20.3 shall be finally settled by arbitration.

20.4.2 No arbitration proceedings shall be commenced on any claim or dispute where notice of a claim or dispute has not been given by the applying party within ninety days of the occurrence or discovery of the matter or issue giving rise to the dispute.

20.4.3 Notwithstanding the issue of a notice as stated above, the arbitration of such a claim or dispute shall not commence unless an attempt has in the first instance been made by the parties to settle such claim or dispute amicably with or without the assistance of third parties. Proof of such attempt shall be required.

20.4.4 The Arbitrator shall, without prejudice to the generality of his powers, have powers to direct such measurements, computations, tests or valuations as may in his opinion be desirable in order to determine the rights of the parties and assess and award any sums which ought to have been the subject of or included in any certificate.

20.4.5 The Arbitrator shall, without prejudice to the generality of his powers, have powers to open up, review and revise any certificate, opinion, decision, requirement or notice and to determine all matters in dispute which shall be submitted to him in the same manner as if no such certificate, opinion, decision requirement or notice had been given.

20.4.6 The arbitrators shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Engineer, relevant to the dispute. Nothing shall disqualify representatives of the Parties and the Engineer from being called as a witness and giving evidence before the arbitrators on any matter whatsoever relevant to the dispute.

20.4.7 Neither Party shall be limited in the proceedings before the arbitrators to the evidence, or to the reasons for dissatisfaction given in its Notice of Dissatisfaction.

20.4.7 Arbitration may be commenced prior to or after completion of the Works. The obligations of the Parties, and the Engineer shall not be altered by reason of any arbitration being conducted during the progress of the Works.

20.4.8 The terms of the remuneration of each or all the members of Arbitration shall be mutually agreed upon by the Parties when agreeing the terms of appointment. Each Party shall be responsible for paying one-half of this remuneration.

**20.5 Arbitration with National Contractors**

20.5.1 If the Contract is with national contractors, arbitration proceedings will be conducted in accordance with the Arbitration Laws of Kenya. In case of any claim or dispute, such claim or dispute shall be notified in writing by either party to the other with a request to submit it to arbitration and to concur in the appointment of an Arbitrator within thirty days of the notice. The dispute shall be referred to the arbitration and final decision of a person to be agreed between the parties. Failing agreement to concur in the appointment of an Arbitrator, the Arbitrator shall be appointed, on the request of the applying party, by the Chairman or Vice Chairman of any of the following professional institutions;

i) Architectural Association of Kenya
ii) Institute of Quantity Surveyors of Kenya
iii) Association of Consulting Engineers of Kenya
iv) Chartered Institute of Arbitrators (Kenya Branch)
v) Institution of Engineers of Kenya

20.5.2 The institution written to first by the aggrieved party shall take precedence over all other institutions.

**20.6 Arbitration with Foreign Contractors**

20.7.1 Arbitration with foreign contractors shall be conducted in accordance with the arbitration rules of the United Nations Commission on International Trade Law (UNCITRAL); or with proceedings administered by the International Chamber of Commerce (ICC) and conducted under the ICC Rules of Arbitration; by one or more arbitrators appointed in accordance with said arbitration rules.

20.7.2 The place of arbitration shall be a location specified in the **SCC;** and the arbitration shall be conducted in the language for communications defined in Sub-Clause 1.4 [Law and Language].

**20.7 Alternative Arbitration Proceedings**

Alternatively, the Parties may refer the matter to the Nairobi Centre for International Arbitration (NCIA) which offers a neutral venue for the conduct of national and international arbitration with commitment to providing institutional support to the arbitral process.

**20.8 Failure to Comply with Arbitrator's Decision**

20.8.1 The award of such Arbitrator shall be final and binding upon the parties.

20.8.2 In the event that a Party fails to comply with a final and binding Arbitrator's decision, then the other Party may, without prejudice to any other rights it may have, refer the matter to a competent court of law.

**10.7 Contract operations continue**

Notwithstanding any reference to arbitration herein,

a) The parties shall continue to perform their respective obligations under the Contract unless they otherwise agree; and
b) The Procuring Entity shall pay the Contractor any monies due the Contractor.

## SECTION IX - SPECIAL CONDITIONS OF CONTRACT

The following Particular Conditions shall supplement the GCC. Whenever there is a conflict, the provisions herein shall prevail over those in the GCC.

| Conditions | GCC Clause | Data |
|---|---|---|
| **Procuring Entity's name and address** | 1 | **MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED**<br>**P.O BOX 84-01034 KANDARA, NEXT TO DC'S OFFICE-KANDARA.**<br>**Telephone: +254716645345**<br>***Email: murangasouth@gmail.com or info@muswasco.co.ke***<br>***Website: www.muswasco.co.ke*** |
| **Time for Completion** | 1 | _____180_____days<br>*If Sections are to be used, refer to Table: Summary of Sections below: -* |
| **Engineer's name and address** | 1 | **TECHNICAL MANAGER**<br>**MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED**<br>**P.O BOX 84-01034 KANDARA, NEXT TO DC'S OFFICE-KANDARA.**<br>**Telephone: +254716645345**<br>***Email: murangasouth@gmail.com or info@muswasco.co.ke*** |
| **Electronic transmission** | 1.3 | If so allowed the systems of electronic transmission shall be _____**Not Applicable**_____ |
| **Time for the Parties entering into a Contract Agreement** | 1.6 | Insert the date.<br>**December,2026** |
| **Time for access to the Site** | 2.1 | No later than the Commencement Day, except for the following parts (if applicable, with detailed description of parts concerned: _____**Immediately after commencement date** days after Commencement Date |
| **Engineer's Authority to make variations.** | 3.1.2 (b) (ii) | Variation would increase the Accepted Contract Amount by not exceeding---**Not Applicable**---% of the contract Price. |
| | | Variations resulting in an increase of the Accepted Contract Amount in excess of__ **Not Applicable**__% shall require approval of the Procuring Entity. |
| **Performance Security** | 4.2.2 | The Performance Security shall be in the amount of _____**10%**_____ and denominated in the currency_____ **10% of the Contract Amount** _____(*name of Currency).* |
| | | The performance security will be in the form of a *"demand bank guarantee"* in the amount(s) of ____**10% of the Contract Amount** ____*[insert related figure(s)]* percent of the Accepted Contract Amount in the same currency(ies) of the Contract Amount. |
| **Contractor's Representative's name** | 4.3 | *[insert the name of the Contractor's Representative agreed by the Procuring Entity prior to Contract signature]* |
| **Working Hours** | 6.5 | Normal working hours shall be__**0800hrs-1700hrs**_____. |
| **Key Personnel names** | 6.9.1 | *[insert the name of each Key Personnel agreed by the Procuring Entity prior to Contract signature]*<br>**Technical Services Manager**<br>**Murang'a South Water and Sanitation Company Limited**<br>**P.O Box 84-01034 Kandara, Next To Dc's Office-Kandara.**<br>**Telephone: +254716645345** |
| **Commencement of Works** | 8.1.1(c) | *Modifications shall be* _____ **Not Applicable**_____ *(if nay)* |

| Conditions | GCC Clause | Data |
|---|---|---|
| **Delay Damages** | 8.7.1 | Delay damages shall be _____ **Not Applicable**_____per day of delay. |
| Maximum amount of delay damages | 8.7.1 | __ **Not Applicable**____% of the final Contract Price. |
| **Defects Notification Period** | | ---- days. |
| **Adjustments for Changes in Cost** | 13.8.3 | Period "n" applicable to the adjustment multiplier "Pn": _ _____ **Not Applicable**____ *[Insert the period if different from one (1) month; if period "n" is one (1) month, insert "not applicable"]* |
| **Delay damages for the Works** | 8.7 & 14.15(b) | **Not Applicable** *If Sections are to be used, refer to Table: Summary of Sections below* |
| | | |
| **Provisional Sums** | 13.5. (b)(iii) | *[If there are Provisional Sums, insert a percentage for adjustment of Provisional Sums]* _____%, otherwise insert "NONE". **Not Applicable** |
| **Total advance payment** | 14.2.1 | __% Percentage of the Accepted Contract Amount payable in the currencies and proportions in which the Accepted Contract Amount is payable **Not Applicable** *[Insert number and timing of installments if applicable]* |
| **Repayment amortization rate of advance payment** | 14.2.4(b) | _____% **Not Applicable** |
| **Limit of Retention** | 14.3.2(c) | The limit of Retention Money (if any) shall be _____ **Not Applicable**_____ |
| **Percentage of Retention** | 14.3.2(c) | ----------%____ |
| **Plant and Materials** | 14.5.2(b)(i) | If Sub-Clause 14.5 applies: Plant and Materials for payment Free on Board _____ **Not Applicable**_____ *[list].* |
| | 14.5.2(c)(i) | Plant and Materials for payment when delivered to the Site _____ *[list].* |
| **Minimum Amount of Interim Payment Certificates** | 14.6.1 | _____10_____ % of the Accepted Contract Amount. |
| **Publishing source of commercial interest rates for financial charges in case of delayed payment** | 14.8 | Three percentage points above the discount rate given by the Central bank of Kenya. |
| **Maximum total liability of the Contractor to the Procuring Entity** | 17.6.2 | *[Select one of the two options below as appropriate]* The product of_____ **Not Applicable**_____ *[insert a multiplier less or greater than one]* times the Accepted Contract Amount, *or* _____ *[insert amount of the maximum total liability]* |
| **Periods for submission of insurance:** | 18.1.6 | *[Insert period for submission of evidence of insurance and policy. Period may be from 14 days to 30 days.]* |
| **a. evidence of insurance.** | | __**14**___days |
| **b. relevant policies** | | ___**14**__days |
| **Maximum number of deductibles for insurance of the Procuring Entity's risks** | 18.2(d) | *[Insert maximum amount of deductibles]* |
| **Minimum amount of third-party insurance** | 18.3.2 | *[Insert amount of third-party insurance]* |
| **The place of arbitration** | 20.7.2 | The place of arbitration shall be ----------**As Per Kenya Laws**----------_____ |

## Section X - Contract Forms

**Table of Forms**

FORM No. 1 - NOTIFICATION OF INTENTION TO AWARD

FORM NO. 2 – REQUEST FOR REVIEW

FORM No. 3-LETTER OF AWARD

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FORM No. 8 - RETENTION MONEY SECURITY

FORM NO. 9 BENEFICIAL OWNERSHIP DISCLOSURE FORM

## FORM No. I - Notification of Intention to Award

**[*This Notification of Intention to Award shall be sent to each Tenderer that submitted a Tender.*] [*Send this Notification to the Tenderer's Authorized Representative named in the Tender Information Form*]**

**FORMAT**

For the attention of Tenderer's Authorized Representative

Name:……..*[insert Authorized Representative's name]* Address: *[insert Authorized Representative's Address]* Telephones: *[insert Authorized Representative's telephone/fax numbers]* Email Address: *[insert Authorized Representative's email address]*

*[**IMPORTANT:** insert the date that this Notification is transmitted to Tenderers. The Notification must be sent to all Tenderers simultaneously. This means on the same date and as close to the same time as possible.]*

**Date of Transmission**: This Notification is sent by: [*email*] on [*date*] (local time)

Procuring Entity: *[insert the name of the Procuring Entity]* Contract title: *[insert the name of the contract]*

Country: Kenya, County_____(*if the Procuring Entity is from a County*)

This Notification of Intention to Award (Notification) notifies you of our decision to award the above contract. The transmission of this Notification begins the Standstill Period. During the Standstill Period, you may:

a) Request a debriefing in relation the evaluation of your Tender, and/or

b) Submit a Procurement-related Complaint in relation to the decision to award the contract.

**1. The successful Tenderer**

Name: [*insert name of successful Tenderer*]. Address: [*insert address of the successful Tenderer*] Contract price: [*insert contract price of the successful Tender*]

**2 Other Tenderers**: *insert names of all Tenderers that submitted a Tender. If the Tender's price was evaluated include the evaluated price as well as the Tender price as read out.]*

| | **Name of Tenderer** | **Tender price** | **Evaluated Tender price** | *Comments (if any)* |
|---|---|---|---|---|
| *1* | | | | |
| *2* | | | | |
| *3* | | | | |
| *4* | | | | |
| *5* | | | | |
| *6* | | | | |
| *7* | | | | |
| *Etc.* | | | | |

## 1. How to request a debriefing

DEADLINE: The deadline to request a debriefing expires at midnight on [*insert date*] (local time).

You may request a debriefing in relation to the results of the evaluation of your Tender. If you decide to request a debriefing your written request must be made within three (3) Business Days of receipt of this Notification of Intention to Award. Provide the contract name, reference number, name of the Tenderer, contact details; and address the request for debriefing as follows:

**Attention**: [*insert full name of person, if applicable*] **Title/position**: *[insert title/position*] **Procuring Entity**:

[*insert name of Procuring Entity*] **Email address**: [*insert email address*]

If your request for a debriefing is received within the 3 Business Days deadline, we will provide the debriefing within five (5) Business Days of receipt of your request. If we are unable to provide the debriefing within this period, the Standstill Period shall be extended by five (5) Business Days after the date that the debriefing is provided. If this happens, we will notify you and confirm the date that the extended Standstill Period will end. The debriefing may be in writing, by phone, video conference call or in person. We shall promptly advise you in writing how the debriefing will take place and confirm the date and time.

If the deadline to request a debriefing has expired, you may still request a debriefing. In this case, we will provide the debriefing as soon as practicable, and normally no later than fifteen (15) Business Days from the date of publication of the Contract Award Notice.

## 2. How to make a complaint

**Period:** Procurement-related Complaint challenging the decision to award shall be submitted by midnight, [*insert date*] (local time).

Provide the contract name, reference number, name of the Tenderer, contact details; and address the Procurement-related Complaint as follows:

Attention: [*insert full name of person, if applicable*]

Title/position: [*insert title/position*] Procuring

Entity: [*insert name of Procuring Entity*] Email

address: [*insert email address*]

At this point in the procurement process, you may submit a Procurement-related Complaint challenging the decision to award the contract. You do not need to have requested, or received, a debriefing before making this complaint. Your complaint must be submitted within the Standstill Period and received by us before the Standstill Period ends.

In summary, there are four essential requirements:

a) You must be an 'interested party'. In this case, that means a Tenderer who submitted a Tender in this tendering process, and is the recipient of a Notification of Intention to Award.

b) The complaint can only challenge the decision to award the contract.

c) You must submit the complaint within the period stated above.

d) You must include, in your complaint, all of the information necessary to support your case.

e) The application must be accompanied by the fees set out in the Procurement Regulations, which shall not be refundable (information available from the Public Procurement Authority at www.ppoa.go.ke.

**3. Standstill Period**

a) **DEADLINE:** The Standstill Period is due to end at midnight on [*insert date*] (local time).

i) The Standstill Period lasts ten (14) Days after the date of transmission of this Notification of Intention to Award.

(ii) The Standstill Period may be extended as stated in Section 4 above.

If you have any questions regarding this Notification please do not hesitate to contact

us. On behalf of the Procuring Entity:

Name_____

Title and Position_____

_____

Signature_____

Date_____

## FORM NO. 2 - REQUEST FOR REVIEW

**FORM FOR REVIEW (r.203 (1))**

**PUBLIC PROCUREMENT ADMINISTRATIVE REVIEW BOARD**

**APPLICATION NO…….OF……..…20……...**

**BETWEEN**

**……...…….APPLICANT**

**AND**

**……RESPONDENT (Procuring Entity)**

Request for review of the decision of the…… (Name of the Procuring Entity of ……dated the…day of ……20…….in the matter of Tender No……..…of ……..20….. for ..... (Tender description).

**REQUEST FOR REVIEW**

I/We……,the above named Applicant(s), of address: Physical address…….P. O. Box No……. Tel. No……..Email ……., hereby request the Public Procurement Administrative Review Board to review the whole/part of the above mentioned decision on the following grounds , namely:

1.

2.

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

1.

2.

SIGNED ……. (Applicant) Dated on…….day of ……/…20……

---

FOR OFFICIAL USE ONLY Lodged with the Secretary Public Procurement Administrative Review Board on……day of ……....20….……

**SIGNED**

**Board Secretary**

## FORM NO. 3 - LETTER OF AWARD

*[Letter head paper of the Procuring Entity]*

*[Date]*

**FORMAT**

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

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

You are requested to furnish the Performance Security within 30 days in accordance with the Conditions of Contract, using, for that purpose, one of the Performance Security Forms included in Section X, Contract Forms, of the tender document.

We attach a copy of the Contact for your

Authorized Signature:

Name and Title of

Signatory: Name of

Agency:

**Attachment: Contract Agreement**

## FORM NO. 4 – CONTRACT AGREEMENT

THIS AGREEMENT made the _____ day of _____, _____, between _____of _____ (hereinafter "the Procuring Entity"), of the one part, and_____of_____(herein after "the Contractor"), of the other part:

WHEREAS the Procuring Entity desires that the Works known as_____should be executed by the Contractor, and has accepted a Tender by the Contractor for the execution and completion of these Works and the remedying of any defects therein, The Procuring Entity and the Contractor agree as follows:

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

2. The following documents shall be deemed to form and be read and construed as part of this Agreement. This Agreement shall prevail over all other Contract documents.

   a) The Letter of Acceptance
   b) The Letter of Tender
   c) The addenda Nos_____(if any)
   d) The Particular Conditions
   e) The General Conditions;
   f) The Specification
   g) The Drawings; and
   h) The completed Schedules and any other documents forming part of the contract.

3. In consideration of the payments to be made by the Procuring Entity to the Contractor as specified in this Agreement, the Contractor hereby covenants with the Procuring Entity to execute the Works and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Procuring Entity hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

   IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of Kenya on the day, month and year specified above.

**Signed by**_____

_____(For the Procuring Entity)

**Signed by**_____

_____(For the Contractor)

**FORM NO. 5 - PERFORMANCE SECURITY**
**– (Unconditional Demand Bank Guarantee)**

*[Guarantor letterhead or SWIFT identifier code]*

**Beneficiary:** _____ *[insert name and Address of* Procuring

Entity*]* **Date:** _____ *[Insert date of issue]*

**PERFORMANCE GUARANTEE No.:** _____

**Guarantor:** *[Insert name and address of place of issue, unless indicated in the letterhead]*

1. We have been informed that _____ (herein after called "the Applicant") has entered into Contract No. _____ *dated* _____ with the Beneficiary, for the execution of _____ (herein after called "the Contract").

2. Further more, we understand that, according to the conditions of the Contract, a performance guarantee is required.

3. At the request of the Applicant, we as Guarantor, here by irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of _____( ),[1] such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in breach of its obligation(s) under the Contract, without the Beneficiary needing to prove or to show grounds for your demand or the sum specified therein.

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

5. The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed *[six months] [one year],* in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."

_____
_____
*[Name of Authorized Official, signature(s) and seals/stamps*]

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

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

[2] *Insert the date twenty-eight days after the expected completion date as described in GC Clause 11.9. The Procuring Entity should note that in the event of an extension of this date for completion of the Contract, the Procuring Entity would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Procuring Entity might consider adding the following text to the form, at the end of the pen ultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months] [one year], in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."*

**FORM No. 6 - PERFORMANCE SECURITY OPTION 2– (Performance Bond)**

*[**Note:** Procuring Entities are advised to use Performance Security–Unconditional Demand Bank Guarantee instead of Performance Bond due to difficulties involved in calling Bond holder to action]*

*[Guarantor letterhead or SWIFT identifier code]*

**Beneficiary:**_____*[insert name and Address of* Procuring

Entity*]* **Date:**_____*[Insert date of issue]* **PERFORMANCE**

**BOND No.:**_____

**Guarantor: [***Insert name and address of place of issue, unless indicated in the letter head]*

1. By this Bond_____as Principal (hereinafter called "the Contractor") and_____] as Surety (hereinafter called "the Surety"), are held and firmly bound unto_____] as Obliged (hereinafter called "the Procuring Entity") in theamountof_____for the payment of which sum well and truly to be made in the types and proportions of currencies in which the Contract Price is payable, the Contractor and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

2 WHEREAS the Contractor has entered into a written Agreement with the Procuring Entity dated the day of, 20_____, for_____in accordance with the documents, plans, specifications, and amendments thereto, which to the extent here in provided for, are by reference made part hereof and are herein after referred to as the Contract.

3 NOW, THEREFORE, the Condition of this Obligation is such that, if the Contractor shall promptly and faithfully perform the said Contract (including any amendments thereto), then this obligation shall be null and void; otherwise, it shall remain in full force and effect. Whenever the Contractor shall be, and declared by the Procuring Entity to be, in default under the Contract, the Procuring Entity having performed the Procuring Entity's obligations there under, the Surety may promptly remedy the default, or shall promptly:

1) Complete the Contract in accordance with its terms and conditions; or

2) Obtain a tender or tenders from qualified tenderers for submission to the Procuring Entity for completing the Contract in accordance with its terms and conditions, and upon determination by the Procuring Entity and the Surety of the lowest responsive Tenderers, arrange for a Contract between such Tenderer, and Procuring Entity and make available as work progresses (even though there should be a default or a succession of defaults under the Contract or Contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the Balance of the Contract Price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "Balance of the Contract Price," as used in this paragraph, shall mean the total amount payable by Procuring Entity to Contractor under the Contract, less the amount properly paid by Procuring Entity to Contractor; or

3) Pay the Procuring Entity the amount required by Procuring Entity to complete the Contract in accordance with its terms and conditions up to a total not exceeding the amount of this Bond.

4 The Surety shall not be liable for a greater sum than the specified penalty of this Bond.

5 Any suit under this Bond must be instituted before the expiration of one year from the date of the issuing of the Taking-Over Certificate. No right of action shall accrue on this Bond to or for the use of any person or corporation other than the Procuring Entity named here in or the heirs, executors, administrators, successors, and assigns of the Procuring Entity.

6 In testimony where of, the Contractor has here unto set his hand and affixed his seal, and the Surety has caused these presents to be sealed with his corporate seal duly attested by the signature of his legal representative, this day
_____of_____20_____.

SIGNED ON_____on behalf of_____

By_____in the capacity of_____

In the presence of

SIGNED ON_____on behalf of_____

By_____in the capacity of_____

In the presence of

## FORM NO. 7 - ADVANCE PAYMENT SECURITY

**[Demand Bank Guarantee]** *[Guarantor letterhead or SWIFT identifier*

*code] [Guarantor letterhead or SWIFT identifier code]*
**Beneficiary:**_____*[Insert name and Address of* Procuring Entity*]* **Date:**_____*[Insert date of issue]*

**ADVANCE PAYMENT GUARANTEE No.:** *[Insert guarantee reference number]*

**Guarantor: [***Insert name and address of place of issue, unless indicated in the letterhead]*

1. We have been informed that_____(herein after called "the Applicant") has entered into Contract No._____*dated*_____with the Beneficiary, for the execution of _____ (herein after called" the Contract").

2. Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum _____( ) is to be made against an advance payment guarantee.

3. At the request of the Applicant, we as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of_____( )[1] upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating either that the Applicant:
   a) Has used the advance payment for purposes other than the costs of mobilization in respect of the Works; or
   b) Has failed to repay the advance payment in accordance with the Contract conditions, specifying the amount which the Applicant has failed to repay.

4. A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary's bank stating that the advance payment referred to above has been credited to the Applicant on its account number_____at_____

5. The maximum amount of this guarantee shall be progressively reduced by the amount of the advance payment repaid by the Applicant as specified in copies of interim statements or payment certificates which shall be presented to us. This guarantee shall expire, at the latest, upon our receipt of a copy of the interim payment certificate indicating that ninety (90) percent of the Accepted Contract Amount, less provisional sums, has been certified for payment, or on the_____day of_____,2_____,[2] whichever is earlier. Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

6. The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed *[six months] [one year],* in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee.

   *[Name of Authorized Official, signature(s) and seals/stamps*]

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

[1] *The Guarantor shall insert an amount representing the amount of the advance payment and denominated either in the currency (ies) of the advance payment as specified in the Contract, or in a freely convertible currency acceptable to the Procuring Entity.*

[2] *Insert the expected expiration date of the Time for Completion. The Procuring Entity should note that in the event of an extension of the time for completion of the Contract, the Procuring Entity would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee. In preparing this guarantee, the Procuring Entity might consider adding the following text to the form, at the end of the penultimate paragraph: "The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed [six months] [one year], in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee."*

## FORM NO. 8 - RETENTION MONEY SECURITY
**[Demand Bank Guarantee]**

*[Guarantor letterhead]*

**Beneficiary:** _____*[Insert name and Address of* Procuring Entity*]* **Date:** _____*[Insert date of issue]*

**ADVANCE PAYMENT GUARANTEE No.:**_____
*[Insert guarantee reference number]*

**Guarantor:** *[Insert name and address of place of issue, unless indicated in the letterhead]*

1. We have been informed that_____*[insert name of Contractor, which in the case of a joint venture shall be the name of the joint venture]* (herein after called" the Contractor") has entered into Contract No. _____*[Insert reference number of the contract]* dated_____with the Beneficiary, for the execution of_____*[insert name of contract and brief description of* Works*]* (herein after called" the Contract").

2. Furthermore, we understand that, according to the conditions of the Contract, the Beneficiary retains moneys upto the limit set forth in the Contract ("the Retention Money"), and that when the Taking-Over Certificate has been issued under the Contract and the first half of the Retention Money has been certified for payment, and payment of *[*insert the second half of the Retention Money] is to be made against a Retention Money guarantee.

3. At the request of the Contractor, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of *[insert amount in figures]*_____(*[insert amount in words*_____*])*[1] upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Contractor is in breach of its obligation(s) under the Contract, without your needing to prove or show grounds for your demand or the sum specified therein.

4. A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary's bank stating that the second half of the Retention Money as referred to above has been credited to the Contractor on its account number_____at_____*[insert name and address of Applicant's bank]*.

5. This guarantee shall expire no later than the……. Day of……..…, 2…[2], and any demand for payment under it must be received by us at the office indicated above on or before that date.

6. The Guarantor agrees to a one-time extension of this guarantee for a period not to exceed *[six months] [one year],* in response to the Beneficiary's written request for such extension, such request to be presented to the Guarantor before the expiry of the guarantee.

_____
*[Name of Authorized Official, signature(s) and seals/stamps*]

***Note: All italicized text (including foot notes) is for use in preparing this form and shall be deleted from the final product.***

---

[1] *The Guarantor shall insert an amount representing the amount of the second half of the Retention Money.*

[2] *Insert a date that is twenty-eight days after the expiry of retention period after the actual completion date of the contract. The Procuring Entity should note that in the event of an extension of this date for completion of the Contract, the Procuring Entity would need to request an extension of this guarantee from the Guarantor. Such request must be in writing and must be made prior to the expiration date established in the guarantee.*

**FORM NO. 9 BENEFICIAL OWNERSHIP DISCLOSURE FORM**

**(Amended and issued pursuant to PPRA CIRCULAR No. 02/2022)**

***INSTRUCTIONS TO TENDERERS: DELETE THIS BOX ONCE YOU HAVE COMPLETED THE FORM***

*This Beneficial Ownership Disclosure Form ("Form") is to be completed by the successful tenderer pursuant to Regulation 13 (2A) and 13 (6) of the Companies (Beneficial Ownership Information) Regulations, 2020. In case of joint venture, the tenderer must submit a separate Form for each member. The beneficial ownership information to be submitted in this Form shall be current as of the date of its submission.*

*For the purposes of this Form, a Beneficial Owner of a Tenderer is any natural person who ultimately owns or controls the legal person (tenderer) or arrangements or a natural person on whose behalf a transaction is conducted, and includes those persons who exercise ultimate effective control over a legal person (Tenderer) or arrangement.*

Tender Reference No.:_____[*insert identification no*] Name of the Tender Title/Description:_____*[insert name of the assignment]* to:_____*[insert complete name of Procuring Entity]*

In response to the requirement in your notification of award dated__*[insert date of notification of award]* to furnish additional information on beneficial ownership:_____*[select one option as applicable and delete the options that are not applicable]*

I) We here by provide the following beneficial ownership information.

**Details of beneficial ownership**

| | **Details of all Beneficial Owners** | | **% of shares a person holds in the company Directly or indirectly** | **% of voting rights a person holds in the company** | **Whether a person directly or indirectly holds a right to appoint or remove a member of the board of directors of the company or an equivalent governing body of the Tenderer** (Yes / No) | **Whether a person directly or indirectly exercises significant influence or control over the Company (tenderer) (Yes / No)** |
|---|---|---|---|---|---|---|
| **1.** | Full Name | | Directly---------- % of shares<br><br>Indirectly---------- % of shares | Directly…… …….% of voting rights<br><br>Indirectly---------- % of voting rights | 1. Having the right to appoint a majority of the board of the directors or an equivalent governing body of the Tenderer: Yes -----No----<br>2. Is this right held directly or indirectly?:<br><br>Direct…… ……<br><br>Indirect…… ……... | 1. Exercises significant influence or control over the Company body of the Company (tenderer)<br><br>Yes -----No----<br><br>2. Is this influence or control exercised directly or indirectly?<br><br>Direct…… ….. |
| | National identity card number or Passport number | | | | | |
| | Personal Identification Number (where applicable) | | | | | |
| | Nationality | | | | | |
| | Date of birth *[dd/mm/yyyy]* | | | | | |
| | Postal address | | | | | |
| | Residential address | | | | | |
| | Telephone number | | | | | |
| | Email address | | | | | |
| | Occupation or profession | | | | | |

| | **Details of all Beneficial Owners** | | **% of shares a person holds in the company Directly or indirectly** | **% of voting rights a person holds in the company** | **Whether a person directly or indirectly holds a right to appoint or remove a member of the board of directors of the company or an equivalent governing body of the Tenderer** (Yes / No) | **Whether a person directly or indirectly exercises significant influence or control over the Company (tenderer) (Yes / No)** |
|---|---|---|---|---|---|---|
| | | | | | | Indirect…… … |
| | | | | | | |
| **2.** | Full Name | | Directly---------- % of shares<br><br>Indirectly---------- % of shares | Directly…… …….% of voting rights<br><br>Indirectly---------- % of voting rights | 1. Having the right to appoint a majority of the board of the directors or an equivalent governing body of the Tenderer: Yes -----No----<br>2. Is this right held directly or indirectly?:<br><br>Direct…… ……<br><br>Indirect…… ……... | 1. Exercises significant influence or control over the Company body of the Company (tenderer) Yes -----No----<br><br>2. Is this influence or control exercised directly or indirectly?<br><br>Direct…… …..<br><br>Indirect…… … |
| | National identity card number or Passport number | | | | | |
| | Personal Identification Number (where applicable) | | | | | |
| | Nationality(ies) | | | | | |
| | Date of birth *[dd/mm/yyyy]* | | | | | |
| | Postal address | | | | | |
| | Residential address | | | | | |
| | Telephone number | | | | | |
| | Email address | | | | | |
| | Occupation or profession | | | | | |
| | | | | | | |
| **3.**<br><br>**e.t .c** | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

*II)* Am fully aware that beneficial ownership information above shall be reported to the Public Procurement Regulatory Authority together with other details in relation to contract awards and shall be maintained in the Government Portal, published and made publicly available pursuant to Regulation 13(5) of the Companies (Beneficial Ownership Information) Regulations, 2020.(Notwithstanding this paragraph Personally Identifiable Information in line with the Data Protection Act shall not be published or made public). *Note that Personally Identifiable Information (PII) is defined as any information that can be used to distinguish one person from another and can be used to deanonymize previously anonymous data. This information includes National identity card number or Passport number, Personal Identification Number, Date of birth, Residential address, email address and Telephone number.*

III) In determining who meets the threshold of who a beneficial owner is, the Tenderer must consider a natural person who in relation to the company:

(a) holds at least ten percent of the issued shares in the company either directly or indirectly;

(b) exercises at least ten percent of the voting rights in the company either directly or indirectly;

(c) holds a right, directly or indirectly, to appoint or remove a director of the company; or

(d) exercises significant influence or control, directly or indirectly, over the company.

IV) What is stated to herein above is true to the best of my knowledge, information and belief.

*Name of the Tenderer: .....*[insert complete name of the Tenderer]*_____

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

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

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

*Date this ..... [insert date of signing] day of..... [Insert month], [insert year]*

Bidder Official Stamp

# REPUBLIC OF KENYA

**MURANGA SOUTH WATER AND SANITATION COMPANY LTD**

MURANG'A SOUTH WATER AND SANITATION LTD.
Quality Water Through Quality Services

**TENDER No. : MUSWASCO/KWASH/26-27/01**

# CONSTRUCTION WORKS FOR MURANGA SOUTH WATER SUPPLY PROJECT

## ANNEXURE NO. 1: TECHNICAL SPECIFICATIONS

**NOVEMBER, 2026**

# GENERAL AND PARTICULAR SPECIFICATIONS

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# TENDER No.

# MURANGA SOUTH WATER SUPPLY INTENSIFICATION PROJECT

# BID DOCUMENT

# VOLUME II

## CONTENTS

SECTION 1: GENERAL AND SPECIFIC SPECIFICATIONS

SECTION 2: STANDARD REFERENCE NUMBER

# GENERAL AND PARTICULAR SPECIFICATIONS

# 1. GENERAL

## 101. INTRODUCTION

All materials, equipment and testing apparatus etc. to be furnished and Works to be executed by the Contractor in this Contract shall conform to the requirements of the latest Kenya Standards, International Standards Organization (ISO), European Norm (EN), British Standards (BS) or other approved applicable standard in Kenya.

Equipment to be purchased shall be from well recognized manufacturers whose products are standardized and controlled by any recognized Standards Organization.

All dimensions and measurement units shall be in S.I. units.

The equipment to be employed by the Contractor shall have sufficient performance capacity and durability as to secure the completion of the Works within the construction period stipulated under the Contract. All materials and equipment shall be subject to inspections or tests by the Engineer at any time and in any state of completion both off-site and on-site as he deems necessary. **The Contractor shall furnish promptly, without additional charge, all facilities, labour and materials reasonably needed for performing such inspections and tests as may be required by the Engineer.**

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

Any Clauses in this Specification which relate to work or materials not required by the Bills of Quantities or subsequently by a Variation or Extra Works Order shall be deemed not to apply.

## 102. BRIEF DESCRIPTION OF THE WORKS

The Works comprising the Contract are summarized in Appendix A.

## 103. LOCATION OF THE WORKS

The location of the works in this Contract is summarized in Appendix B.

## 104. ACCESS TO SITES

The Contractor shall construct and maintain all temporary accesses required for the execution of the Works. Access roads shall be constructed and maintained up to the Site Offices if required. The cost of all these Works shall be deemed to be covered by rates and prices quoted by the Contractor.

## 105. RIGHTS OF WAY, WAYLEAVES AND COMPENSATION

The Employer will provide for the construction of the Works, land or rights-of way and wayleaves over such land as is within the Site. The Contractor shall give notice to the Engineer's Representative at least thirty days in advance of his intention to enter any part of the Site.

The Contractor shall, nevertheless, not enter any land nor commence any operations until such time as he receives written confirmation from the Engineer's Representative that all necessary compensation formalities have been completed and that permission has been obtained from

the Land owner and Tenant to enter the land forming the Site and to commence operations. Should the Contractor enter on to any part of the Site without first obtaining this confirmation, or should he enter onto any other land at any time, he shall be liable in whole or part, at the sole discretion of the Engineer, for all additional costs and for legal charges which might arise therefrom.

If the Contractor needs any extra land for the purpose of the execution of the Works, then all the cost involved in acquiring the land shall be borne by the Contractor and shall be deemed to be included in his rates.

## 106. SITE INFORMATION

Information available regarding the nature of the ground and subsoil at the Site, and the position of existing pipelines and services is to some extent not shown on the drawings. Supplementary information is held by the Engineer and may be viewed by appointment only. The accuracy and completeness of such information cannot be guaranteed, and, does not relieve the Contractor of his obligations under the Conditions of Contract.

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

To this effect the Contractor shall obtain drawings showing the latest information regarding location of existing services from each of the relevant authorities. These drawings must be presented to the Engineers Representative prior to the commencement of excavation.

In all cases where such works are exposed, they shall be properly shored or hung up. Special care shall be exercised in refilling to consolidate the ground under mains, cables, etc. and not to cover up exposed water meters and stop-cock boxes, etc. Poles supporting cables adjacent to the Works shall be kept securely in place until the work is complete, and shall then be made safe and as permanent as before.

The Contractor shall be responsible for arranging for the moving of services subject to agreement of the Engineer's Representative and, where necessitated by the Works, shall pay for the moving of and alteration to such services. Subject to the agreement of the Engineer, and upon production of receipts, the Contractor will be reimbursed in Interim Payment Certificates from the Provisional sum provided in Bill No. 1 the net cost of all permanent alterations/relocations, plus the percentage inserted by the Contractor in the Bills of Quantities for charges and profits in making the payment.

Notwithstanding the foregoing requirements, and without lessening the Contractor's responsibility, the Contractor shall inform the Engineer's Representative immediately if any existing works are exposed.

The Contractor shall liaise with the necessary authorities to whom the existing services belong and any work near or on the services shall be done to the complete satisfaction of the respective authority or its representative and the Engineer's Representative.

## 107. STANDARDS

The Contractor shall supply at his own expense, two copies of the latest edition of all standards referred to in the documents, except for alternative standards approved by the Engineer which will already have been submitted.

## 108. OFFICE FOR CONTRACTOR

The Contractor shall have an office on the Sites to be approved by the Engineer and which shall be open and attended to at all hours during which work is in progress.

Notwithstanding anything contained in the General Conditions of Contract, any notice to be given to or served upon the Contractor shall be deemed and taken to be efficiently given or served by the delivery thereof at such office on the site.

### 108.(a) Survey Equipment

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

| Equipment | Quantity |
|---|---|
| RTK Machine including the rover, tripods, brackets and carrying case | 1 Nr |
| Total Station including tripods, complete with reflectors, poles, brackets and carrying case (Wild or similar) | 1 Nr |
| Automatic Level (Wild or Similar) with legs and metric staff, complete with carrying case | 1 Nr |
| Metric extending levelling staffs with vertical bubble | 1 Nr |
| 30m (enamelled or otherwise protected) steel bands | 1 Nr |
| 3 metre ranging rods | 10 Nr |
| Survey umbrellas with stand | 2 Nr |
| Work boots | 4 sets |
| Rain Gear (trousers and jacket type, complete with rain hat) | 4 sets |
| Hard hats | 6 sets |
| 5 metre retractable pocket steel tapes | 4 Nr |
| 30 metre metal tapes | 2Nr |
| 100 metre metal tapes | 1Nr |
| Builders spirit levels 1000mm long | 2 Nr |
| Hammers 3 kg each | 2 Nr |

The Contractor shall also supply pegs, crayons, spray paint, nails and all other items required for setting out and measuring the work.

The Contractor shall be responsible for maintaining the survey and field equipment throughout the Contract Period, including replacement of items damaged during the normal course of the

Works.

The Contractor shall provide all such labour and assistance as may be required by the Engineer for checking the Contractor's setting out and/or survey work before approvals.

The Contractor shall make available such labour, materials, equipment and consumables as the Engineer may require from time to time, for inspections and tests in connection with the Works.

## 109. CONTRACTOR'S YARDS, STORES AND ACCOMMODATION FOR WORKMEN

The Contractor shall be responsible for obtaining the land and for the provision of all temporary yards, stores, workshops, offices, mess rooms, shelters and for all services in connection therewith. The location of all such facilities shall be agreed beforehand with the Engineer and shall be such as to avoid obstruction and nuisance to the public.

The Contractor shall establish secure storage compounds and storage building where he shall store at his own risk all equipment and Plant awaiting erection. The Contractor shall also provide secure covered storage for all samples submitted to the Engineer for approval. Storage building shall be weatherproof and shall be of sufficient size to accommodate all items requiring covered storage.

The Contractor shall provide and maintain suitable and sufficient shelters and mess rooms for his workmen and supervisory staff as are customary and necessary. The Contractor shall provide sufficient closets or latrines to the satisfaction of the relevant authority.

The Contractor shall be responsible for providing all buildings, fences, etc. that he may require and on completion of the works shall be required to remove the same and restore the land to its original condition to the satisfaction of the Engineer

The mess rooms, closets and latrines shall be located in positions to be approved by the Engineer. The Contractor shall be responsible for making all arrangements for the disposal of waste from mess rooms, closets and latrines.

## 110. CLIMATE CONDITIONS

The Bidder to verify on his own, the climate conditions in the Project Area with the Kenya Meteorological Department including rainfall, temperature, high winds etc. and make his Work Plan accordingly.

## 111. LEVEL DATUM

Before the commencement of Construction Work the Contractor shall establish, in a position to the approval of the Engineer, a bench mark comprising of steel datum pegs which shall be securely concreted in. The level of these pegs shall be established and agreed with the Engineer and all levels used in the construction of the Works shall be referred to these established datum points. The correctness of this datum shall be checked at regular intervals during the construction period as agreed with the Engineer.

Where possible construction drawings and all levels used for construction shall be referred to

the national height datum as defined by the Survey of Kenya. The Contractor shall be responsible for obtaining the location and values of the permanent bench marks. In cases where such bench marks do not exist, the site datum shall be agreed with the Engineer.

## 112. SETTING OUT OF THE WORKS

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

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

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

The Contractor shall prepare and submit to the Engineer, at an approved scale, Plans of the Water Pipeline Routes and profiles of ground levels after any initial clearing of the wayleave or easement showing the proposed pipe invert levels and precise chainages for all valves, fittings, manholes, etc. for approval. Following approval, the Contractor shall submit to the Engineer two copies of the agreed alignment and profiles.

The Contractor shall also be required to carry out Site/Engineering Survey of demarcated land where permanent structures/appurtenances will be constructed as directed by the Engineer after initial clearance of sites. The Contractor shall prepare an updated layout plan with contours at 1.0m interval. The contours shall be generated from a 10x10m grid topo survey.

## 113. SURVEY BEACONS

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

Should any beacon be damaged or destroyed, the Contractor shall forthwith report the damage to the Engineer and to the Director of Surveys and shall be held liable for the cost of reinstatement thereof.

## 114. CONTROL OF TRAFFIC

In the event of single way traffic becoming necessary on any particular section of the Works, or

on the approaches to the Works, the Contractor shall, in maintaining through traffic routes, provide a width of at least 3 metres for single way traffic. He shall also provide approved electrically operated signals for traffic control on each of the affected sections and any additional traffic signs as may be directed in accordance with Clause 116. Signal lights are to be operated by competent operators provided by the Contractor, if and when required by the Engineer. Manually operated "Stop-Go" signs will only be permitted if approved by the Engineer, and shall be of the size, colour and type authorized. The Contractor shall be responsible for liaison with Police.

## 115. TEMPORARY DIVERSION OF TRAFFIC

Temporary diversion ways, including those listed in any schedule to the Bill of Quantities shall be constructed whenever the site is intersected by existing public and private roads, footpaths, cycle tracks, farm accesses, temporary and accommodation roads.

Any diversion way shall be of such a standard of construction that it is suitable in all respects for the class or classes of traffic requiring to use it. It shall be constructed in advance of the taking up of the existing way and regularly maintained for so long as required in a satisfactory condition all to the approval of the Engineer.

## 116. TEMPORARY TRAFFIC SIGNS

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

## 117. PROTECTION OF WORKS

All materials shall be stored on site in a manner approved by the Engineer and the Contractor shall carefully protect from injury by weather all work and materials which may be affected thereby.

No separate payment will be made for this and the Contractor will allow in his rates for this.

## 118. DAMAGE TO LAND

The Employer shall provide the Site upon which the Permanent Works are to be constructed. Where a drain or pipeline is to be within an existing road or track reserve or is otherwise located in land designated Public Domain, the Site width will be restricted to the limit of the public land. The existing boundary fences and walls shall not be disturbed without prior approval of the Engineer and, unless road diversions and closure notices are approved and posted, carriageways shall be left available for the safe passage of traffic.

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

The Contractor shall not enter upon or occupy with men, tools, equipment or materials any land other than the site without the written consent of the owner of such land.

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

## 119. RIVERS AND DRAINS

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

## 120. REINSTATEMENT OF ROADS AND FOOTWAYS FOR WATER MAINS AND SEWER CROSSINGS

The Contractor shall allow in his rates for liaison with the relevant Roads Authority and obtain a Road Opening Permit. Statutory fee for road crossings will be paid under relevant Item in the Bills of Quantity.

The road crossings shall be constructed in the following specifications and any other requirement stipulated by the Road Authority:

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

The Contractor shall be responsible for all liaison with the Police for traffic control during execution of the works.

The contractor shall keep a record of before and after works of the crossings.

## 121. TEMPORARY WORKS

The Contractor shall provide, maintain and remove on completion of the Works all temporary Works including roadways, sleeper tracks and stagings etc., over roads, footpaths, suitable in every respect to carry all plant required for the work or for providing access or for any other purpose.

Details of Temporary Works shall be submitted in advance to the Engineer for his approval and the approval shall not relieve the Contractor of complete responsibility for their safety and satisfactory operation.

## 122. LIGHTING AND GUARDING OF OBSTRUCTIONS

The details of the method of signing and guarding an obstruction to traffic caused in the course of the execution of the Works shall be submitted to the Engineer for approval before that portion of the Works is commenced.

No greater area of the road than the Engineer considers necessary shall be closed at any one time.

Temporary traffic signs shall comply with Clause 108. Generally, the following precautions will be required: -

**Signing**

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

**Guarding**

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

**Footpaths**

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

## 123. EXISTING SERVICES

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

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

Except that such services as require to be removed or altered by virtue of the layout of the permanent work and not the manner in which the work is carried out, shall be so removed or altered at the direction and at the expense of the Employer.

Notwithstanding the foregoing requirements and without lessening the Contractor's responsibility, the Contractor shall inform the Engineer immediately any existing works have

been exposed and shall comply with any requirements of the authority concerned.

The Contractor shall be liable for the cost of repairs to any services damaged as a result of carrying out the Works and execution of these Works.

## 124. CONNECTIONS TO EXISTING PIPES AND EQUIPMENT

The Contractor shall be responsible for joining up and making connections between water pipes, sewer pipes, etc. equipment installed by him and existing facilities. The Contractor shall submit to the Engineer a drawing showing the details of the connection, and shall state the date on which the particular connection is required, and the work shall not proceed until the Engineer's approval has been given.

The Contractor shall be responsible for ensuring the compatibility of new pipes with existing pipework, cables, tubing, equipment, etc.

## 125. PRIVATELY OWNED OR PUBLIC SERVICES

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

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

## 126. WATER SUPPLY

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

## 127. ADDITIONAL LAND

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

## 128. USE OF HEAVY PLANT

In the event of the Contractor desiring to use heavy machinery or plant, he shall first satisfy the Engineer that they will be of such size and used in such a manner as not to cause any disturbance or damage in particular to water, electricity, Post Office or other mains, cables and connections or to sewers, culverts etc. or interfere with the line or position of any overhead wires and cables of any sort, telegraph poles, power poles etc.

The Contractor will be held liable for any such damage or disturbance and shall pay the full costs of any reinstatement, relaying, repairing or refixing as may be required, as agreed between the Engineer and the owner affected.

## 129. PROVISION OF INSTRUMENTS AND LABOUR

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

## 130. POLLUTION

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

The Contractor shall take all reasonable steps to protect the environment on and off the site and to avoid damage or nuisance to persons or to property of the republic or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation

## 131. TREE PROTECTION

Trees within the permanent and temporary easement are the property of owners. Specific trees will be identified by the Engineer, prior to construction, and the Contractor shall neither remove nor cut their roots unless otherwise directed by the Engineer. If the roots of such trees appear within the trench areas, the Contractor shall handle the roots with maximum care so that no portion of the roots will be damaged. During the excavation of the trench, the exposed roots may be removed to a position that will not damage the roots and will not interfere with the pipelaying. During the construction, the roots shall be thoroughly protected by appropriate cover and wetted as directed. After the pipes are laid, the moved roots shall be placed back to the original locations and backfilled carefully by selected soft soil which can support vegetation.

## 132. GEOLOGICAL DATA

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

## 133. WATCHING, FENCING AND LIGHTING

The Contractor shall arrange to employ watchmen to guard the Works both during the day and night from the commencement of the Works until the substantial completion of the Works.

Any excavation or other obstruction likely to cause injury or damage to any person or domestic animals must be fenced off as directed by the Engineer.

## 134. SANITATION

The site shall be kept in a clean and proper sanitary condition. No nuisance shall be committed on or around the work, and latrines for the workmen and staff shall be provided in accordance with the requirements of the Medical Officer or Sanitary Authorities. The Contractor shall be

responsible for the sanitary discipline of his labour.

## 135. MEDICAL FACILITIES

The Contractor's attention is drawn to Legal Notice No. 79 of 22nd September, 1978 by which it is mandatory that every Contractor employing more than twenty people should appoint (in writing) a safety supervisor. A safety supervisor advice the management on all matters regarding safety, hygiene and welfare of the people affected by the Contractor's undertaking on the site. The safety officer may in addition carry out other duties.

The Contractor shall provide adequate first aid equipment on the site, and ensure that at least two of his site staff is competently trained in first aid

## 136. SIGNBOARDS

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

As directed by the Engineer the signboard shall give a brief description of the Works and bear the names of the Employer, the Financier, the Project, the Consultant and the Contractor. The expenses for the signboard shall be priced separately in the Bill of Quantities.

On completion of the works the Contractor shall remove the signboard when instructed to do so by the Engineer's Representative.

No advertisements shall be placed on any boarding, fencing or scaffolding erected for any purpose connected with the contract without the written permission of the Engineer.

## 137. TIPS

The Contractor shall be responsible for provision of all tips, at his own expense, for disposal of all spoil or other rubbish collected during the construction of the Works. Any surplus excavated material not required shall also be carted away to these tips. The Contractor to liaise with the local Authorities for approval of location of tips.

## 138. TROPICALISATION

In choosing materials and their finishes, due regard shall be given to the tropical conditions of the site to which they will be subjected. The Contractor shall submit details of his practices which have proven satisfactory and which he recommends for application on the parts of the Works which may be affected by the tropical conditions.

## 139. INSPECTION OF WORKS

The Contractor must give due notice in writing to the Engineer when any part of the works are ready for inspection.

## 140. MONTHLY SITE MEETINGS

Throughout the project period, site meetings will be held at the Resident Engineer’s Office once every calendar month to discuss the progress of the work, schedule for the ensuing month, methods of construction, procurement, transportation, labours, etc. These meetings can be

called at any other time intervals at the request of the Contractor or as directed by the Engineer. The meetings will be attended by Representatives of the Client, Supervision Team and the Contractor. Costs of holding the meetings shall be deemed to be covered under the Contractor's rates.

The Contractor shall at all meetings be represented by a responsible representative other than the Site Agent, who has the powers to commit the Contractor in all matters concerning the Contract.

In the event, no responsible representative of the Contractor is present at the meetings; any decision taken by the Engineer at the meeting will be binding upon the Contractor.

## 141. INSPECTION BY ENGINEER DURING DEFECTS LIABILITY PERIOD

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

## 142. SUBMISSION OF SAMPLES

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

Before incorporating in the finished work any materials or articles which he supplies under the terms of the Contract, the Contractor shall submit to the Resident Engineer for approval a sample of each respective material or article, and such samples shall be delivered to and kept at his office for reference. All the respective kinds of materials and articles used in and upon the Works shall be at least equal in quality to the approved samples. Each and every sample shall be a fair average of the bulk material or of the article which it represents. The Resident Engineer may decide the method by which each sample to be taken from the bulk material shall be obtained. Any costs related to adhere to above will be deemed to be covered in Bidder's Rates.

## 143. RESPONSIBILITY FOR ORDERING MATERIALS AND MANUFACTURED ARTICLES AND SAMPLES FOR TESTING

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

With regard to any item in the Bill of Quantities which is the subject of a P.C. Sum, the Contractor shall notify the Engineer of his requirements as early as possible leaving ample time for the Engineer to make any necessary arrangements so that no delay occurs in the progress of the work.

## 144. TESTS OF MATERIALS AND MANUFACTURED ARTICLES BEFORE USE

Any or all of the materials and manufactured articles supplied by the Contractor for use on any of the Works throughout this Contract shall be subject in advance to tests as may be specified in the relevant Standard Specification as may from time to time be deemed necessary by the Engineer. Samples of all such materials and manufactured articles, together with all the necessary labour, materials, plant and apparatus for sampling and for carrying out of tests on the site on all such materials and manufactured articles shall be supplied by the Contractor at his own expenses. The cost of special tests ordered by the Engineer to be carried out by an independent person at a place other than the site or place of manufacture or fabrication shall be borne by the Contractor.

## 145. REJECTED MATERIALS

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

## 146. QUALITY OF MATERIALS AND WORKMANSHIP

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

## 147. TEST RUNNING OF THE SCHEME

Upon substantial completion of the scheme and official inspection which agrees to this, the Contractor shall operate the entire scheme for the test period indicated in the Bill of Quantities.

The Contractor shall supply all necessary personnel, electricity, fuels, oils and chemicals for the test running and together with the Engineer's Representative shall compile a list of detailed operating instructions that shall be incorporated into the Operation and Maintenance Manual. The Contractor shall further bring to the attention of the Engineer's Representative and of the Employer's operational staff any problem or defects he encounters during this period of test running so that solutions may be found and any necessary alterations made.

The Contractor shall make provision for the on-site training of up to 5 of the Employer's staff during the Construction Period and the Test Running Period.

## 148. OPERATION AND MAINTENANCE MANUALS

Draft Operation and Maintenance Manuals will be compiled prior to substantial completion and Handing Over of the Works.

The Manuals have to be revised and brought to a final draft state prior to the test running of the

Schemes. The Contractor's rates should include for provision in triplicate, and in English, details of all the different manufactured plant and components incorporated in the Works including but not limited to all pertinent Manufacturers' Brochures, 'As-Built' Drawings prepared by the Contractor, Digital Progress Report Photographs, etc.

Substantial completion of the Schemes will not be considered until such detailed information as is required in triplicate has been submitted by the Contractor to and accepted by the Engineer.

## 149. CONSTRUCTION PROGRAMME

The Contractor shall submit to the Engineer for approval, a revision of the Construction Programme attached in four (4) copies and after approval to the Employer in two (2) copies in the following manner:

(1) Within twenty eight (28) days after receiving the Letter of Acceptance, the Contractor shall submit to the Engineer for approval, a detailed Programme based on the key date stated hereinafter or other dates which are given in the Letter of Acceptance in the form of a Critical Path Method (hereinafter referred to as CPM Network) showing the order of procedure in which he proposes to carry out the Works including design, manufacture, delivery to the site, transport, storage, survey and setting out, construction, commissioning and maintenance. This Programme shall indicate clearly all activities and its duration along with the earliest and the latest event, times and the first and last dates of the submission of the Drawings and each date of shop inspection by the Engineer for the section or portion of the Works.

The Programme so prepared shall be rearranged in the form of a Time Bar-chart Schedule of which size shall be 841mm x 594mm (A-1 size). This Time Bar-chart Schedule shall be submitted to the Engineer together with the CPM Network. The Programme shall clearly indicate the execution schedules specific the sewerage network and associated infrastructure

**Generic work programmes shall not be acceptable.**

(2) The CPM Network shall be in accordance with commonly accepted practices and shall show graphically the chain of activities / sub-activities and their sequential relationship with each other from the start of construction to the completion of the Contract. The Time Bar-chart Schedule shown in weeks shall list all main activities and its applicable sub-activities.

(3) In preparing the CPM Network and the Time Bar-chart Schedule the Contractor shall make due allowances for possible delays. Under no circumstances shall the CPM Network or the Time Bar-chart Schedule show a completion in excess of the "Time for Completion" stated in the Form of Bid.

(4) The Programme once approved by the Engineer shall thereafter be referred to as the Contractual Programme. The Engineer's approval of such programme shall not relieve the Contractor of any of his duties or responsibilities under the Contract.

The Contractual Programme approved shall supersede all other Programmes and shall be

deemed to be the Programme on which the Contractor has based his Contract Sum and in accordance with which he will undertake the execution of the Works. This Programme shall become part of the Contract.

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

The Contractor shall ensure that all the Works especially Electrical and Mechanical Works which may be carried out by the Electrical/Mechanical Sub-Contractor, are well coordinated with the overall Works under the Contract for the efficient execution of the Works, and shall clearly indicate them on the construction Programme.

The Contractor shall also describe the conditions of working shifts, if necessary, to execute the Works and whether work needs to be carried out at night and/or on Sundays and holidays. The Contractor should also indicate which particular Works are subject to these timings in his construction Programme.

Whenever the Contractor proposes to change the Contractual Programme, approval of the revision shall be obtained in writing from the Engineer.

If the Contractor has fallen behind the approved Contractual Programme or can foresee delay(s) therein, he shall, immediately after such default or event occurred or foreseen or at the request of the Engineer submit a revision of the Contractual Programme showing the reasons of such a delay and the proposed measures to recover such delay or to complete the Works on time, for the approval of the Engineer.

## 150. CONTRACTOR'S SUPERINTENDENCE AND WORKMEN

The Contractor shall give or provide all necessary superintendence during the execution of the works and as long thereafter as the Engineer may consider necessary for proper fulfilling of the Contractor's obligations under the Contract.

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

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

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

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

## 151. QUALITY CONTROL

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

## 152. WORKING HOURS

The Contractor shall submit in writing to the Engineer, at the time of submitting the work programme, which hours shall be considered normal working hours and which day of the week is to be set aside for rest, and these, when approved, shall be maintained throughout the continuance of the Contract. The Contractor shall respect all public holidays and cultural festivals. Where the Contractor wishes to work outside these hours, he shall request the Engineer in writing at least 24 hours in advance for consideration and to enable the Engineer to make provisions for proper inspection of such work.

## 153. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

Within 42 days of Commencement, the Contractor shall submit a Project Specific Environmental and Social Management Plan (ESMP) for approval of the Engineer. The ESMP will be in complieance with requirements in Chapter 14 of this specification.

The Contractor must carry out all works in accordance with Kenyan Environmental Laws and Regulations, and the requirements of this document.

It is also a contractual obligation for the Contractor to take full cognizance of the environmental and social concerns and requirements as stipulated in the Employer's Environmental and Social Management Plan (ESMP) prepared for this Project. The full Environmental and Social Impact Assessment (ESIA) Report will also be issued to the Contractor on Award.

Accordingly, the Contractor shall be required to prepare a site-specific Environmental and Social Management Plan (ESMP) for the project. This site-specific ESMP shall be based on the Contractor's evaluation of the requirements of these Specifications and the Employer's ESMP. The site-specific ESMP shall be submitted to the Engineer for approval within 42 days of Commencement.

The site-specific ESMP is the Contractor’s operative document on how to enforce, mitigate, inspect and monitor potential Project impacts during mobilization, construction and demobilization. In this sense, it is an eminently practical and concrete instrument.

Based on the above, the structure and content of the site-specific ESMP shall emphasize the following aspects:

i) Executive Summary

ii) Introduction

iii) Project Description

- Focus on impact-generating activities (e.g. demand of water and permanent materials, earth movement, etc.);
- Environmental liabilities: identify and include a photographic registry of pre- existing environmental liabilities (e.g. gully erosion areas, abandoned borrow pits, unauthorized dumping sites, etc.) that are not attribute to the implementation of the Project.

iv) Potential Impacts during Mobilisation, Construction and Demobilisation

- Apply simple rating of significance;
- Quantity/quality impacts (e.g. surface and type of vegetation to be removed, amount and type of wastes to be generated, noise levels, etc.);
- Identify places where specific impacts will manifest

v) Mitigation Plan

- Specify the detailed measures to mitigate the identified impacts (also by location)
- Include designs for measures requiring structural solutions (e.g. gabions, etc.);
- Include the schedule of implementation of mitigation measures in relation to the general construction schedule;
- Health and Safety Plan (detailed);
- Waste Management Plan (detailed);
- Traffic Management Plan (detailed);
- Training Program (detailed);
- Accident and Emergency Response Plan (detailed);
- HIV/AIDS Awareness and Prevention Program (include only a reference to this program to be prepared by an NGO);
- Community Relations Program;
- Location and technical specifications for installation and operation of campsites, including workshops, garages, laboratories, offices, communal kitchenette / dining facilities, sanitary installations, etc.;
- Location, and technical specifications for operation of quarries and borrow pits, and procedures for negotiation with and compensation of land owners where they are located;
- Location and technical specifications for installation and operation of concrete batching, stone crushing, cement mixing and asphalt plants;
- Location and technical specifications for installation and operation of

temporary and permanent dump sites.

vi) Inspection Plan

- Inspection function: specify frequency, locations and instruments (e.g. checklists, site reports, photo registry, etc.) to conduct site inspections;
- Permitting: required environmental permits and schedule to obtain them;
- Specific actions and responsibilities: what, who, where, when, how and why

vii) Monitoring Plan

- Specify, for each variable: frequency of measurement, locations, methods/equipment, units/measures, quality standards, and reporting requirements and periodicity, including establishment of trends.
- Specific actions and responsibilities: what, who, where, when, how and why.

viii) Organisation and Management

- Specify organizational structure, personnel, resource and equipment requirements, reporting requirements and periodicity, and inter-institutional communication and coordination mechanisms.
- Specific actions and responsibilities: what, who, where, when, how and why

ix) Annexes

- If the Contractor wishes to incorporate information beyond the indicated above, such as the policy, institutional and regulatory framework for environmental management in Kenya, biophysical and socio-economic characteristics of the area of influence of the Project, etc., that information should be included as an annex and not in the body of the site-specific ESMP. Preferably, such information should not be attached and, further, if necessary, the pertinent chapter of the ESIA should be referenced.
- Annexes should be used, if necessary, to include detailed information on the specific topics of the ESMP (e.g. inspection forms or checklists, design of structural mitigation measures, photographic registry of environmental liabilities, etc.).

## 154. HEALTH AND SAFETY MANAGEMENT PLAN

Within 42 days of Commencement, the Contractor shall submit a project specific Health and Safety Management Plan (HSMP) for approval of the Engineer. The HSMP will be in complieance with requirements in Chapter 14 of this specification.

The Contractor must at all times comply with the National and County Laws and Regulations during the Construction and Commissioning Phases of the Project.

**Site-Specific Health and Safety Management Plan**

The Contractor shall appoint a full time qualified Health and Safety Manager who shall have responsibility for all safety issues on the Project. The Contractor must submit a site- specific Health and Safety Management Plan (HSMP), which shall, as a minimum, address the following:

1) Introduction (including objectives of the HSMP)
2) Hazard Prevention and Control
    i. Risk assessment (including description of risk assessment method used);
    ii. Prevention, protection and control measures (based on risk assessment performed):
        a) Personal protective equipment and clothing: safety goggles, ear plugs, work boots, dusk masks, protective clothing etc.;
        b) H&S and sanitary facilities, equipment, materials and personnel: first- aid kits and stations, health personnel, safe drinking water, sanitary facilities, accommodation, washing facilities, domestic waste disposal, etc.;
        c) On-site safety measures and procedures to protect workers against accidents and health risks in the performance of construction-related activities:
            - Site security: access, safety of visitors, separation of work and rest areas, signage, etc.
            - Handling of raw materials: earthwork, gravel, crushed rock, sand, etc.
            - Handling of other materials causing dust development, such as cement;
            - Handling of hydrated lime and other activators and additives;
            - Handling of asphalt;
            - Hazardous materials management
            - Handling of inflammable materials;
            - Maintenance of vehicles and machinery;
            - Deep Excavation and trenching;
            - Emergency prevention, preparedness and response.
    i) Contractor's participation in Health and Safety Training Program
    ii) Contractor's participation in HIV/AIDS Awareness and Prevention Program
    iii) Provide specifics of training and instruction: topics, frequency, modalities,

target audiences, instructors, training materials, etc.

iv) Potential Topics:

- Occupational safety risks and prevention
- Health risks and prevention
- Use of personal protective equipment
- Safe work procedures: general and specific.
- Organization and Management

v) Organizational structure, personnel, equipment, communication and reporting requirements, accident and incident reports, and procedures and tools to verify and ensure compliance with occupational health and safety requirements.

vi) Annexes should be used, if necessary, to include detailed information on the specific topics of the HSMP, such as (illustrative list):

- Accident Report forms.
- Dangerous Occurrence forms (near misses).
- Safety Audit Forms.
- Safety Check List.
- Safety Rules.
- List of hospitals, emergency evacuation strategy and other arrangements to treat seriously injured staff.
- List of personnel trained in first aid and their places of deployment.
- List of first aid kits and locations where these will be held.

The Compliance of this Clause by the Contractor is deemed to be covered in his rates quoted in the Bid.

## 155. PROGRESS REPORTS

The Contractor shall submit a monthly progress report to the Engineer. The formal, content and level of detail shall be determined and agreed by the Engineer.

The Reports submitted by the Contractor shall include a section on Environment and Social Performance Reporting, under which the Contactor shall report on the aspects included in the ESMP and HSMP (Ref. Clauses 141 and 142).

If the Engineer considers it necessary, the frequency of reporting may be increased. Alternatively, the Contractor may be instructed to provide a special progress report for a particular section of works (that is significantly delayed for example), on a more frequent basis (e.g. weekly, or even daily). The Contractor's rates in his Bid are deemed to cover these costs.

## 156. DAILY LOGS

The Contractor shall maintain a daily site log. The log book entries shall be prepared in triplicate, with one copy being delivered/ submitted each day to the Engineer for comments and signing.

The content and format of the Daily Log shall be agreed with the Engineer upon commencement of the contract. However, typically the log shall include the date, weather conditions, numbers/movement of plant and labour, location/ main areas of work and daily activity/progress, deliveries of plant and materials to site, tests, issues, shut-downs, key instructions, visitors, and accidents, among others.

In addition, the log sheet shall have a space designated for comments by the Engineer.

The Engineer may, at his discretion, instruct the Contractor to provide daily labour and plant returns. Alternatively, the Engineer may request to review such information.

In addition, the Contractor shall provide the Engineer with copies of all delivery notes of plant and materials delivered to site. The Contractor's rates in his Bid are deemed to cover these costs.

## 157. TEST FORMS

The Contractor shall prepare, to the satisfaction of the Engineer, test forms to be used for the various components of the works.

All test forms shall be completed, signed and dated by the appropriate persons conducting the tests. The original copy of all test forms shall be submitted to the Engineer. The Contractor's rates in his Bid are deemed to cover these costs.

Test forms shall be submitted to the Engineer regardless of whether the test passes or fails.

## 158. TRAINING OF OPERATOR

The Contractor shall make provision and arrange for the on-site training of the Operator's technical team and training during commissioning especially on the operation and maintenance of the system.

## 159. AS-BUILT AND RECORD DRAWINGS

The Contractor shall prepare, and keep up-to-date, a complete set of "as-built" records of the execution of the works, showing the exact "as-built" locations, sizes and details of the work as executed, with cross references to relevant specifications and data sheets. These records shall be kept on the Site and shall be used exclusively for the purposes of this specification. Two copies shall be submitted to the Resident Engineer prior to the commencement of the Tests on Completion of Works.

In addition, the Contractor shall prepare and submit to the Resident Engineer "as- built-drawings" of the works, showing all works as executed. The drawings shall be prepared as the works proceed, and shall be submitted to the Resident Engineer for his inspection. The Contractor shall obtain the consent of the Resident Engineer as to their size, the referring system, and other pertinent details.

Prior to substantial completion and Handing Over of the Works, the Contractor shall deliver to

the Engineer one complete set of record ("as-built") drawings of all works constructed under the Contract, including all underground works such as pipes, services, cables and conduits.

The Engineer shall review and comment on the draft Record Drawings, and within a further two (2) weeks of receiving the comments, the Contractor shall produce a final set of drawings.

If, during the Defects Liability Period, the Contractor modifies any of the Works, the modifications shall be included as amendments to the As-Built Drawings and all other affected documentation.

Prior to the issue of any Taking-Over Certificate, the contractor shall submit to the Resident Engineer one full-size original copy, six printed copies of the relevant "as-built-drawings" and the corresponding computer files (AutoCAD, Excel, MS Word, etc.) on CD-ROM and any further Construction Documents specified in the Specifications. The works shall not be considered to be completed for the purposes of Taking-Over until such documents have been submitted to the Resident Engineer.

**The compliance of this Clause by the Contractor is deemed to be covered in his rates as quoted in the Bid.**

# 2. CLEARING SITE

## 201. CLEARING SITE

Before commencing any site clearance, general clearance, clearance of pipelines etc. the Contractor shall inform the Engineer or his authorised representative of his intention. The Engineer or his representative will be visiting the section of works concerned, determine the extent of the clearance expressly required.

The Contractor shall demolish, break up and remove buildings, walls, gates, fences, advertisements and other structures and obstructions, grub up and remove trees, hedges, bushes and shrubs and clear the site of the works at such time and to the extent required by the Engineer but not otherwise, subject to the provisions of Clause 4.24 of the Conditions of Contract: the materials so obtained shall so far as suitable be reserved and stacked for further use; all rubbish and materials for use shall be destroyed or removed from the site, as directed by the Engineer.

Where top soil has to be excavated this shall be removed and stacked on site. After completion of construction, it shall be spread over the disturbed ground, any surplus being disposed of as directed by the Engineer.

Underground structures and chambers where required to be demolished, shall be demolished to depths shown on drawings or as directed. They shall be properly cleaned out and backfilled and compacted with suitable material to the direction and approval of the Engineer.

## 202. VEGETATION

No allowance will be made for the cutting and removal of crops, grass, weeds and similar vegetation. The cost of all such work will be held to be included in the rates entered in the Bill of Quantities.

## 203. BUSHES AND SMALL TREES

All bushes and small trees, the main stem of which is less than 500mm girth at 1 metre above ground level shall be uprooted (unless otherwise directed by the Engineer) and burnt or otherwise disposed off as directed by the Engineer.

## 204. HEDGES

Where directed by the Engineer, hedges shall be uprooted and disposed off by burning.

## 205. FELLING TREES

Where shown on the drawings or directed by the Engineer, trees shall be uprooted or cut down as near to ground level as is possible. The rates entered in the Bill of Quantities shall include for cutting down, removing branches and foliage, cutting useful timber into suitable lengths, loading, transporting not more than 1 km. and stacking or disposing off all as directed by the Engineer.

For the purpose of measurement trees cut down shall be classified according to their girth at 1 metre above ground level, the cost of grubbing up roots shall be deemed to be covered by the

rate for felling trees.

## 206. GRUBBING-UP ROOTS

Stumps and tree roots shall, unless otherwise directed, be grubbed up, blasted, burnt or removed and disposed of in approved dumps to be provided by the Contractor. Where directed by the Engineer, the holes resulting from grubbing up shall be filled with approved materials, which shall be deposited and compacted in layers not exceeding 225mm loose depth, to the same dry density as that of the adjoining soil. For the purpose of measurement, tree roots shall be classified according to the mean diameter of the stump measured across the cut.

## 207. WEED CONTROL

The Contractor shall take all necessary precautions against the growth on the site of weeds and remove them as necessary throughout the period of works and maintenance.

The finished base of all footways and elsewhere as directed shall be sprayed with an approved persistent total herbicide at the rate recommended by the manufacturer. The application shall be by an even spray in a high volume of water at about 0.7 to 0.11 litres per square metre. After this application the footways shall receive at least two further waterings before the surface is sealed.

# 3. EXCAVATION, BACKFILLING AND RESTORATION

## 301. DEFINITION AND CLASSIFICATION OF EXCAVATED MATERIALS

Excavation in the Bills of Quantities shall be classified in two categories: -

1) Common Excavation

Any material which in the opinion of the Engineer can be excavated by use of pick axes and hand levers shall be classified as common excavation. Water logged material shall be included in this class. Murram in any form shall be classified as common excavation.

2) Rock

The decision of the Engineer in classifying rock shall be final and binding. Rock in the Bill of Quantities will be itemized in three classes: -

Class 'A'

Soft rock of the type known locally as 'tuff' which in the opinion of the Engineer cannot be considered as hard rock but which considerably increases the amount of labour needed for its removal shall be known as Class 'A' rock.

Class 'B'

Very weathered phonolite lava containing many fissures and faults shall be known as hard rock. This type of rock contains stones and boulders of unweathered or incompletely formed blacktrap or lava. A boulder or outcrop of hard rock 1.5 cubic metres or less and grey or green building stone in a formation which is massive and geologically homogeneous, will be deemed to be Class 'B' rock.

Class 'C'

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

(i) in good order complete with all equipment and accessories as supplied;
(ii) rated 300 BHP flywheel power or over;
(iii) with an operating weight of not less than 37.2 tonnes;
(iv) equipped with a hydraulically operated single tine ripper compatible with the tractor used; and
(v) Operated by a qualified operator in accordance with the manufacturer's recommendations and to the satisfaction of the Engineer

The Class 'C' rock type is basically of the form of black trap.

All loose, shattered or fractured rock shall be removed from excavations in rock material. Where excavations in rock material are carried out by blasting, the manner and extent of the blasting shall be such as will prevent damage to the surrounding strata or ground or to the Works.

No excavations in rock shall be carried out by blasting where damage to surrounding strata or ground or properties or to the works would result thereby. The rates for excavation in rock shall

be held to include for excavation by a means, as the circumstances require.

## 302. STORAGE AND HANDLING OF EXPLOSIVES AND BLASTING

The removal of hard materials by use of explosives will normally be permitted subject to compliance by the Contractor in all respects with the Explosives Laws of Kenya.

The Contractor shall provide proper buildings or magazines in suitable positions for the storage of explosives in manner and quantities to be approved; he shall also be responsible for the prevention of any unauthorised issue or improper use of any explosives brought on the works and shall employ only licensed and responsible men to handle explosives for the purpose of the works.

The shots shall be properly loaded and tamped and where necessary, the Contractor shall use heavy mesh blasting nets. Blasting shall be restricted to such periods and such parts of the works as the Engineer may prescribe.

Blasting shall in no way weaken existing structures or foundations or ground adjacent to existing and proposed works. Blasting operations shall be carried out with as little interference as possible to traffic or persons and the Contractor shall take all necessary precautions to prevent loss, injury or accident to persons and property. The Contractor shall be entirely liable for any accident or damage that may result from the use of explosives.

If, in the opinion of the Engineer, blasting would be dangerous to persons or property or to any finished work or is being carried out in a reckless manner, he may prohibit it, and order the rock to be excavated by other means and payment will be made at the rate for rock for excavation where blasting is permitted. The use of explosives by the Contractor in large blasts, as in seams, drifts, pits, or large holes, is prohibited unless authorized in writing by the Engineer. In the event of wasting of rock through any such blasting, the Contractor shall if required by the Engineer, furnish an equivalent amount of approved materials for fill, 1 cubic metre of rock in-situ being taken to equal 1.5 cubic metre of material in embankment.

## 303. EXCAVATION FOR FILL

Where excavation reveals a combination of suitable and unsuitable materials, the Contractor shall, wherever the Engineer considers it practicable, carry out the excavation in such a manner that the suitable materials are placed separately for use in the works without contamination by the unsuitable materials.

If any suitable material excavated from within the site is, with the agreement of the Engineer, taken by the Contractor for his use, sufficient suitable filling material to occupy after specified compaction, a volume corresponding to that which the excavated material occupied, shall, unless otherwise directed by the Engineer be provided by the Contractor from his own sources.

No excavated material shall be dumped or run to spoil except on the direction or with the permission of the Engineer who may require material which is unsuitable to be retained on site. Material used for haul roads shall not be re-used without the permission of the Engineer.

## 304. COMPACTION OF FILL

All materials used in fill shall be compacted to specification by plant approved by the Engineer for that purpose. Maximum compacted thickness of such layers shall not be more than 200mm.

Work on the compaction of plastic materials for fill shall proceed as soon as practicable after excavation and shall be carried out only when the moisture content is not greater than 2 per cent above the plastic limit for that material. Where the moisture content of plastic material as excavated is higher than this value the material shall be run to spoil and an equal volume of material suitable for filling shall be replaced, unless the Contractor prefers, at his own expense, to wait until the material has dried sufficiently for acceptance again as suitable material.

Nevertheless, if with any material the Engineer doubts whether compaction will be obtained within the above moisture limits he may require compaction to proceed only when the limits of moisture content for the compaction of non-plastic materials are within the range of the optimum moisture content and 3 per cent below the optimum moisture content as determined by the laboratory compaction test method described in British Standard 1377: Methods of Test for Soil Classification and Compaction.

If any such non-plastic material on excavation is too wet for satisfactory compaction and the Engineer orders the moisture content to be lowered or raised, such work shall be treated as included in the rates. All adjustments of moisture content shall be carried out in such a way that the specified moisture content remains uniform throughout compaction.

Work shall be continued until a state of compaction is reached throughout the fill, which shall have relative compaction determined according to B.S. 1377 not less than 95% of maximum dry density at optimum moisture contents. For excavation under Roads, House Drives and Car Parks the backfilling shall be compacted in 150mm layers to 100% maximum dry density.

If with non-plastic materials the compacted material has become drier in the interval between the completion of compaction and the measurement of the state of compaction, then the moisture content to be used for the calculation of the air content shall be the mean moisture content for the compaction of such materials as specified above.

## 305. STONE REVETMENTS (STONE PITCHING)

Where shown on the drawings, the slopes of embankments, rivers, streams, watercourses and other surfaces shall be protected against water or other action by hand-set stone facing set on end. The larger stones shall be roughly dressed on the bed and face, and roughly square to the full depth of the joints. No rounded boulder shall be used, or stones less than 225mm in depth of 0.05 cubic metre in volume. The stones shall be laid to break bond, and shall be well bedded on to a 75mm layer of gravel or fine rubble rammed to a uniform surface and the whole work finished to the satisfaction of the Engineer. Where required, a trench shall be excavated at the bottom of the slope to such a depth as will ensure a safe foundation for the revetment.

## 306. TIPPED REFUSE ON SITE

Tipped refuse other than artificial deposits of industrial waste or shale found on the site shall be removed and disposed off in a spoil heap to be provided by the Contractor.

## 307. REMOVAL OF INDUSTRIAL WASTE, ETC.

Artificial deposits of industrial waste or shale found on the site shall be removed and disposed off as directed by the Engineer. Should any particular deposits consist of or contain material which in the opinion of the Engineer is suitable for incorporation in fills, all such material shall be used accordingly and deposited in layers and compacted as specified. The prices entered in the Bill of Quantities for the excavation of the material shall include loading, transportation, disposal and compaction of same as and where directed.

## 308. LAND SLIPS

Remedial works and/or the removal of materials in slips, slides or subsidences and overbreaks of rock extending beyond the lines and slopes, or below the levels shown on the drawings or required by the Engineer, will not be paid for.

## 309. CLASSIFICATION OF MATERIAL FROM SLIPS

The classification of material from slips or slides will be in accordance with its condition at the time of removal, regardless of prior condition. Measurement of overbreak in rock excavation shall be that of the space originally occupied by the material before the slide occurred and regardless of its subsequent classification.

## 310. BORROW PITS

Where for any reason, it becomes necessary to form borrow pits, these shall be located and the work executed in all respects to the instructions of the Engineer. They shall be regular in width and shape and admit of ready and accurate measurement, and shall be properly graded and drained and finished with neatly trimmed slopes.

## 311. RESTORATION OF BORROW AREAS, SPOIL TIPS AND QUARRIES

Any spoil tips, quarries or other borrow area developed by the Contractor for the purpose of the Works shall be finished to safe and fair slopes to the approval of the Engineer.

## 312. STREAMS, WATERCOURSES AND DITCHES

Excavations carried out in the permanent diversion, enlargement, deepening, or straightening of streams, watercourses, or ditches shall be performed as directed by the Engineer. The rates for such excavations shall include for excavated materials and all pumping, timbering works, and materials necessary for dealing with the flow of water.

## 313. FILLING OLD WATERCOURSES

Where watercourses have to be diverted from the sites of embankments or other works, the original channels shall be cleared of all vegetable growths and soft deposits and carefully filled in with approved materials deposited and compacted as directed by the Engineer.

## 314. OPEN DITCHES

Open ditches for drainage purposes shall be cut where and of such cross section as the Engineer shall direct and where so required by him they shall be constructed before the cuttings are opened or the embankments begin. The sides shall be dressed fair throughout and the bottom

accurately graded so as to carry off the water to the outlet to be provided. The material excavated from the ditches shall be disposed of as directed by the Engineer.

## 315. CLEARING EXISTING DITCHES

Where directed by the Engineer, existing ditches shall be cleared by removing vegetable growths and deposits. The sides shall be shaped fair throughout and the bottoms properly graded. Material removed from existing ditches shall be disposed of in tips provided by the Contractor. The rates included in the Bill of Quantities for clearing ditches shall include for maintaining and keeping clean until and up to maintenance period.

## 316. EXCAVATION FOR FOUNDATIONS BELOW OPEN WATER

The rates for excavation for foundations below the water level shall include for the cost of all temporary close timbering and shoring, sheet piling, coffer dams, caissons, pumps and other special appliances required and for the draining of any water in the excavation.

## 317. TRENCHES OF GREATER WIDTH AND DEPTH THAN NECESSARY

The Contractor shall not be entitled to payment in respect of excavation to any greater extent, whether horizontally or vertically, than is necessary to receive any structure for which the excavation is intended, except where a separate item is provided for additional excavation for working space, timbering, or other temporary work. Excavation to a greater depth or width than directed shall be made good with suitable materials to the satisfaction of the Engineer and at the Contractor's cost.

## 318. SUPPORTS FOR TRENCHES

The sides of trenches shall where necessary be adequately supported to the satisfaction of the Engineer by timber or other approved means.

## 319. PROVISION OF SPOIL HEAPS

The Contractor shall provide spoil heaps at his own expense for the disposal of surplus material and all rubbish collected when clearing the site and during the construction of the works. The sites for these shall be approved by the Engineer.

## 320. USE OF VIBRATORY COMPACTION PLANT

Where vibratory rollers or other vibratory compaction plant is used, the mechanism for vibration shall be kept working continuously during compaction operations, except during periods when the Engineer permits or directs discontinuance of vibration.

Unless otherwise permitted by the Engineer, the frequency for vibration shall be maintained within the range of amplitude and frequency recommended by the manufacturers of the plant for the material to be compacted. The frequency shall be recorded by a tacheometer indicating speed of rotation of any shaft producing vibrations.

## 321. WATER IN EXCAVATIONS

All excavations shall be kept free from water, from whatever source, at all times during construction of works until in the opinion of the Engineer, any concrete or other works therein

are sufficiently set. The Contractor's rates are deemed to cover compliance with this requirement.

The Contractor shall construct any sumps or temporary drains that the Engineer may deem necessary and shall be responsible for the removal and disposal of all water entering the excavations from whatever source and shall deal with and dispose of such water in a manner approved by the Engineer so as to ensure that excavations are kept dry.

The Contractor shall provide all plant, labour and materials required for such work and all costs incurred shall be deemed to be included in his rates for excavation.

## 322. TRIAL HOLES

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

## 323. REINSTATEMENT OF SURFACES

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

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

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

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

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

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

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

In verges and other grass surfaces and after the backfilling had been thoroughly consolidated the topsoil shall be re-laid rolled and planted with grass or other vegetation as directed by the Engineer as may be necessary and watered until the grass has become well established. Should the planting fail it shall be replanted as required until satisfactory growth is obtained. If at any time any reinstatement deteriorates the Contractor shall restore it to a proper condition

immediately.

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

All trees, shrubs and plants shall be carefully transplanted and shall be returned to their original location after the refilling of the excavations. Return of old or mature trees may be waived in cases where the age of the tree makes return impracticable, and approved tree seedlings shall be planted in their place.

**Topsoil shall be carefully set aside and replaced at the surface of the backfilling**.

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

If any trench becomes dangerous the Engineer may call upon the Contractor for its reinstatement at three hours' notice and failing this to have the work done by others at the Contractor's expense.

In the case of footpaths, the trench shall be refilled and rammed as specified to within 125mm of the surface. A foundation layer of 100mm compacted thickness of approved crushed limestone shall then be laid and compacted. The surface shall be cleaned and primed and the footpath surfacing shall be temporarily reinstated with 25mm compacted thickness of 14 mm nominal size dense wearing course macadam laid and compacted so as to achieve a dense, smooth and even course surface using a roller of 750 to 3000kg mass. Any kerbs shall be reinstated to their original condition.

The trench surface shall be thus maintained until the end of the Period of Maintenance or permanent reinstatement is ordered by the Engineer. Where permanent reinstatement is ordered by the Engineer the temporary surface and part of the foundation shall be removed to 50mm depth to permit the construction of a tiled or paved surface to match the original surface. An approved tiled or paved surface shall then be laid and bedded on sand or mortar to an even finish

## 324. TOP SOILING AND GRASSING

Where required surfaces shall be soiled with fine sifted soil or silt not less than 100 mm compacted thickness which shall be raked and brought to a fine tilth.

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

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

The Contractor shall supply attendance during the Defects Liability Period to ensure that all

planted grass is kept weeded and cut, and if necessary watered.

Above shall also apply for trees planted under the contract.

# 4. PIPELINE CONSTRUCTION WORKS

## 401. 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.

## 402. 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.

## 403. STORAGE

The Contractor shall comply with the manufacturer's and Engineer's specification regarding the storage of pipes, fittings and valves. Where storage dumps are to be provided along the route of the pipeline, these will be subject to the Engineer's approval. The cost of so providing shall be borne by the Contractor and deemed to be covered by his rates in the Bill of Quantities.

## 404. 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.

## 405. EXAMINATION OF PIPES AND FITTINGS

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

## 406. INTERFERENCE WITH FENCES, DRAINS AND OTHER SERVICES

The Contractor shall ensure the proper reinstatement of fences, drains, telephone lines, KP&L cables etc. where affected by his work. All services shall be adequately protected and propped to the satisfaction of the Engineer. The Contractor shall be liable for any damage caused to the services due to his failure to provide adequate protection.

## 407. METHOD OF EXCAVATION

The Contractor is deemed to have covered in his excavation rates all the work that is necessary in order to comply with the provisions of the Specifications in general and this Clause in particular.

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

b) For the purpose of measurement, the width of trench shall be taken as the

nominated width for the particular size of pipe, irrespective of the width of trench the Contractor may choose to excavate.

Nominated trench width for:

| | |
|---|---|
| 100mm main | 0.6m |
| 150mm main | 0.6m |
| 200mm main | 0.6m |
| 225mm main | 0.6m |
| 250mm main | 0.6m |
| 300mm main | 0.7m |
| 400mm main | 0.8m |

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

c) Where the trench passes through grassland, arable land or gardens, whether enclosed or otherwise, the turf, if any, shall be carefully pared off and stacked, and the productive soil shall be carefully removed for a width of 600mm greater than the nominated trench width, or equal to the overall width of track of excavating machine, whichever is greater, and laid aside to be subsequently used in reinstating the surface of the ground after the trench has been refilled.

d) The bottom of the trench shall be properly trimmed off, and all low places or irregularities shall be levelled up with fine material. Where rock or large stones are encountered, they shall be cut down to a depth of at least 100mm below the level at which the bottoms of the barrel of the pipes or flanges are to be laid, and covered to a like depth with fine material, so as to form a fine and even bed for the pipes. The bottom of trenches to accommodate uPVC piping shall be hardened by tamping in gravel or broken stone in all soft spots. The bedding shall consist of soil which can be properly compacted to provide support for the pipe and to comply with Clause 409 b).

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

f) The pipe trench shall be kept clear of water at all times as per Clause 321 of this Specification.

g) The Contractor shall, wherever necessary, by means of timbering or otherwise, support the sides of the trench so as to make them thoroughly secure, and afford adequate support to adjoining roads, land, buildings and property, during the whole time the trench remains open and shall remove such timbering when the trench has been backfilled. The cost of such timbering or other work shall be deemed to be included in the rates for excavation. In

case the Contractor is instructed by the Engineer to leave any portion of such timber in position after backfilling the trench, he will be paid for it accordingly.

h) The clear width inside the timbering shall be at least 150mm in excess of the external diameter of the pipe being laid, in order to allow it to be freely lowered into position, in the trench without damage to the external protection.

i) Should the excavation be taken out to a greater depth than is specified the bottom shall be made good to the correct level with Class 15/20 concrete or other material approved by the Engineer. No payment shall be made for any over excavation carried out by the Contractor nor for the cost of filling up to required levels.

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

k) The Contractor shall fix Sight Rails for use with boning rods at intervals of not more than 30 metres and temporary Bench Marks related to the Survey of Kenya Datum shall be provided at such intervals as directed by the Engineer.

## 408. PIPE LAYING

Immediately before pipes are placed in any trench, the bottom shall be cleared of all stones and other debris and shall be in a condition acceptable to the Engineer.

Prior to placing in the trench, all pipes shall be inspected for damage. Damaged pipes which in the opinion of the Engineer cannot satisfactorily be made good shall not be used in the Permanent Works.

a) Pipelines 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 within the specified tolerances, to the routes and levels indicated on the Drawings. Any pipes not so laid shall be removed if so directed by the Engineer, and re-laid in proper manner at the Contractor's expense.

In laying the pipes and specials care shall be taken not to damage the protective linings and the pipes shall be handled with tackle if so directed by the Engineer.

The pipes and specials shall be checked for flaws before they are lowered into the trench. After the pipes or specials have been checked they shall be cleaned and set to proper gradient and line so that there is a continuous rise from each washout to air valve.

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

b) Large diameter curves to pipelines shall wherever possible be formed by allowing for deflection at flexible joints, not exceeding 3 degrees, or as specified by the manufacturers.

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

d) In laying pipes and specials with flanged joints, flanges shall be brought together and bolted with the faces absolutely parallel. A rubber jointing gasket ring 3mm thick shall be used in each flange joint and one washer with and not provided for each bolt.

The bolts shall be tightened up gradually and equally in the customary manner in order to distribute the stress evenly over the flange. If it is found necessary to deviate slightly from the normal run of the flanged piping, the deflection shall be obtained by means of a bevelled gun metal ring washer between the flanges.

e) The Contractor shall, subject to approval of the Engineer, cut pipes to such lengths as directed. Pipes should be cut off clean and square with the axis. Cuts should be made with an approved cutting device dependant on the type of pipe specified. Ends of pipes should be tapered by means approved by the Engineer if mechanical joints are to be used.

## 409. BACKFILLING OF TRENCH

a) When a section of the main has been jointed, the ends shall be temporarily closed with caps, plugs or flanges to prevent ingress of foreign matter into the pipe to the satisfaction of the Engineer. The trench shall be properly backfilled and rammed for its whole length so that the soil covers to the main shall not be less than 600mm except at joint holes which shall be kept clear of all backfilling, if necessary, by the use of timbering, so that each joint is left fully exposed for the Engineer's inspection. Special care shall be exercised when using surround to uPVC pipes which shall be free from any stones and well compacted in layers to not less than 100mm above the crown of the pipe.

b) The Contractor's attention is drawn to the special requirements for bedding and sidefill to uPVC pipes. Clay should not be used. Soils which are of a granular nature and provide adequate support after compaction shall be used. If unavailable from excavated material the Contractor should provide suitable material for which an item in the Bill has been included.

With flexible pipes it is important that the sidefill should be firmly compacted between the pipe and the soil sides of the trench. The bedding material shall be placed in 75mm layers up to the crown of the pipe with adequate compaction and then to a minimum height of 100mm or two thirds of the pipe diameter. The progress of filling and tamping should proceed equally on either side of the pipe so as to maintain an equal pressure on both sides.

c) Where a main is laid across a road or is in such a position as to interfere seriously with the normal use of the road, the Contractor may, with the consent of the Engineer and at his own risk, fill such holes as may be necessary. Due consideration is to be given to compaction of section of the trench across the road to prevent undue settlement. In the event of damage at this section the Contractor is required to re-excavate and repair the pipeline all at his own expense.

## 410. CLEANING OF PIPELINES

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. 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. The expenses for water used for washing out shall be payable by the Contractor.

## 411. CLEARANCE OF SITE

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

## 412. TIE IN WORKS BETWEEN EXISTING AND NEW WORKS

### 412.1 General

This specification clause shall apply to any tie in works between existing operational and new pipelines which involve closing down of any main which is in service supplying water, either Raw or Treated, within the existing water supply system. It shall further apply to any new fitting that has to be inserted into an existing operational pipeline.

The Contractor shall be responsible for the execution of the works except under circumstances where the execution of the tie in operation is assumed by Engineer as mentioned under (f) below, from the date of the Engineer's instruction to perform described under (g) below. The Engineer's instruction to perform the tie in will be given at least 14 days before the date on which the tie in is to be executed.

### 412.2 Fittings and Valves

The Contractor shall take delivery of any fittings and valves required at the Works not less than 96 hours before the commencement of the tie in operations. He shall provide all the necessary watching to ensure that such fittings do not get misplaced or stolen. The Contractor shall, check the suitability of such fittings including checking of all dimensions, particularly the external diameter of the pipe into which the connection is being made and the internal diameter(s) of couplings which are to be used for such connection. This shall be done by measuring diameter at 4 positions to a tolerance of 0.25 mm. The Contractor shall certify the suitability of such materials to Engineer not less than 48 hours before the commencement of tie-in operations.

The Contractor shall prepare a schedule of fittings including those on existing pipes that are to be used for such tie-in or redeployed elsewhere as instructed on the drawings and shall obtain approval of the Engineer not less than 48 hours before the commencement of tie in operations of such schedule.

The Contractor shall ensure that all materials are at the site of the works not less than 24 hours before the commencement of the tie-in operation and shall inform the Engineer who shall check the materials against the schedule as approved where he deems this necessary.

Any non-standard fittings which are required for the execution of the tie-in works shall be fabricated under the Engineer's supervision and shall be hydro statically tested to at least one and a half times the maximum working pressure.

### 412.3 Personnel

The Contractor shall ensure that at least one senior member of his field supervisory staff who has proven experience of such operations and fluent in English, is on site throughout the whole duration of the tie in operation.

The Contractor shall also ensure that all necessary skilled artisans for the operation of all his plant are on site for the whole duration of the tie-in operation.

The Contractor shall furnish the Engineer's Representative a list of the key personnel to be involved in the tie in exercise at least 48 hours before the commencement of the exercise and shall get the Engineer's approval at least 24 hours before the commencement in respect of such personnel. To gain this approval the Engineer may require that operative is tested in the performance of his duties in the operation of the plant for which he is in attendance.

In particular this requirement shall apply to all welders, pipe cutters using either mechanical or flame cutting equipment and lifting plant operators.

The Contractor shall ensure that an adequate number of labourers are in attendance upon the site during the period of the tie in operation.

### 412.4 Pre Tie-in Works

The Contractor shall execute all works possible before the commencement of the operations which shall include:-

i) Excavation and supports to the excavation.
ii) Blinding with concrete the bottom of the excavation and (where instructed by the Engineer) immediate working areas.
iii) Provision of any required drains a sump of adequate size from which any accumulating water is to be pumped out.
iv) Casting of the floor of any chamber which is to be constructed around such tie-in works.
v) Casting of any thrust blocks or thrust walls or any other works necessary for effective execution of the tie-in works as may be required by the Engineer.

The Contractor shall complete these works at least 96 hours before the commencement of the tie-in operation or within a period that may be otherwise set by the Engineer upon issue of the Engineer's instruction to perform the tie-in works, and obtain the Engineer's approval not less than 24 hours before commencement of the tie-in operations.

### 412.5 Plant

The Contractor shall prepare a schedule of the plant which he proposes to have on site either to use, or on standby, or for emergency use and shall obtain the approval of the Engineer not less than 48 hours before the commencement of the tie-in operations.

Such Plant shall include

i) Excavation plant
ii) Cutting equipment
iii) Lifting equipment
iv) Pumping equipment (unless a drain is provided)
v) Concrete Mixer
vi) All tools necessary for the erection and assembly of the plant.

The Contractor shall also ensure that all plant is on site not less than 24 hours before the commencement of the tie-in operation and shall inform the Engineer who shall check the plant against the schedule as approved where he deems this necessary.

### 412.6 Actual Tie-in Works

The Contractor shall prepare a programme giving details of the proposed scheduling and sequencing of tie-in works necessary for minimising the interruption to the existing water supply. Approval of such programme by the Engineer shall be obtained not less than 72 hours before commencement of the tie-in operation.

The Contractor, unless relieved of the responsibility by the Client or the Engineer, shall first empty the section of the main on which the tie-in is to be made and shall ensure that the nearest air valves and washouts immediately upstream and downstream are all open and the washout dry.

Where the Contractor is relieved of this operation, which shall be notified to him by the Engineer not less than 96 hours before the tie-in operation is due to commence, he shall check that air-valves and washouts mentioned above are in the state described.

When the Engineer is also satisfied that the main is empty of water he shall verbally give the order to commence the works from which time the Contractor shall be solely responsible for the execution and completion of the tie-in works unless relieved of such responsibility by the Engineer.

In event that the Engineer directs that the required tie-in works be carried out during the night for purposes of minimising the effect of such tie-in on the Municipality consumer community, the Contractor shall make all required preparation for provision of lighting (including standby and emergency) and any other measures as the Engineer may direct.

The Contractor shall provide all the insurance normally required by the Engineer and the operating F.I.D.I.C. Conditions of Contract and shall obtain an endorsement if necessary to ensure that the insurances remain valid in the event that the Engineer takes over the direction of the works.

When the Engineer is satisfied that the tie-in works are completed he shall give notice for the main to be re- commissioned, when this has been satisfactorily accomplished the Contractor shall re-deploy his staff on the Engineer's verbal instructions of completion of the tie-in.

### 412.7 Post tie-in Works

Within 48 hours of the completion of the tie-in works the Contractor shall have completed all permanent works required to support the plant installed during the tie in operation, and shall remove all temporary supports within a further 48 hours after the permanent support works have

been approved by the Engineer. The temporary supports shall not be removed before such approval has been given.

Within 14 days from the date of the completion of the tie-in, the Contractor shall have completed all the other permanent works required to allow operation of the plant installed during the tie-in operation, or other plant for which the tie- in executed, and shall obtain the approval of the Engineer on the completion of such works.

The Engineer shall issue the Contractor with a notice stating the operations for which the plant installed during the tie-in operation may be used, which shall remain in force for a period extending for 28 days from the date of approval of the completion of the Post tie-in works as described above.

Before the expiry of the 28 day period described above the Contractor shall obtain the approval of the Engineer for the completed works when the Engineer shall issue a notice allowing full operation of the plant on the expiry of the above mentioned period upon which the Contractors responsibility for the works, unless requested otherwise shall cease.

## 412.8 Schedule for Tie-in Works

| SCHEDULE OF INSTRUCTION, SUBMISSIONS AND APPROVALS FOR THE TIE-IN WORKS | |
|---|---|
| 1. ENGINEERS INSTRUCTIONS TO PERFORM TIE IN | 14 DAYS |
| 2. MATERIALS: ACCEPTANCE BY CONTRACTOR | 96 HOURS |
| CERTIFICATE OF SUITABILITY BY CONTRACTOR | 48 HOURS |
| SCHEDULE OF THOSE NEEDED SUBMISSION | |
| APPROVAL 48 HOURS | |
| ARRIVAL ON SITE 24 HOURS | |
| CHECKED ON SITE BY THE ENGINEER | |
| 3. WORKS PROGRAMME OF EXECUTION SUBMISSION | |
| APPROVAL 72 HOURS | |
| SCHEDULE OF PLANT SUBMISSION | |
| APPROVAL 48 HOURS | |
| PLANT ARRIVAL ON SITE 24 HOURS | |
| CHECKED ON SITE BY ENGINEER | |
| ARTISANS APPROVED BY ENGINEER 24 HOURS | |
| TESTING OF BY ENGINEER | |
| 4. NOTICE OF RESPONSIBILITY FOR DRAWING MAINS | 96 HOURS |
| 5. PRE-TIE IN WORKS COMPLETION OF | 96 HOURS |
| INSPECTION BY ENGINEER 24 HOURS | |
| 6. ENGINEER'S VERBAL INSTRUCTION TO COMMENCE WHEN MAIN IS DRY | |
| 7. ENGINEER'S VERBAL INSTRUCTION TO RECOMMISSION MAIN | |
| 8. ENGINEER'S VERBAL APPROVAL OF THE TIE-IN COMPLETION | |
| 9. ENGINEER'S NOTICE OF PLANT OPERATIONS ALLOWED | |
| 10. SUPPORT WORKS: COMPLETION 48 HOURS | |
| APPROVAL BY ENGINEER | |
| REMOVAL OF TEMPORARY | |
| 11. POST TIE-IN WORKS COMPLETION 14 DAYS | |

| | |
|---|---|
| APPROVAL BY THE ENGINEER | |
| 12. FINAL APPROVAL BY THE ENGINEER OF WHOLE WORKS | 42 DAYS |
| NOTE: A) Times given are the latest<br>B) Where items are not given the Contractor shall ensure execution of that item so as not to cause any other item to be delayed. | |

## 412.9 Planning and Arrangements for Shutdowns of Water Supply (As Applicable)

### 412.91 Work to be continuous until completed

Attention is specifically drawn to the fact that installation work will involve the planning and conducting of shutdowns of the water supply to along the transmission mains, distribution centres, residential and commercial areas where only limited interruptions to the water supply will be acceptable. Shutdown work will normally entail a continuous and intensive period of work, including work outside normal working hours, when necessary, in order to complete critical work and re-instate the water supply in the shortest possible time.

### 412.92 Notice Period

The Contractor will be responsible for making arrangements with the Water Service provider in the project area, not less than 14 days in advance, to shut down any major components of the water supply system for works requiring such shutdowns.

### 412.93 Shutdown Plan and Meeting

Each application for a shutdown must be preceded by a Shutdown meeting between the Contractor and the responsible officials of the Water Service provider in the project area, and the Engineer's Representative.

The Contractor shall prepare a Shutdown plan for discussion at this meeting, covering the minimum requirements set out in ANNEXURE B in section XIII of this document.

### 412.94 Limitation of Duration of Water Supply Interruptions

Any shutdown plan shall ensure that the section of the transmission main, reservoir, pump station or network to be shut down, is out of commission for the shortest possible period of time, which shall in any event not exceed eight hours.

### 412.95 Preparatory Work

The Contractor shall carry out shortly, before a shutdown, all preparatory work and checks necessary to ensure trouble-free and expeditious completion of the installation or refurbishment operations. The Contractor shall be required to accurately measure the existing pipe work and valves (using callipers), meters, and chambers. The correct external diameter of pipes and the drilling pattern of flanges must be identified to ensure the correct sizing of couplings, weld on flanges, fittings etc. to be used during installation. No additional payment will be made for fittings,

specials or couplings that are discarded or which required modification because they did not fit.

Preparatory work will also include but not be limited to marking of pipes to be cut, and testing of all isolating valves to be closed in order to achieve the shutdown. The Contractor must carry out a dummy shutdown prior to the actual shutdown to ensure that all valves that need to be operated are operational and that effective closure of the flow of water at the construction site can be achieved.

The Contractor shall, before committing himself (and the Employer) to a course of action by cutting a pipe or removing a fitting, ensure that a replacement meter, specials, fittings, and any other items of material necessary for the completion of the work, are delivered to the point where the fitting, valve, equipment or meter is to be installed, dimensions have been checked and pre-assembly has been done. In addition the Contractor shall ensure that all plant, tools, staff, equipment and standby equipment are available and operational, in order to successfully complete the work in a single continuous work session, and to deal with any contingencies that may arise.

Where necessary, special planning must be done to ensure quick and safe drainage of the lines to be worked on. The Contractor shall take note that long sections of transmission and distribution mains in particular may need to be drained and that the topography is flat and will not easily accommodate large water flows. Where possible measures shall be planned and implemented to reduce the amount of water to be scoured, such as planning for consumptive usage or insertion of a spade into the pipeline. In particular the drainage path of water to be scoured from the line must be planned and if necessary measures must be taken to avoid flooding or damage to roads, properties, and the natural environment.

### 412.96 Slow Closure and Opening of Valves

The Contractor will be responsible for shutting down and re-opening mains for mains, valves or meter installation or repair works or as agreed with the Water Authority. Under no circumstances shall the Contractor interfere in any way with the continuance of the existing water supply except with specific, written permission of the Engineer and the responsible officer of the Water service provider in the project area.

The Contractor shall take note that slow closure and opening of water valves, especially on AC mains, is a clear requirement, to avoid surges that may result from the collapse of entrapped air pockets, and water hammer, that may damage pipes and fittings. The Contractor must ensure that all reasonable steps are taken to release entrapped air from lines during filling e.g. by opening hydrants, scours or other connections, especially at high points where air may be entrapped.

A pressure gauge and pressure logger may be installed on the upstream side of the valve prior to it being operated. The rate of closure is then regulated by observing the pressure readings. Should the pressure approach the safe allowable limit for the lowest class of pipe in the line being shut down, the action must immediately be reversed and sufficient time must pass to allow the excess pressure to dissipate and for the flow regime in the length of pipe involved to stabilize. In general, the flow regime (rate of flow and pressure) must be altered gradually, especially during the final stages of valve closure.

### 412.97 Judicious Postponement of Shutdown work

If the start of shutdown work is delayed beyond the planned starting time (e.g. because drainage of the line took longer than anticipated), the Contractor shall be responsible, after consulting with the Engineer and staff of Water service provider in the project area, for making a judicious decision on site to postpone the start of work on any shutdown that commits the Employer to an ill-timed interruption of the water supply.

### 412.98 Employer's Right to Cancel or Postpone a Shutdown

In any case, the Employer, Engineer or the Water service provider in the project area shall have the right to cancel or postpone and re-schedule a shutdown. Compensation for such an event will be decided upon by the Engineer basing his decision on the reasons for the cancellation, postponement or re-scheduling. Should the delay be a result of the Contractor not having been fully prepared for the planned shutdown, no compensation will be made

# 5. PIPES, FITTINGS, VALVES

## 501. GENERAL

All materials shall comply with those standards and specifications laid down by internationally recognized institutions for the water industry. Preference will be given to manufacturers who are quality certified to ISO 9001.

The approval in writing or otherwise by the Engineer of any material shall not in any way whatsoever relieve the Supplier from any liability or obligation under the Contract and no claim by the Supplier on account of the failure, insufficiency or unsuitability of any such materials will be entertained.

a) All items hereinafter specified shall be to such other Standard or Specification which in the opinion of the Engineer provides for a quality of material and workmanship. The Standard or Specification must be submitted to the Engineer for approval before commencement of work.

b) All ferrous pipes and fittings shall be coated with a protective paint suitable for use in the conveyance of sewage,.

c) The Supplier shall supply to the Purchaser 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.

d) The Supplier 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.

e) The Supplier should exercise diligence to provide the best material.

f) Where applicable, the manufacturer's Specification should accompany all offers. The name of the manufacturer must in every case be stated.

g) Where necessary the Supplier shall provide rubber gaskets to comply with EN 1514, DIN 2693 or DIN 2697 and all other bolts, nuts, washers, etc. to undertake jointing at fittings etc.

h) Any articles required under this Contract which are found to be faulty due to a crack, flaw or any other reason or is not in accordance with the Specification stipulated will not be accepted nor will the Purchaser 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 Supplier may deal with it accordingly and include it in the Contract at a price to be mutually agreed. Straight pipes which have been cut will be accepted at the discretion of the Engineer , provided the length is not less than 4 metres or two thirds of the standard length whichever is the lesser and will be priced pro-rata.

All materials supplied to the site shall be subject to acceptance tests carried out by an approved Authority and shall be subject to the Engineer's approval.

Any or all materials and manufacture articles supplied by the Contractor for use in the works, shall if so required by the Engineer be tested in advance at the Contractor's expenses, in accordance with the required specifications. Inspection or approval by the Engineer of any equipment or materials shall no release the Contractor from any of his obligations under this Contract.

## 502. AUTHORISATION AND CERTIFICATES

The Contractor shall seek Engineer's approval of his proposed Manufacturer/ supplier for any construction materials. No change of the source of materials will be accepted without prior approval of the Engineer.

The Contractor shall also furnish the Engineer with a manufacturer certificate in respect of every consignment of the Materials confirming that all items comprising the consignment comply in all respects with the requirements of the specified Standard and of this Specification.

The original and one copy of such manufacturer's certificate shall be delivered to the Engineer not later than 14 days prior to the intended date of delivery of the Pipeline Materials to Site.

## 503. INSPECTION AND TESTING

Before delivery to site the Contractor shall allow for inspection of all Materials by an inspector appointed by the Engineer. The inspection will include attendance at all pressure and material tests, execution of dimensional checks and inspection of the workmanship and standard of manufacture with scrutiny of evidence of the materials used in the manufacturing of the Materials.

The Contractor shall arrange for such testing as may be required to be carried out at the place of manufacture according to this Specification. If there are no facilities at the place of manufacture for making the prescribed tests the Contractor shall bear the cost of carrying out the tests elsewhere.

The Contractor shall supply test certificates and shall furnish and prepare the necessary test pieces and samples and shall supply and provide all test rigs, equipment appliances, labour and any other facility required for inspection and testing.

The Engineer and his inspector shall be allowed full access to all areas at the place of manufacture or elsewhere where testing, furnishing or preparation of materials for the performance and testing of work under this Specification is taking place.

The Contractor shall furnish the Engineer with reasonable facilities and space (without charge) for the inspection, testing and obtaining of such information as he desires respecting the character of material in use and the progress and manner of the work.

## 504. UNPLASTICISED PVC (uPVC) SEWER PIPES

Unplasticised PVC piping shall be in accordance with BS EN 1452.

The Supplier shall submit full details of the pipes he intends to supply.

The pipes of 50mm diameter and over shall consist of a grooved socket at one end of the pipe.

The socket shall be designed to give a clearance fit on the outside diameter of the parent pipe. The sealing medium which shall seat in the groove shall be a rubber ring.

If the formation of the socket and groove results in the thinning of the original wall thickness of the pipe, it shall be compensated for by shrinking on to the outside of the socket area a reinforcing sleeve of the same material as the pipe. The socket and groove shall incorporate no sharp angles where the stress points are created.

The joint shall take 10% deformation of the spigot at the point where it enters the socket without leakage from the pipe when subjected to the test pressure specified for the pipe. Thermal expansion of the pipe shall be accommodated in the joint. The joint shall be capable of linear deflection up to 3 degrees.

The sealing ring shall be of first grade natural rubber and the physical properties of the mix shall meet the requirements of DIN 4060, BS2494 or EN 681.

The Supplier 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 Supplier shall submit full details of the type of joint offered and a full description of the method of jointing.

The fittings shall have the same type of joint as for the pipes to be used. The Supplier shall submit full details of the materials dimensions and test pressures of the fittings offered.

Precautions shall be taken to avoid damage to the pipes and fittings.

In handling and storing the pipes and fittings, every care shall be taken to avoid distortion, flattening, scoring or other damage. The pipes and fittings shall not be allowed to drop or strike objects. Pipe lifting and lowering shall be carried out by approved equipment only.

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

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

## 505. uPVC PRESSURE PIPES AND FITTINGS

uPVC pipes and fittings shall both conform to BS 3505 and BS 4346 or ISO standards. The use of rework material during manufacture is however strictly forbidden and the supplier shall provide certification to this effect. The classes referred to on the Drawings and in the Bills of Quantities are for the following working heads and pressures and pipes are specified by their Outside diameter

| Class | Working Head in Metres | Working Pressure in Kg/cm$^2$ |
|---|---|---|
| C | 90 | 9 |
| D | 120 | 12 |
| E | 160 | 16 |

Pressure pipes in uPVC shall comply with BS 3505 Class C (9 bar maximum sustained working pressure) and shall have push-fit joints to BS 4346: Part 2. The maximum sustained working pressures to which the pipes and fittings will be subjected is based on water at a temperature of 30 degrees centigrade.

Outside diameters conforming to ISO 161/1 may be adopted, but in other respects pipes shall comply with the foregoing. The Supplier shall submit full details of the pipes he intends to supply.

The thickness for uPVC pipes to conform to ISO 4065:1996 as summarized in the following tables:

| **Nominal outside diameter, *d*n** | **Pipe series S** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Nominal (minimum) wall thickness** | | | | | | |
| | S 20 (SDR 41) | S 16 (SDR 33) | S 12,5 (SDR 26) | S 10 (SDR 21) | S 8 (SDR 17) | S 6,3 (SDR 13,6) | S 5 (SDR 11) |
| | **Nominal pressure PN based on service (design) coefficient *C* = 2,5** | | | | | | |
| | | PN 6 | PN 8 | PN 10 | PN 12,5 | PN 16 | PN 20 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12 | | –– | –– | –– | –– | –– | 1,5 |
| 16 | | –– | –– | –– | –– | –– | 1,5 |
| 20 | | –– | –– | –– | –– | 1,5 | 1,9 |
| 25 | | –– | –– | –– | 1,5 | 1,9 | 2,3 |
| 32 | | –– | 1,5 | 1,6 | 1,9 | 2,4 | 2,9 |
| 40 | | 1,5 | 1,6 | 1,9 | 2,4 | 3,0 | 3,7 |
| 50 | | 1,6 | 2,0 | 2,4 | 3,0 | 3,7 | 4,6 |
| 63 | | 2,0 | 2,5 | 3,0 | 3,8 | 4,7 | 5,8 |
| 75 | | 2,3 | 2,9 | 3,6 | 4,5 | 5,6 | 6,8 |
| 90 | | 2,8 | 3,5 | 4,3 | 5,4 | 6,7 | 8,2 |
| 110 | | | | | | | |
| 125 | | | | | | | |
| 140 | | | | | | | |
| 160 | | | | | | | |
| 180 | | | | | | | |
| 200 | | | | | | | |
| 225 | | | | | | | |
| 250 | | | | | | | |
| 280 | | | | | | | |
| 315 | | | | | | | |

| **Nominal outside diameter,** | **Pipe series S** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Nominal (minimum) wall thickness** | | | | | | |
| | S 20 (SDR 41) | S 16 (SDR 33) | S 12,5 (SDR 26) | S 10 (SDR 21) | S 8 (SDR 17) | S 6,3 (SDR 13,6) | S 5 (SDR 11) |
| | **Nominal pressure PN based on service (design) coefficient *C* = 2,0 a** | | | | | | |
| | PN 6 | PN 8 | PN 10 | PN 12,5 | PN 16 | PN 20 | PN 25 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2,7 | 3,4 | 4,2 | 5,3 | 6,6 | 8,1 | 10,0 |
| 110 | 3,1 | 3,9 | 4,8 | 6,0 | 7,4 | 9,2 | 11,4 |
| 125 | 3,5 | 4,3 | 5,4 | 6,7 | 8,3 | 10,3 | 12,7 |
| 140 | 4,0 | 4,9 | 6,2 | 7,7 | 9,5 | 11,8 | 14,6 |
| 160 | 4,4 | 5,5 | 6,9 | 8,6 | 10,7 | 13,3 | 16,4 |
| 180 | 4,9 | 6,2 | 7,7 | 9,6 | 11,9 | 14,7 | 18,2 |
| 200 | 5,5 | 6,9 | 8,6 | 10,8 | 13,4 | 16,6 | –– |
| 225 | 6,2 | 7,7 | 9,6 | 11,9 | 14,8 | 18,4 | –– |
| 250 | 6,9 | 8,6 | 10,7 | 13,4 | 16,6 | 20,6 | –– |
| 280 | 7,7 | 9,7 | 12,1 | 15,0 | 18,7 | 23,2 | –– |
| 315 | 8,7 | 10,9 | 13,6 | 16,9 | 21,1 | 26,1 | –– |
| To apply an overall service (design) coefficient of 2,5 (instead of 2,0) for pipes with nominal diameters above 90 mm, the next higher pressure rating, PN, shall be chosen. | | | | | | | |
| NOTE 1 The nominal wall thicknesses conform to ISO 4065:1996 [10].<br>NOTE 2 The PN 6 values for S 20 and S 16 are calculated with the preferred number 6,3. | | | | | | | |

The pipes up to and including 40mm diameter can be of a solvent weld type. The pipe shall be supplied with interchangeable sockets preformed at the factory and of such internal diameter that it takes the plain end of the pipe with the same nominal diameter. The joint shall sustain the end thrust to which the pipe shall be subjected. The Supplier shall supply sufficient quantity of the cleaner and adhesive, which shall be required to make the joints with the pipes.

The pipes of 50 mm 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. 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 Supplier 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 Supplier shall submit full details of the materials dimensions and test pressures of the fittings offered.

Precautions shall be taken to avoid damage to the pipes and fittings. In handling and storing the pipes and fittings, every care shall be taken to avoid distortion, flattening, scoring or other damage. The pipes and fittings shall not be allowed to drop or strike objects. Pipe lifting and lowering shall be carried out by approved equipment only. Special care shall be taken in transit, handling and storage to avoid any damage to the ends.

Pipes and fittings shall be marked at not greater than one-meter intervals showing their class

and diameter. Fittings for use with pressure pipes of DN 100 and greater shall be steel fittings complying with the requirements for such fittings, stated elsewhere in this Specification.

## 506. STEEL PIPES AND SPECIALS

All piping shall be plain ended unless otherwise specified and suitable for use with flexible mechanical couplings. The grade of steel used shall comply with the requirements of BS EN 14164.

The pipes shall be welded or seamless and shall conform to BS EN 10216.

All the pipes shall be internally protected with epoxy coatings for internals and externals of steel pipes in accordance with AWWA C210.External protection to be as specified in DIN 30671, EN 10309, AWWA C213 or NFA 49-706.

All joints shall be of the flexible mechanical type and shall be supplied complete with all bolts, nuts, washers and joint rings as may be required. All metal parts of joints shall be adequately protected with rust-proof paint. The joints shall be protected from corrosion by wrapping with Denso paste and tape or by some similar approved material.

All fittings and specials shall be of such dimensions as will conform / fit with the piping supplied.

Flanged adaptors shall be pieces suitable for connecting a flanged gate valve etc. to the type of piping supplied and shall be supplied complete with all bolts, nuts, washers and joint rings.

The spigot ends of all Tees shall be suitable for connection to the pipework supplied using the aforementioned flexible mechanical joints.

All flanges on specials shall conform to NP 16 or NP 25, as specified in the Price Schedules in accordance with BS EN 1092, unless otherwise detailed.

All flanged joints shall be protected from corrosion by wrapping with Denso paste and tape or some similar approved material.

## 507. HIGH DENSITY POLYETHYLENE (HDPE) PIPES AND FITTINGS

HDPE pipes shall be according to DIN 8074 / 8075, with working pressure 20°C, resistant against UV radiation and frost. They may be delivered in coils, on reels or in rigid tubing up to a diameter of 125 mm. The inner diameter of pipe coils depends on the outside diameter of the pipes and has to conform to the requirements defined by the manufacturer.

HDPE pipes shall be in black colour with blue stripes and must be marked with producer, type, pressure and production date as well as length of each coil (if applicable) printed on each pipe.

Diameters and minimum wall thickness of HD-PE pipes are specified below (in mm):

High Density Polyethylene Pipes - Dimensions

| Nominal Diameter (mm) | External Diameter (mm) | Wall Thickness (mm) | |
|---|---|---|---|
| | | PN10 | PN16 |
| 15 | 20.0 | 2.0 | 2.3 |
| 20 | 25.0 | 2.3 | 2.8 |
| 25 | 32.0 | 3.0 | 3.6 |
| 40 | 50.0 | 4.6 | 5.6 |
| 50 | 63.0 | 5.8 | 7.1 |
| 80 | 90.0 | 8.2 | 10.1 |
| 100 | 125.0 | 11.4 | 14.0 |
| 150 | 180.0 | 16.4 | 20.1 |
| 200 | 225.0 | 20.5 | 25.2 |

(A more elaborate specification is provided in annex 6 and forms part of the technical specifications)

HDPE pipes shall be resistant against UV-radiation and shall have black colour with blue stripes indicating PN10, and red stripe indicating PN16. Pipes shall be marked with dimension, and running meters, producer, type and pressure nominal.

HDPE pipes and fittings shall meet the requirements of BS 3284 and 5114 respectively. They shall be transported, laid, jointed and backfilled in accordance with the manufacturers written instructions.

Standard Length of rolls of HDPE pipes shall be as follows:

| HDPE DN [mm] | Pipe length on roll [m] |
|---|---|
| 20 = ISO 25 | 100 |
| 25 = ISO 32 | 100 |
| 32 = ISO 40 | 50 |
| 40 = ISO 50 | 50 |
| 50 = ISO 63 | 50 |

Installation – including fusion jointing work on HDPE pipelines – must be directed and supervised by suitably qualified and experienced persons and the Contractor shall have demonstrated his ability to provide this in his Tender.

Before transporting HDPE pressure pipes the loading surface of the vehicle must be cleaned and free from projecting nails, screws or other sharp objects. The bottom layer of all pipes must as far as possible be in contact with the loading surface throughout their entire length and not project beyond it. The pipes must be secured from slipping and shall not be pulled over sharp edges when loading and offloading. Pipes shall not be dragged along the ground.

Pipes, fittings and coils shall be stored in such a way that they are protected from direct sunlight. When covered they must be well ventilated to avoid accumulation of heat and resultant deformation. Transparent coverings shall not be used. The storage location shall be flat and shall, for pipes, support the pipes throughout their length. Stones and sharp objects shall not be present. Pipes shall not be stacked to a height exceeding 1 m. The pipes must be secured at the sides to prevent them from rolling. Contact with harmful materials shall be avoided. As far as possible, coils shall be stored in a horizontal position. The area shall be free of stones and sharp objects. If stored upright they must be secured to avoid tilting.

Prior to laying in trench the bed of the trench must provide support throughout the entire length of the pipe. The pipe shall not be laid directly on cohesive, rocky or stony soil. Such material shall be over excavated to a depth of not less than 0.1 m and shall be removed and replaced by non-cohesive soil or a special pipe support. This shall initially be re-compacted and then the surface loosened on the day of and prior to laying.

Pipes supplied in coils and of up to 63 mm diameter may be unrolled with the coil in the vertical position. For larger diameters an unwinding device shall be used. A turnstyle can be used with the coil laid in a horizontal position on it or with the coil mounted vertically on a slow moving lorry. The pipe shall never be removed from a coil in a spiral manner as this may cause kinking. Should kinking nevertheless occur the Contractor shall cut the pipe on either side of the kink, prepare the ends, and then use an approved joint after laying. All costs of dealing with kinking shall be to the Contractors expense. A minimum bending radii of 20 x the diameter shall be observed.

## 508. GALVANISED PIPES AND SPECIALS

All piping shall conform to SRN 823 and SRN 903 for “Medium” Piping. The pipes shall be screwed and socketted, coupled or flanged.

All specials shall be of such dimensions as will mate with the piping supplied. Screw down stopvalves shall conform to SRN 826. Barrel nipples shall conform to SRN 823 and all other specials shall conform to SRN 824.

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

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## 509. CONCRETE PIPES AND SPECIALS

Concrete pipes and specials shall comply with the requirements of SRN 840. They shall carry the relevant Standards Institution registration certification trade mark, or test certificates shall be furnished by the manufacturers.

## 510. CONCRETE POROUS PIPES

Concrete porous pipes shall comply with the requirements of SRN 410: Concrete Porous Pipes for Under-drainage.

## 511. FLANGED JOINTS

Where specifically called for or deemed appropriate, flanged joints shall be utilised. They shall conform to DIN Standards 2500, 2501, 2519, 2576, 2627, 2566, 2655-56, 2673, 2526, 2527, BS EN 1092, BS 1560 or ISO 7005: 1988., drilled to NP10 except where otherwise indicated in Price Schedules, with gaskets made of reinforced elastomer rubber to DIN Standards 2693, 2697 or EN 1514 and minimum thickness of 3mm.

All flanges on fittings and pipework where flanged connections are required must comply with the requirements of DIN Standards 2500, 2501, 2519, 2576, 2627-38, 2566, 2655-56, 2673, 2526, 2527, BS EN 1092, BS 1560 or ISO 7005: 1988 and drilled to NP 16, unless otherwise specified.

Inspection gaskets for flanged joints shall be rubber reinforced with cotton, 3mm thick and shall be in accordance with DIN Standards 2693, 2697 or EN 1514. Bolts, washers and nuts for flanged joints shall be of mild steel complying with ISO 898/1, ISO 898/2.

## 512. FLEXIBLE JOINTS

All flexible couplings (Viking Johnson or other approved type) shall be supplied and shall be coated with fusion bonded epoxy layer 350 microns thick, complete with rubber gaskets, bolts, nuts and washers. All couplings shall be coated with red oxide primer and bituminous composition suitable for use with potable water.

Flexible couplings shall be of a mechanical type coupling consisting of a centre sleeve, two end ring flanges, two wedge shaped sealing rings of grade T Nitrile rubber, and with galvanized nuts bolts. The main components shall be made from malleable cast iron to ASTM A 47-77 for larger diameters. If specifically called for, couplings shall be provided with a suitably sized screw plugged hole in the sleeve to allow for the introduction of molten bitumen for additional internal protection. The manufacturer shall then include the necessary removable internal backing-up rings of rubber composition and shall further include for all materials for in-situ jointing and protecting both for remedial works and for internal and external protection at such joints. After jointing, the exposed part of the bolt shall be provided with a tight-fitting polythene protection cap.

## 513. GATE VALVES

Gate valves shall comply with the requirements of BS 5163, AWWA C203-78, DIN 3230 Part 1-3, DIN 3352 Part 1-4.

The gate valves shall be suitable for use in pipelines and for the operating pressure to a head of

160 metres or 250 metres of water (NP 16) or NP 25.

Unless otherwise specified, gate valves of nominal diameters up to and including DN 300 shall be made of epoxy coated cast ductile iron in accordance with BS EN 1074. The epoxy coating shall be not less than 150 microns thickness. The gate shall be completely rubber encapsulated, the gate valve being of pocketless type with a straight through port.

The gate valves shall be double flanged. The dimensions and drilling of flanges shall be in accordance with BS EN 1092. Flanges shall be machined flat. Flanges shall be NP 16 / NP 25 complying with BS EN 1092, unless otherwise indicated Price Schedules.

Spindles of the gate valves shall be provided with cast iron caps conforming to the requirements as specified under "Valve Caps" in DIN 3230, DIN 3352, BS 5163 or AWWA C203-78, or handwheels if so specified.

Unless otherwise specified the face to face dimensions of gate valves with integral flanged ends shall be in accordance with BS 5155 basic series 14 (short) or basic series 15 (long) as indicated in the Price Schedules.

Where specified, valves for replacement washouts shall be in accordance with specification Clause 202 except that the valve bodies shall be of epoxy coated ductile iron and the flanges shall be undrilled. Face to face dimensions for these valves shall be to BS 5155 basic series 14 (short).

The spindles of the gate valves shall be of the non-rising type, except where specifically indicated otherwise and screwed so as to close the valves when rotated in a clockwise direction. The direction of closing shall be clearly cast on the valve cap or hand-wheel. Where specified, valves for replacement washouts shall be in accordance with specification Clause 202 except that the valve bodies shall be of epoxy coated ductile iron and the flanges shall be undrilled. Face to face dimensions for these valves shall be to BS 5155 basic series 14 (short).

The gate valves shall be subject to "Closed End Tests" in accordance with the procedure set out in BS 5163, AWWA C203-78, DIN 3230 Part 1-3, DIN 3352 Part 1-4.

The gate valves shall be suitable for opening and closing against an unbalanced head by manual operation.

The gate shall be of ductile iron fully rubber encapsulated, the gate sealing in the body being ensured by compressing of the rubber.

The gate valves shall be works cleaned and shot-blasted in accordance with BS 2640. They shall be coated internally and externally with fusion bounded powder epoxy or equivalent suitable for potable water and to a minimum thickness of 150 microns. The body, the bonnet and the gate of the valve shall be made of ductile iron to BS EN 1563 OR BS EN 1564, the gate being encapsulated with elastomer EPDM, nitrile or equivalent.

## 514. AIR VALVES

Automatic air relief and vacuum break valves (air valves) shall be of the anti-shock anti-surge type designed to meet the following requirements.

The required valves shall provide all of the functions described below.

- Pipeline filling
- Uninterrupted high volume air discharge through the large orifice.
- Pipeline draining or Column Separation
- Uninterrupted high volume air intake through the large orifice.
- Pipeline full and operating
- Discharge of dis-entrained pressurised air through the small orifice.
- Rapid Filling / Column Separation

The valve must incorporate an integral surge alleviation mechanism that will automatically dampen surge pressures due to rapid air discharge or the subsequent re-joining of separated water columns.

The air release and vacuum break valve shall be of a compact single chamber design with solid cylindrical High Density Polyethylene control floats. These shall be housed in a tubular stainless steel or corrosion protected body with epoxy powder coated cast iron, or s/steel ends secured by means of stainless steel tie rods.

The valve shall have an integral surge alleviation mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure due to high velocity air discharge or the subsequent re-joining of separated water columns. The limitation of pressure rise must be achieved by deceleration of approaching water prior to valve closure. Relief mechanisms that act subsequent to valve closure cannot react in the low millisecond time span required and are therefore unacceptable.

Large orifice sealing shall be effect by the flat face of the control float seating against a nitrile rubber 'Ó' Ring housed in a dovetail groove circumferentially surrounding the large orifice. Discharge of pressurised air shall be controlled by the seating and unseating of a small orifice on a natural rubber seal affixed to the control float.

The intake/discharge area shall be equal to the nominal size of the valve i.e. a 150 mm valve shall have a 150 mm intake/discharge orifice.

The valve construction shall be proportioned with regard to material strength characteristics, so that deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure.

The valve design shall incorporate an over pressure safety feature that will fail without an explosive effect, such as is normally the case when highly compressed air is released suddenly. This feature shall consist of easily replaceable components such as gaskets, seals or the like.

The air valve shall be provided with a separate isolating gate valve or if so specified with a separate isolating butterfly valve.

Unless otherwise specified all air valves shall be provided with an integral flanged inlet with studs appropriate to BS 4504 NP 16 or as the installation demands and complying with the appropriate nominal pressure.

Air valves shall be of approved manufacturer.

## 515. CHECK VALVES/NON-RETURN VALVES

Non return Valves shall be with face to face dimension to EN 558-1 GR 48 (DIN 3202 part 1 - F6), flange dimensions and drilling to EN 1092-2 PN 16 (DIN 28605 / DIN 2501) and shall be suitable for a nominal working pressure of 16 bar or higher pressure class (e.g. PN25, PN40) as specified, according to Drawings, Specifications and Bill of Quantities.

Body and disc of cast iron GG 250, disc lever-arm of ductile iron GGG 500, fluidised bed epoxy powder coated inside and outside to DIN 30677-Part 2 in accordance with the quality and test requirements of RAL-Quality Mark 662. The coating thickness shall be minimum 250µm freedom from imperfections shall be tested by high-voltage method.

The shaft, all bolts, nuts and washers shall be made from stainless steel. The disc gasket made from EPDM.

They are equipped with a cast iron removable top mounted with bolts and stud bolts and give access to the flap.

For special applications non return valves may have rubber membranes instead of flaps or steel-reinforced disks.

Working pressures of non-return valves is minimum 16 bar or higher if specified.

## 516. WATER METERS

The meters considered herein are:

- Single jet and Multi-jet Meters (Velocity Meters),
- Volumetric Meters (Displacement Meter) and
- Ultrasonic meters, UFM

The singlejet meters are applicable for small flow rates (diameters typically range from 15 to 50 mm). The multijet water meters are suitable for small and medium flow rates (diameters typically range from 15 to 150 mm). Displacement meters (Volumetric Meters) are sensitive to turbid water hence shall be accompanied by a strainer upstream. UFMs are mainly recommended for measurement of bulk flows (diameters typically range from 15 to 1,800 mm) and commonly used as 'clamp-on' meters to calibrate large diameter velocity meters.

All meters shall comply with applicable specifications (either according to EN ISO 4064:2014, or OIML R49: 2013). They shall be certified by Laboratories. In Kenya for all meters KEBS certificate will be mandatory.

The meter size will be designated by the nominal size of its inlet and outlet threaded or flanged connectors. Both the inlet and outlet shall be of the same size and on the same axis. For each meter size designated, the corresponding fixed set of dimensions must correspond to BS 5728/1, ISO 4064-1: 2014 and no deviations from this shall be accepted

**All meters of size 15 to 40mm diameter** shall be supplied complete with a set of copper alloy connectors

A water meter shall be of such design, composition, and construction that it does not facilitate the perpetration of fraud. A visible indicator showing any form of tampering is a requirement.

The meter shall have inbuilt Non – Return Valve to reduce the risk of water meter reversal fraud.

The meter shall be delivered calibrated.

The indicated volume of water shall be expressed in cubic metres and its multiples

The nominal diameter is required to be marked on the meter

A water meter shall be clearly and indelibly marked with the following information, either grouped or distributed, on the casing, the indicating device dial, an identification plate or the meter cover, if it is not detachable. These markings shall be visible without dismantling the water meter after the instrument has been placed on the market or put into use.

- Unit of measurement.
- Accuracy class, where it differs from accuracy class 2.
- Numerical value of $Q_3$ and the ratio $Q_3/Q$
- Type approval sign according to national regulations.
- Name or trademark of the manufacturer.
- Year of manufacture
- Serial number, Marking of approving laboratory with approval number
- Direction of flow
- Maximum admissible pressure (MAP)

A water meter shall be designated as accuracy class 2. This requires the Maximum Permissible Error (MPE) to be ±2 % (for temperatures from 0.1 °C to 30 °C and ±3 % for temperatures greater than 30 °C) for the upper flow rate zone.

The water meter manufacturer must guarantee that the meter will perform at its optimum accuracy throughout its lifespan with only the removal of silt.

A water meter shall be manufactured from materials of adequate strength and durability for the purpose for which it is to be used.

**Testing:** Before acceptance upon delivery 5% of the meters will be sampled at random. A batch will be considered as failed if one or more meters do not comply with the established technical specifications or have failed the tests. Under these circumstances, the specific batch of meters has to be rejected. Testing shall be coordinated by the Engineer and the cost thereof borne by the Contractor.

Meters will be supplied with installation instructions and maintenance manual. The installation instructions shall be guided by the ISO 4064-5:2014 best practice recommendations

The WASPA guidelines for water meters generally acceptable for appliances in Kenya and are recommended under this project.

### Bulk water meters

Unless otherwise directed, bulk water meters shall be in-line helical vane water meters. The meters shall comply with Class B measuring requirements of BS 5728. The meters shall comply dimensionally with ISO 4064, and shall have flanges drilled to BS EN 1092: 1997.or Compatible with the supplied flange fittings

Meter chambers will be purpose constructed to standard details

# 6. CONCRETE

## 601.SCOPE OF SECTION

This section covers the materials, design of mixes, mixing, transport, placing, compaction and curing of concrete and mortar required in the Works. It also covers formwork and reinforcement for concrete.

**DEFINITIONS**

- Structural concrete is any class of concrete which is used in reinforced, prestressed or unreinforced concrete construction, which is subject to stress.
- Non-structural concrete is composed of materials complying with the Specification but for which no strength requirements are specified and which is used only for filling voids, blinding foundations and similar purposes where it is not subjected to significant stress.
- A formed surface is a face which has been cast against formwork.
- An unformed surface is a horizontal or nearly horizontal surface produced by screeding or trowelling to the level and finish required.
- A pour refers to the operation of placing concrete into any mould, bay or formwork, etc. and also to the volume which has to be filled. Pours in vertical succession are referred to as lifts.

## 602. THE DESIGN OF CONCRETE MIXES

### a) Cement

Cement for structural concrete shall be CEM I – 42.5 to KS EAS 18-1 and KS EAS183

### b) Classes of Concrete

The classes of structural concrete to be used in the works shall be those shown on the Drawings and designated in Table 7.1, in which the class designation includes two figures. The first figure is the nominal strength at 28 days expressed in $N/mm^2$ and the second figure is the maximum nominal size of aggregate in the mix expressed in millimetres.

### c) Design of Proposed Mixes

The Contractor shall design all the concrete mixes called for on the Drawings, making use of the ingredients which have been approved by the Engineer for use in the Works and in compliance with the following requirements:-

**Table 7.1 - Concrete Classes and Strengths**

| Class of Concrete | Nominal Strength | Maximum Nominal Size | Maximum Water / Cement Ratio | | Trial Mixes Target Mean | Early Works Test Cubes | |
|---|---|---|---|---|---|---|---|
| | $N/mm^2$ | of Aggregate | | | Strength | Any one | Average of |
| | | mm | A | B | $N/mm^2$ | Cube $N/mm^2$ | any Group of 4 Cubes $N/mm^2$ |
| 10/75 | 10 | 75 | 0.60 | 0.55 | 13.5 | 8.5 | 13.3 |
| 15/75 | 15 | 75 | 0.60 | 0.50 | 21.5 | 12.8 | 20.0 |
| 15/40 | 15 | 40 | 0.60 | 0.50 | 21.5 | 12.8 | 20.0 |
| 15/20 | 15 | 20 | 0.57 | 0.50 | 21.5 | 12.8 | 20.0 |
| 20/40 | 20 | 40 | 0.55 | 0.48 | 31.5 | 17.0 | 27.5 |
| 20/20 | 20 | 20 | 0.53 | 0.48 | 31.5 | 17.0 | 27.5 |
| 20/10 | 20 | 10 | 0.50 | 0.48 | 31.5 | 17.0 | 27.5 |
| 25/40 | 25 | 40 | 0.52 | 0.46 | 36.5 | 21.3 | 32.5 |
| 25/20 | 25 | 20 | 0.50 | 0.46 | 36.5 | 21.3 | 32.5 |
| 25/10 | 25 | 10 | 0.48 | 0.46 | 36.5 | 21.3 | 32.5 |
| 30/40 | 30 | 40 | 0.50 | 0.45 | 41.5 | 25.5 | 37.5 |
| 30/20 | 30 | 20 | 0.48 | 0.45 | 41.5 | 25.5 | 37.5 |
| 30/10 | 30 | 10 | 0.47 | 0.45 | 41.5 | 25.5 | 37.5 |
| 40/20 | 40 | 20 | 0.46 | 0.43 | 51.5 | 34.0 | 47.5 |
| 40/10 | 40 | 10 | 0.45 | 0.43 | 51.5 | 34.0 | 47.5 |

**NOTES**: 1. Under water/cement ratio, column A applies to moderate and intermediate exposure, and column B applies to severe exposure. See NOTE after Table 7.2.

2. In case of concrete having a maximum aggregate size of 40mm or less, 150mm cubes should be used.

   In case of concrete having a 75mm or larger aggregate, 200mm cubes should be used.

   i) The aggregate portion shall be well graded from the nominal maximum size of stone down to the 150 micron size.

   ii) The cement content shall be such as to achieve the strengths called for in Table 7.1 but in any case not less than the minimum necessary

for impermeability and durability shown in Table 7.2.

iii) The workability shall be consistent with ease of placing and proper compaction having regard to the presence of reinforcement and other obstructions.

iv) The water/cement ratio shall be the minimum consistent with adequate workability but in any case not greater that that shown in Table 7.1 taking due account of any water contained in the aggregates. The Contractor shall take into account that this requirement may in certain cases require the inclusion of a workability agent in the mix.

v) The drying shrinkage determined in accordance with BS 1881 shall not be greater than 0.05 percent.

**Table 7.2 - Minimum Cement Content**

| Minimum Cement Content - kg/m$^3$ of Compacted Concrete | | | |
|---|---|---|---|
| **Class of Concrete** | **Moderate Exposure** | **Intermediate Exposure** | **Severe Exposure** |
| 10/75,15/75 | 200 | 220 | 270 |
| 15/40, 20/40, 25/40, 30/40 | 240 | 270 | 290 |
| 15/20, 20/20, 25/20, 30/20 | 260 | 300 | 330 |
| 40/20 | 300 | 320 | 330 |
| 20/10, 25/10, 30/10 | 300 | 340 | 390 |
| 40/10 | 310 | 340 | 390 |

**Note**: the minimum cement contents shown in the above table are required in order to achieve impermeability and durability. In order to meet the strength requirements in the Specification higher contents may be required.

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

| | |
|---|---|
| Moderate exposure | Surface sheltered from severe rain; buried concrete, concrete continuously under water |
| Intermediate drying | Surface exposed to driving rain; alternate wetting exposure and drying; exposure traffic; corrosive fumes; heavy condensation |
| Severe exposure | Surface exposed to sea water, moorland water having a pH of 4.5 or less, groundwater containing sulphates. |

**d) Trial Mixes**

At least six weeks before commencing placement of concrete in the Permanent Works trial

mixes shall be prepared for each class of concrete specified.

For each mix of concrete for which the Contractor has proposed a design, he shall prepare three separate batches of concrete using the materials which have been approved for use in the works and the mixing plant which he proposes to use for the Works. The volume of each batch shall be the capacity of the concrete mixer proposed for full production.

Samples shall be taken from each batch and the following action taken, all in accordance with BS 1881:-

a. The slump of the concrete shall be determined.

b. Six test cubes shall be cast from each batch. In the case of concrete having a maximum aggregate size of 40mm or less, 150mm cubes shall be used. In the case of concrete containing 75mm or larger aggregate, 200mm cubes shall be used and in addition any pieces of aggregate retained on a 53mm BS sieve shall be removed from the mixed concrete before casting the cubes.

c. Three cubes from each batch shall be tested for compressive strength at seven days and the remaining three at 28 days.

d. 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 7.1.

The Contractor shall also carry out tests to determine the drying shrinkage of the concrete unless otherwise directed by the Engineer.

Based on the results of the tests on the trial mixes, the Contractor shall submit full details of his proposals for mix design to the Engineer, including the type and source of each ingredient, the proposed proportions of each mix and the results of the tests on the trial mixes.

If the Engineer does not agree to a proposed concrete mix for any reason, the Contractor shall amend his proposals and carry out further trial mixes. No mix shall be used in the works without the written consent of the Engineer.

**e) Quality Control of Concrete Production**

i) Sampling

For each class of concrete in production at each plant for use in the works, samples of concrete shall be taken at the point of mixing and/or of deposition as instructed by the Engineer, all in accordance with the sampling procedures described in BS 1881 and with the additional

requirements as set out below.

Six number 150mm or 200mm cubes as appropriate shall be made from each sample and shall be cured and tested all in accordance with BS 1881, two at seven days and the other four at 28 days.

Each sample shall be taken from one batch selected at random and at intervals such that each sample represents not more than $20m^3$ of concrete unless the Engineer agrees to sampling at less frequent intervals.

Until compliance with the Specification has been established the frequency of sampling shall be three times that stated above or such lower frequency as may be instructed by the Engineer.

ii) Testing

1) The slump or compacting factor of the concrete shall be determined for each batch from which samples are taken and in addition for other batches at the frequency instructed by the Engineer.

The slump of the concrete in any batch shall not differ from the value established by the trial mixes by more than 25mm or one third of the value, whichever is the greater.

The variation in value of the compacting factor, if used in place of a slump value, shall be within the following limits:

For value of 0.9 or more +0.03

For value of between 0.8 and 0.9 +0.04

For values of 0.8 or less +0.05

2) The water/cement ratio as estimated from the results of (a) above, determined by samples from any batch shall not vary by more than five per cent from the value established during the trial mixes.

3) The air content of air entrained concrete in any batch shall be within 1.5 units of the required value and the average value of four consecutive measurements shall be within 1.0 unit of the required value, expressed as a percentage of the volume of freshly mixed concrete.

4) Until such time as sufficient test results are available to apply the method of control described in 5) 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 7.1 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 7.1 under the same heading.

The 7-day cube result may be used as an early strength indicator, at the discretion of the Engineer.

5) When test cube results are available for at least 20 consecutive batches of any class of concrete mixed in any one plant, the average of any four consecutive results at 28 days shall exceed the nominal strength by not less than half the current margin (Table 7.3) and each individual result shall not be less than 85 per cent of the nominal strength.

The current margin shall be defined as 1.64 times the standard deviation of cube tests on at least 20 separate consecutive batches produced from one plant over a period exceeding five days but not exceeding six months or on at least 50 separate consecutive batches produced from one plant over a period not exceeding 12 months. If both figures are available, the smaller shall be taken.

The current margin shall in any case not be less than the figure given below:-

**Table 7.3 - Minimum Current Margin For Test Cubes**

| | Minimum Current Margin for | | |
|---|---|---|---|
| | **10N/mm$^2$** | **15N/mm$^2$ & above** | **20N/mm$^2$** |
| After 20 batches | 3.3 | 5 | 7.5 |
| After 50 batches | 1.7 | 2.5 | 3.8 |

Failure to comply with requirements:

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

If more than one cube result in a group of four consecutive results is less than 85% of the nominal strength or if the average strength of the group fails to satisfy the strength requirement then all the batches between those represented by the first and last cubes in the group shall be deemed not to comply with the Specification, and the Specification, and the Contractor shall immediately adjust the mix design subject to the agreement of the Engineer to restore compliance with the Specification. After adjustment of the mix design the Contractor will again be required to comply with sub- clauses 701(b) and 701(c) of this Section of the Specification.

The Contractor shall take necessary action to remedy concrete which does not comply with this Specification. Such action may include but is not necessarily confined to the following:-

i) Increasing the frequency of sampling until control is

again established.

ii) Cutting test cores from the concrete and testing in accordance with SRN 117.

iii) Carrying out strengthening or other remedial work to the concrete where possible or appropriate.

iv) Carrying out non-destructive testing such as load tests on beams.

v) Removing the concrete.

## 603. MIXING CONCRETE

Before any plant for batching, mixing, transporting, placing, compacting and finishing concrete is ordered or delivered to site, the Contractor shall submit to the Engineer full details including drawings of all the plant which he proposes to use and the arrangements he proposes to make.

Concrete for the Works specifically for Treatment Works Units and Storage Reservoirs shall be and mixed using an automatic batching plant in one or more central location. If the Contractor proposes to use ready mixed concrete he shall submit to the Engineer for his approval full details and test results of the concrete mixes. The Engineer may approve the use of ready mixed concrete provided that:

a) the proposed mixes, the material to be used and the method of storage and mixing comply with the requirements of the Specification;

and

b) adequate control is exercised during mixing.

Approval for the use of ready mixed concrete may be withdrawn if the Engineer is not satisfied with the control of the materials being used and control during mixing.

The mixing of concrete shall be carried out at central plant located at a site remote from place of discharge of mixed concrete. The mixed concrete shall be transported from the central plant using transit lorry mixers and/or agitator trucks.

Batching and mixing plants shall be modern efficient equipment complying with the requirements of SRN 118 and capable of producing a uniform distribution of the ingredients throughout the mass. Truck mixes shall comply with the requirements of SRN 121 and shall only be used with the prior agreement of the Engineer. If the plant proposed by the Contractor does not fall within the scope of SRN 118, it shall have been tested in accordance with SRN 119 and shall have a mixing performance within the limits specified in SRN 118.

All mixing operations shall be under the control of an experienced supervisor.

The aggregate storage bins shall be provided with drainage facilities arranged so that drainage water is not discharged to the weigh hoppers. Each bin shall be drawn down at least once per week and any accumulations of mud or silt removed.

Cement and aggregate shall be batched by weight. Water may be measured by weight or

volume.

The weighing and water dispensing mechanisms shall be maintained in good order. Their accuracy shall be maintained within the tolerances described in SRN 118 and checked against accurate weighs and volumes when required by the Engineer.

The weighs of cement and of each size of aggregate as indicated by the mechanisms employed shall be within a tolerance of plus or minus two percent of the respective weights per batch agreed by the Engineer.

The Contractor shall provide standard test weights at least equivalent to the maximum working load used on the most heavily loaded scale and other auxiliary equipment required for checking the satisfactory operation of each scale or other measuring device. Tests shall be made by the Contractor at least once a week or at intervals to be determined by the Engineer and shall be carried out in his presence. For the purpose of carrying out these tests, there shall be easy access for personnel to the weigh hoppers. The Contractor shall furnish the Engineer with copies of the complete results of all check tests and shall make any adjustments, repairs or replacements necessary to ensure satisfactory performance.

The nominal drum or pan capacity of the mixer shall not be exceeded. The turning speed and the mixing time shall be as recommended by the manufacturer, but in addition, when water is the last ingredient to be added, mixing shall continue for at least one minute after all the water has been added to the drum or pan.

The blades of pan mixers shall be maintained within the tolerances specified by the manufacturer of the mixer and the blades shall be replaced when it is no longer possible to maintain the tolerances by adjustment.

Mixers shall be fitted with an automatic recorder registering the number of batches discharged.

The water to be added to the mix shall be reduced by the amount of free water contained in the coarse and fine aggregates. This amount shall be determined by the Contractor by a method agreed by the Engineer immediately before mixing begins each day and thereafter at least once per hour during concreting and for each delivery of aggregates during concreting. When the correct quantity of water, determined as set out in the Specification, has been added to the mix, no further water shall be added, either during mixing or subsequently.

After mixing for the required time, each batch shall be discharged completely from the mixer before any materials for the succeeding batch are introduced.

Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before any fresh concrete is mixed and thereafter the first batch of concrete through the mixers shall contain only half the normal quantity of coarse aggregate. This batch shall be mixed for one minute longer than the time applicable to a normal batch.

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

## 604. HAND-MIXED CONCRETE

Concrete for structural purposes shall not be mixed by hand. Where non-structural concrete is

required, hand mixing may be carried out subject to the agreement of the Engineer.

The mixing shall be done on a hard impermeable surface. The materials shall be turned over not less than three times dry, water shall then be sprayed on and the materials again turned over not less than three times in a wet condition and worked together until a mixture of uniform consistency is obtained.

For hand mixed concrete the specified quantities of cement shall be increased by 10% and not more than 0.5 cubic metre shall be mixed at one time. During windy weather efficient precautions shall be taken to prevent cement from being blown away during the process of gauging and mixing.

## 605. 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 mixed concrete shall be transported using agitator trucks or transit truck mixers. The agitating speed of the drum shall be between 2 and 4 rpm. The interval between feeding of water into the mixer drum and final discharging of the concrete shall not exceed one hour.

The time elapsed between mixing and placing a batch of concrete shall be as short as practicable and in any case not longer than will permit completion of placing and compaction before the onset of initial set. If the placing of any batch of concrete is delayed beyond this period, the concrete shall not be placed in the Works.

## 606. PLACING OF CONCRETE

### a) Consent for Placing

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

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

### b) Preparation of Surface to Receive Concrete

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

Existing concrete surfaces shall be prepared as set out in Clause 714. Before deposition of further concrete they shall be clean, hard and sound and shall be wet but without any free-standing water.

Any flow of water into an excavation shall be diverted through proper side drains to a sump, or be removed by other suitable methods which will prevent washing away the freshly deposited concrete or any of its constituents. Any underdrains constructed for this purpose shall be completely grouted up when they are no longer required by a method agreed by the Engineer.

Unless otherwise instructed by the Engineer surfaces against which concrete is to be placed shall receive a prior coating of mortar mixed in the proportions similar to those of the fines portion in the concrete to be placed. The mortar shall be kept ahead of the concrete. The mortar shall be well worked into all parts of the excavated surface and shall not be less than 5mm thick.

If any fissures have been cleaned out as described in Section 3 of this Specification they shall be filled with mortar or with concrete as instructed by the Engineer.

The amount of mortar placed at any one time shall be limited so that it does not dry out or set before being covered with concrete.

**c) Chutes**

In general, transportation of concrete by the use of chutes will not be permitted unless approved by the Engineer. The chute shall have a section with round corners and shall have a proper fixed slope so as to allow the concrete to flow satisfactorily and without segregation. The lower end of chute shall be provided with a drop chute not less than 0.6m in height to avoid segregation of falling concrete. The height of drop shall not exceed 1.5m. Chutes shall be protected from direct sunlight, wind and rain.

**d) Concrete Pump or Placer**

The type and capacity of pump shall be determined to meet the specified requirements, taking into account the placing speed, construction schedule, quality of concrete, location to which concrete is poured, etc. Diameter of the delivery pipes shall be not smaller than 3 times of the maximum size of aggregates to be used in the concrete.

Delivery pipes shall be so installed as to permit easy removal. Before starting the pump or placer operation, about one cubic metre of mortar with the same proportion of water, admixture, cement and fine aggregate as designated for the regular concrete mix shall be passed through the pipe. The pipe shall be set as straight and horizontally as possible to prevent clogging of the concrete mix in the pipe. The supports of the pipe line shall be stiff enough to fix the pipes firmly without adverse effect on forms and reinforcing steel already set in position. Care shall be taken to prevent leakage of the concrete mix from the pipe line or any other part.

Air boosters shall not be used except in conditions where the outlet of the pipe is completely embedded at least 2 metres in fresh concrete.

**e) Placing Procedures**

The concrete shall be deposited as nearly as possible in its final position. It shall be placed so as to avoid segregation of the concrete and displacement of the reinforcement, other embedded items, or formwork. It shall be brought up in layers approximately parallel to the construction joint planes and not exceeding 500mm in compacted thickness unless otherwise permitted or directed by the Engineer, but the layers shall not be thinner than four times the maximum nominal size of aggregate.

Layers shall be placed so that they do not form feather edges nor shall they be placed on a previous layer which has taken its initial set. In order to comply with this requirement, a layer may be started before completion of the preceeding layer.

All the concrete in a single bay or pour shall be placed in a continuous operation. It shall be carefully worked round all obstructions, irregularities in the foundations and the like so that all parts are completely full of compacted concrete with no segregation or honeycombing. It shall also be carefully worked round and between waterstops, reinforcement, embedded steelwork and similar items which protrude above the surface of the completed pour.

All work shall be completed on each batch of concrete before its initial set commences and thereafter the concrete shall not be disturbed before it has set hard. No concrete that has partially hardened during transit shall be used in the Works and the transport of concrete from the mixer to the point of placing shall be such that this requirement can be complied with.

Concrete shall not be placed during rain which is sufficiently heavy or prolonged as to wash mortar from coarse aggregate on the exposed faces of fresh concrete. Means shall be provided to remove any water accumulating on the surface of the placed concrete. Concrete shall not be deposited into such accumulation of water.

In drying weather, covers shall be provided for all fresh concrete surfaces which are not being worked on. Water shall not be added to concrete for any reason.

When concrete is discharged above its place of final deposition, segregation shall be prevented by the use of chutes, downpipes, trunking, baffles or other appropriate devices, as approved by the Engineer.

Forms for walls, columns and other thin sections of significant height shall be provided with openings or other devices that will permit the concrete to be placed in a manner that will prevent segregation and accumulations of hardened concrete on the formwork or reinforcement above the level of the placed concrete.

When it is necessary to place concrete under water the Contractor shall submit to the Engineer his proposals for the method and equipment to be employed. The concrete shall be deposited either by bottom-discharging watertight containers or through funnel-shaped tremies which are kept continuously full with concrete up to level above the water and which shall have the discharging bottom fitted with a trapdoor and immersed in the concrete in order to reduce to a minimum the contact of the concrete with the water. Special care shall be taken to avoid segregation.

If the level of concrete in a tremie pipe is allowed to fall to such an extent that water enters the pipe, the latter shall be removed from the pour and filled with concrete before being again lowered into the placing position. During and after concreting under water, pumping or dewatering in the immediate vicinity shall be suspended if there is any danger that such work will disturb the freshly placed concrete.

### f) Interruptions to Placing

If concrete placing is interrupted for any reason and the duration of the interruption cannot be forecast or is likely to be prolonged, the Contractor shall immediately take the necessary action to form a construction joint so as to eliminate as far as possible feather edges and sloping top surfaces and shall thoroughly compact the concrete already placed in accordance with Clause

706. All work on the concrete shall be completed while it is still plastic and it shall not thereafter be disturbed until it is hard enough to resist damage. Plant and materials to comply with this requirement shall be readily available at all times during concrete placing.

Before concreting is resumed after such an interruption the Contractor shall cut out and remove all damaged or uncompacted concrete, feather edges or any other undesirable features and shall leave a clean sound surface against which the fresh concrete may be placed.

If it becomes possible to resume concrete placing without contravening the Specification and the Engineer consents to a resumption, the new concrete shall be thoroughly worked in and compacted against the existing concrete so as to eliminate any cold joints.

**g) Dimensions of Pours**

Unless otherwise agreed by the Engineer, pours shall not be more than two metres high and shall as far as possible have a uniform thickness over the plan area of the pour. Concrete shall be placed to the full planned height of all pours except in the circumstances described in sub-clause 705(d).

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

**h) Placing Sequence**

The Contractor shall arrange that as far as possible the intervals between placing successive lifts of concrete in one section of the Works are of equal duration. This duration shall normally be not less than three or more than seven days under temperate weather conditions unless otherwise agreed by the Engineer.

Where required by the Engineer to limit the opening of construction joints due to shrinkage, concrete shall not be placed against adjacent concrete which is less than 21 days old.

When the drawings call for contraction gaps in concrete, these shall be of the widths and in the locations shown on the drawings and they shall not be filled until the full time interval shown on the drawings has elapsed.

## 607. COMPACTION OF CONCRETE

The concrete shall be fully compacted throughout the full extent of the placed layer. It shall be thoroughly worked against the formwork and around any reinforcement and other embedded items, without displacing them. Particular care shall be taken at arises and other confined spaces. Successive layers of the same pour shall be thoroughly worked together.

Concrete shall be compacted with the assistance of mechanical immersion vibrators, unless the Engineer agrees to another method.

Immersion vibrators shall operate at a frequency of between 7,000 and 10,000 cycles per minute. The Contractor shall ensure that vibrators are operated at pressures and voltages not less than those recommended by the manufacturer in order that the compactive effort is not reduced.

A sufficient number of vibrators shall be operated to enable the entire quantity of concrete being placed to be vibrated for the necessary period and, in addition, standby vibrators shall be available for instant use at each place where concrete is being placed.

Where the concrete contains aggregate with a nominal size of 75mm or more, vibrators with a diameter of 100mm or more shall be used.

Vibration shall be continued at each point until the concrete ceases to contract, a thin layer of mortar has appeared on the surface and air bubbles have ceased to appear. Vibrators shall not be used to move concrete laterally and shall be withdrawn slowly to prevent the formation of voids.

Vibration shall not be applied by way of reinforcement nor shall vibrators be allowed to touch reinforcement or other embedded items. The vibrators shall be inserted vertically into the concrete to penetrate the layer underneath at regular spacing. The spacing shall not exceed the distance from the vibrator over which vibration is visibly effective.

## 608. CURING OF CONCRETE

### a) General

Concrete shall be protected during the first stage of hardening from loss of moisture and from the development of temperature differentials within the concrete sufficient to cause cracking. The methods used for curing shall not cause damage of any kind to the concrete.

Curing shall be continued for as long as may be necessary to achieve the above objectives but in any case for at least seven days or until the concrete is covered by later construction whichever is the shorter period.

The above objectives are dealt with in sub-clause 707(b) and (c) but nothing shall prevent both objectives being achieved by a single method where circumstances permit.

The curing process shall commence as soon as the concrete is hard enough to resist damage from the process, and in the case of large areas or continuous pours, shall commence on the completed section of the pour before the rest of the pour is finished.

Details of the Contractor's proposals for curing concrete shall be submitted to the

Engineer before the placing of concrete commences in the Works.

Formed surfaces may be cured by retaining the formwork in place for the required curing period.

If the use of the foregoing methods is inappropriate, surfaces which will not have further concrete bonded to them and which are not to receive an application of a finish may be cured by the application of a curing compound having an efficiency index of at least 90 percent. Curing compounds shall contain a fugitive dye to enable the extent of the spread to be seen easily.

Curing compound is used on surfaces exposed to the atmosphere shall contain sufficient finely divided flake aluminium 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 707(c).

Water used for curing shall be of the same quality as that used for concrete mixing as stated in Clause 702.

**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 709(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.

## 609. PROTECTION OF FRESH CONCRETE

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

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

Concrete placed in the Works shall not be subjected to any loading until it has attained at least its nominal strength as defined in Clause 701.

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.

## 610. CONCRETING IN HOT WEATHER

### a) General

The Contractor shall prevent damage to concrete arising from exposure to extreme temperatures, and shall maintain in good working order all plant and equipment required for this purpose.

In the event that conditions become such that even with the use of the equipment the requirements cannot be met, concrete placing shall immediately cease until such time as the requirements can again be met.

### b) Concrete Placing in Hot Weather

During hot weather the Contractor shall take all measures necessary to ensure that the temperature of concrete at the time of placing in the Works does not exceed 30 degrees centigrade and that the concrete does not 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 a mist water spray on aggregates

iii) Sun shields on mixing plants and transporting equipment.

iv) Cooling the mixing water. If ice is used for this purpose it should preferably be in flake form. Lump ice shall not be allowed to enter the tank supplying the mixer drum.

v) Covering skips closely with polythene sheet so that the latter is in contact with the concrete.

Areas in which concrete is to be placed shall be shielded from direct sunshine and rock or concrete surfaces shall be thoroughly wetted to reduce absorption of water from the concrete placed on or against them.

After concrete in any part of an area has been placed, the selected curing process shall be commenced as soon as possible. If any interval occurs between completion of placing and start of curing, the concrete shall be closely covered during the interval with polythene sheet to prevent loss of moisture.

## 611. FINISHES ON UNFORMED SURFACES

Horizontal or nearly horizontal surfaces which are not cast against formwork shall be finished to the class shown on the drawings and defined hereunder.

**UF 1 Finish**

All surfaces on which no higher class of finish is called for on the drawings or instructed by the Engineer shall be given a UF 1 finish.

The concrete shall be levelled and screeded to produce a uniform plain or ridged surface, surplus concrete being struck off by a straight edge immediately after compaction.

**UF 2 Finish**

This is a floated finish for roof or floor slabs and other surfaces where a hard trowelled surface is not required.

The surface shall first be treated as a Class UF 1 finish and after the concrete has hardened sufficiently, it shall be floated by hand or machine sufficiently only to produce a uniform surface free from screed marks.

**UF 3 Finish**

This is a hard trowelled surface for use where weather resistance or appearance is important, or which is subject to high velocity water flow.

The surface shall be floated as for a UF 2 finish but to the tolerance stated below. When the moisture film has disappeared and the concrete has hardened sufficiently to prevent laitance from being worked to the surface, it shall be steel trowelled under firm pressure to produce a dense, smooth uniform surface free from trowel marks.

**Table 7.4 - Surface Tolerances**

| Class of Finish | Tolerance in mm. See notes | | |
|---|---|---|---|
| | A | B | C |
| UF 1 | N/A | 10 | + 20 or - 10 |
| UF 2 | Nil | 10 | + 20 or - 10 |
| UF 3 | Nil | 5 | + 12.5 or -7.5 |

**Notes**:

1. Col. A is the maximum allowable value of any sudden change of level in the surface.
2. Col. B is the maximum allowable value of any gradual irregularity of the surface, as indicated by the gap between the surface and a three metre long straight edge or correctly shaped template placed on the surface.
3. Col. C is the maximum allowable value of the difference in level or position between a three metre long straight edge or correctly shaped template placed on the surface and the specified level or position of that surface.

Where dimensional tolerances are given on the drawings or in this Special Specification they shall take precedence over those given in Table 7.4.

## 612. 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 Clause 721 c) and ordinary Portland

cement complying with SRN 103. The mix proportions shall be as stated on the drawings or elsewhere in this Specification or if not stated shall be one part of cement to two parts of fine aggregate by weight.

Small quantities of mortar may be hand mixed but for amounts over 0.5 cubic metre a mechanical mixer shall be used.

The water content of the mortar shall be as low as possible consistent with the use for which it is required but in any case the water/cement ratio shall not be more than 0.5.

Mortar which is specified as 'dry pack' shall be mixed with sufficient water for the mix to become cohesive but not plastic when squeezed in the hand. Dry pack mortar shall be rammed into the cavity it is required to fill, using a hand rammer with sufficient force to ensure full compaction.

## 613. CONCRETE FOR SECONDARY PURPOSES

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

NS concrete shall be composed of ordinary Portland cement complying with SRN 103 and aggregates complying with SRN 108-111 including all-in aggregate within the grading limits of SRN 109 and SRN 111.

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

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

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

b) No Fines concrete (NF concrete) is intended for use where a porous concrete is required and shall only be used where shown on the drawings or instructed by the Engineer.

The mix shall consist of ordinary Portland cement complying with SRN 115. The aggregate size shall be 40mm to 10mm only. The weight of cement mixed with 0.3 cubic metre of aggregate shall not be less than 50 kg. The quantity of water shall not exceed that required to produce a smooth cement paste which will coat evenly the whole of the aggregate.

## 614. RECORDS OF CONCRETE PLACING

Records, in a form agreed by the Engineer, shall be kept by the Contractor of the details of every pour of concrete placed in the Works. These records shall include class of concrete, location of pour, date of pour, ambient temperature and weather conditions during mixing and placing and concrete temperature at time of placing, moisture contents of aggregates, details of mixes, batch numbers, cement batch number, results of all tests undertaken, location of test cube

sample points and details of any cores taken.

The Contractor shall supply to the Engineer four copies of these records each week covering work carried out the preceeding 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.

## 615. CONSTRUCTION JOINTS

Whenever concrete is to be bonded to other concrete which has hardened, the surface of contact between the sections shall be deemed a construction joint.

Where construction joints are shown on the drawings, the Contractor shall form such joints in those positions. The location of joints which the Contractor requires to make for the purpose of construction shall be subject to the agreement of the Engineer. Construction joints shall be in vertical or horizontal planes except in sloping slabs where they shall be normal to the exposed surface or elsewhere where the drawings require a different arrangement.

Construction joints shall be so arranged as to reduce to a minimum the effects of shrinkage in the concrete after placing, and shall be placed in the most advantageous positions with regard to stresses in the structures and the desirability of staggering joints.

Feather edges of concrete at joint shall be avoided and any feather edges which may have formed where reinforcing bars project through a joint shall be cut back until sound concrete has been reached.

The intersection of horizontal or near horizontal joints and exposed faces of concrete shall appear as straight lines produced by use of a guide strip fixed to the formwork at the top of the concrete lift, or by other means acceptable to the Engineer.

Construction joints formed as free surfaces shall not exceed a slope of 20 per cent from the horizontal.

The surface of the fresh concrete in horizontal or near horizontal joints shall be thoroughly cleaned and roughened by means of high pressure water and air jets when the concrete is hard enough to withstand the treatment without the leaching of cement. The surface of vertical or near vertical joints shall be similarly treated if circumstances permit the removal of formwork at a suitable time.

Where concrete has become too hard for the above treatment to be successful, the surface whether formed or free is to be thoroughly scrabbled by mechanical means or wet sand blasted and then washed with clean water. The indentations produced by scrabbling shall be not less than 10mm deep and shall not extend closer than 40mm to a finished face.

If instructed by the Engineer the surface of the concrete shall be thoroughly brushed with a thin layer of mortar composed of one part of cement to two parts of sand by weight and complying with Clause 711 all as set out in sub-clause 705(b) immediately prior to the deposition of fresh concrete. The mortar shall be kept just ahead of the fresh concrete being placed and the fresh layer of concrete shall be thoroughly and systematically vibrated to full depth to ensure

complete bond with the adjacent layer.

No mortar or concrete may be placed in position on or against a construction joint until the joint has been inspected and passed by the Engineer.

## 616. EXPANSION AND CONTRACTION JOINTS

Expansion and contraction joints are discontinuities in concrete designed to allow thermal or other movements in the concrete.

Expansion joints are formed with a gap between the concrete faces to permit subsequent expansion of the concrete. Contraction joints are formed to permit initial contraction of the concrete and may include provision for subsequent filling.

Expansion and contraction joints shall be formed in the positions and in accordance with the details shown on the drawings or elsewhere in the Specifications.

## 617. WATERSTOPS

All references to waterstops include grout stops.

Waterstops shall be of the material and form shown on the drawings. No waterstop material shall be brought on the site until the Contractor has submitted full details of the materials he proposes to use, including samples, and these have been tested and approved by the Engineer. All samples shall be of adequate length for testing.

Waterstops shall be made of materials which are resistant to chlorides, sulphates, or other deleterious substances which may be present in the environment of the Works.

Rubber waterstops may be of natural rubber and shall have an elongation at breaking stress of at least 500 percent at 25 degrees centigrade and shall allow a joint movement of at least 50mm.

Polyvinyl chloride (PVC) waterstops shall be extruded from an unfilled plasticised PVC polymer or copolymer which does not contain any reclaimed or scrap PVC. PVC waterstops shall have an elongation at breaking stress of at least 225 percent at 25 degrees centigrade and shall allow a joint movement of at least 10mm.

Low modulus waterstops shall be of rubber or PVC as described above but shall have an elongation of at least 200 percent at 25 degrees centigrade under a tensile stress of 6N/mm2 and shall allow a joint movement of at least 50mm.

Waterstops shall be supplied in lengths as long as possible consistent with ease of handling and construction requirements.

In rubber or plastic materials, joints other than butt joints shall be supplied ready made by the manufacturer. Butt joints shall be made on site in accordance with the manufacturer's instructions and with equipment supplied for the purpose by the manufacturer.

Waterstop material shall be stored carefully on site to avoid damage and contamination with oil, grease, or other pollutants. Rubber and plastic waterstops shall be stored in cool well ventilated places away from direct sunlight.

Rubber and plastic waterstops which are embedded in one side of a joint more than one month

before the scheduled date of placing concrete on the other side, shall be protected from the sun.

Waterstops shall be firmly fixed in the formwork so that they cannot be displaced during concrete placing and shall be completely free of all dirt, grease, oil, etc., before placing concrete. Where eyelets are provided these shall be fully wired to the reinforcement and be the only means whereby the waterstop is fixed. In no circumstances shall a waterstop be punctured with nails etc. as a means of fixing.

Concrete shall be placed carefully round waterstops so as to avoid distortion or displacement and shall be fully compacted. Where waterstops lie in a horizontal or nearly horizontal plane the Contractor shall ensure that no voids are left on the underside of the waterstop.

Formwork around waterstops shall be carefully removed to avoid damage. If waterstops suffer any damage which cannot be properly repaired in-situ the Engineer may require a section of concrete to be removed and the waterstop replaced.

## 618. GROUTING OF POCKETS AND HOLES AND UNDERPINNING OF BASEPLATES

Pockets and holding-down bolt holes shall be thoroughly cleaned out using compressed air and water jet. Holes drilled by a diamond bit shall be roughened. The pockets and holes shall be filled with grout consisting of cement and clean fresh water mixed in proportion of two parts by weight of cement to one part by weight of water. The pouring of liquid grout shall cease as soon as each hole is filled and any excess grout on the surface of the concrete foundation shall be completely removed and the surface dried off before the next operation proceeds.

The space between the top surface of foundation concrete and the underside of the baseplates shall be filled with a special mortar made up in the following proportions:-

- Portland Cement ..... 50 kg.
- Fine aggregate ..... 50 kg.
- An additive acceptable to the Engineer to counteract shrinkage in proportions recommended by the manufacturer.

The special mortar shall be mixed with the lowest water-cement ratio which will result in a consistency of mix of sufficient workability to enable maximum compaction to be achieved.

The special mortar shall then be well rammed in horizontally below the baseplate and from one edge only until it is extruded from the other three sides. The mortar which has extruded shall then be rammed back to ensure complete support without voids.

## 619. REMEDIAL WORK TO DEFECTIVE SURFACES

If on stripping any formwork the concrete surface is found to be defective in any way, the Contractor shall make no attempt to remedy such defects prior to the Engineer's inspection and the receipt of any instructions which the Engineer may give.

Defective surfaces shall not be made good by plastering.

Areas of honey combing (of a mild nature) which the Engineer agrees may be repaired shall be

cut back to sound concrete or to 75mm whichever is the greater distance. In the case of reinforced concrete the area shall be cut back to at least 25mm clear distance behind the reinforcement or to 75mm, whichever is the greater distance. The cavity shall have sides at right angles to the face of the concrete. After cleaning out with water and compressed air, a thin layer of cement grout shall be brushed on to the concrete surface in the cavity and it shall then be filled immediately with concrete of the same class as the main body but with aggregate larger than 20mm nominal size removed. A form shall be used against the cavity, provided with a lip to enable concrete to be placed. The form shall be filled to a point above the top edge of the cavity.

After seven days the lip of concrete shall be broken off and the surface ground smooth. Surface irregularities which are outside the limits of tolerance set out in Clause 710 shall be ground down in the manner and to the extent instructed by the Engineer.

Severe honeycombing and defects other than those mentioned above shall be dealt with as instructed by the Engineer.

## 620. REINFORCEMENT MATERIALS

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

Where required, mild steel reinforcement, medium tensile steel reinforcement and high tensile steel reinforcement shall comply with BS 4449:2005+A2:2009:2005+A2:2009. Cold twisted steel reinforcement shall comply with BS 4483:2005:2005.

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

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

All reinforcement shall be free from scale, rust, grease, paint or other substances likely to reduce the bond between the steel and the concrete.

## 621. BENDING REINFORCEMENT

Unless otherwise shown on the drawings, bending and cutting shall comply with SRN 129.

The Contractor shall satisfy himself as to the accuracy of any bar bending schedules supplied and shall be responsible for cutting, bending, and fixing the reinforcement in accordance with the drawings. Any discrepancies should be brought to the attention of the Engineer prior to ordering the reinforcement.

Bars shall be bent cold by the application of slow steady pressure. At temperatures below 5 degrees centigrade the rate of bending shall be reduced if necessary to prevent fracture of the steel.

After bending, bars shall be securely tied together in bundles or groups and legibly labelled as set out in SRN 129.

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

## 622. FIXING REINFORCEMENT

Reinforcement shall be securely fixed in position within a dimensional tolerance of 20mm in any direction parallel to a concrete face and within a tolerance of 5mm at right angles to a face, provided that the cover is not thereby decreased below the minimum shown on the drawings, or if not shown shall be not less than 25mm or the diameter of the bar, whichever is the greater. Cover on distribution steel shall not be less than 15mm or the diameter of the bar whichever is the greater.

Unless otherwise agreed by the Engineer, all intersecting bars shall either be tied together with 1.6mm diameter soft annealed iron wire and the ends of the wire turned into the body of the concrete, or shall be secured with a wire clip of a type agreed by the Engineer.

Spacer blocks shall be used for ensuring that the correct cover is maintained on the reinforcement. Blocks shall be as small as practicable and of a shape agreed by the Engineer. They shall be made of mortar mixed in the proportions of one part of cement to two parts of sand. Wires cast into the block for tying in to the reinforcement shall be 1.6mm diameter soft annealed iron.

Alternatively another type of spacer block may be used subject to the Engineer's agreement.

Reinforcement shall be rigidly fixed so that no movement can occur during concrete placing. Any fixings made to the formwork shall not be within the space to be occupied by the concrete currently being placed.

No splices (laps) shall be made in the reinforcement except where shown on the drawings or agreed by the Engineer. Splice lengths shall be as shown on the drawings. Reinforcement shall not be welded except where required by the Contract or agreed by the Engineer. If welding is employed, the procedures shall be as set out in SRN 937 for gas welding or SRN 919 for metal arc welding. Full strength butt welds shall only be used for steel complying with SRN 126, and if used on high yield deformed bars complying with SRN 126 the permissible stresses in the vicinity of the weld shall be reduced to those applicable to plain bars complying with that Specification.

Mechanical splices shall not be used unless the Engineer agrees otherwise.

The Contractor shall ensure that reinforcement left exposed in the Works shall not suffer distortion, displacement or other damage. When it is necessary to bend protruding reinforcement aside temporarily, the radius of the bend shall not be less than four times the bar diameter for mild steel bars or six times the bar diameter for high yield bars. Such bends shall be carefully straightened before concrete placing continues, without leaving residual links or damaging the concrete around them. In no circumstances will heating and bending of high yield bars be permitted.

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

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

Bars complying with SRN 127 or other high tensile bars shall not be bent after placing in the Works.

Before concrete is placed in any section of the Works which includes reinforcement, the reinforcement shall be completely clean and free from all contamination including concrete which may have been deposited on it from previous operations.

The Engineer's approval for concrete placing is to be sought in writing for each pour, leaving adequate time to inspect and rectify any defects noted in the formwork, falsework, reinforcement, scaffolding, concreting arrangements, etc.

## 623. MATERIALS FOR CONCRETE

### a) General

The Contractor shall submit to the Engineer full details of all materials which he proposes to use for making concrete. No concrete shall be placed in the Works until the Engineer has approved the materials of which it is composed. Approved materials shall not thereafter be altered or substituted by other materials without the consent of the Engineer.

### b) Cement

Cement shall comply with the following Kenya Standards:-

- SRN 103 for Ordinary Portland cement.
- SRN 103 for Rapid Hardening Portland cement plus all special conditions to its use stipulated by the manufacturer.
- SRN 104 for Sulphate Resisting or High Alumina cement.

Cement shall be free flowing and free of lumps. It shall be supplied in the manufacturer's sealed unbroken bags or in bulk. Bagged cement shall be transported in vehicles with effective means of ensuring that it is protected from the weather.

Bulk cement shall be transported in vehicles or in containers specially built and equipped for the purpose.

Cement in bags shall be stored in a suitable weatherproof structure of which the interior shall be dry and well ventilated at all times. The floor shall be raised above the surrounding ground level and shall be so constructed that no moisture rises through it.

Each delivery of cement in bags shall be stacked together in one place. The bags shall be closely stacked so as to reduce air circulation but shall not be stacked against an outside wall. If pallets are used, they shall be constructed so that bags are not damaged during handling and stacking. No stack of cement bags shall exceed 3 metres in height. Different types of cement in bags shall be clearly distinguished by visible markings and shall be stored in separate stacks.

Cement from broken bags shall not be used in the Works.

Cement in bags shall be used in the order in which it is delivered.

Bulk cement shall be stored in weatherproof silos which shall bear a clear indication of the type of cement contained in them. Different types of cement shall not be mixed in the same silo.

The Contractor shall provide sufficient storage capacity on site to ensure that his anticipated programme or work is not interrupted due to lack of cement.

Cement which has become hardened or lumpy or fails to comply with the Specification in any way shall be removed from the site.

All cement for any one structure shall be from the same source.

All cement used in the Works shall be tested by the manufacturer or the Contractor in a laboratory acceptable to the Engineer. The tests to be performed shall be those set out in SRN 103 and the Contractor shall supply two copies of each certificate to the Engineer.

Each set of tests carried out by the manufacturer or Contractor shall relate to not more than one day's output of each cement plant, and shall be made on samples taken from cement which is subsequently delivered to the site. Alternatively, subject to the agreement of the Engineer, the frequency of testing shall be one set of tests for every 200 tones of cement delivered to site from each cement plant.

Cement which is stored on site for longer than one month shall be re-tested in the laboratory of the Materials Branch of the Ministry of Transport & Communications or at the Kenya Bureau of Standards or at any other approved laboratory at the rate of one set of tests as shown in SRN 103 for every 200 tonnes, and at monthly intervals thereafter.

Cement which does not comply with the Specification shall not be used in the Works and it shall be disposed off by the Contractor.

The Contractor shall keep full records of all data relevant to the manufacture, delivery, testing and use of all cement used in the Works and shall provide the Engineer with two copies thereof.

**c) Fine Aggregate**

Fine aggregate shall be clean, hard and durable and shall be natural sand, crushed gravel sand or crushed rock sand complying with SRN 108. All the material shall pass through a 5mm standard sieve and the grading shall be in accordance with Zones 1, 2 or 3 of SRN 109. In order to achieve an acceptable grading, it may be necessary to blend materials from more than one source. Fine aggregate for mortar only shall comply with SRN 135.

The fine aggregate shall not contain iron pyrites or iron oxides. It shall not contain mica, shale, coal or other laminar, soft or porous materials or organic matter unless the Contractor can show by comparative tests, on finished concrete as set out in SRN 117, that the presence of such materials does not adversely affect the properties of the concrete.

Other properties shall be as set out below:

Content passing a 75 micron standard sieve shall not exceed 3 per cent for natural or crushed

gravel sand or 15 per cent for crushed rock sand.

Chlorides soluble in a 10 per cent solution by weight of nitric acid shall not exceed 0.05 per cent by weight expressed as chloride ion when tested as set out in SRN 107, subject also to the further restriction given in the note on total chloride content in Clause 721 (d).

Sulphates soluble in a 10 per cent solution by weight of hydrochloric acid shall not exceed 0.4 per cent by weight expressed as SO3, when tested as set out in SRN 601, subject also to the further restriction given in the note on total sulphate content in Clause 721 (d).

Soundness: After five cycles of the test in AASHO T104 or an approved equivalent, the aggregate shall not show a weight loss of more than 10 per cent.

Organic impurities: If the test for presence of organic impurities in aggregates described below shows that more than a trace of organic impurities is present, the fine aggregate shall not be used in the Works unless the Contractor can show by tests on finished concrete as set out in SRN 117 that the presence of organic impurities does not adversely affect the properties of the concrete.

Test for presence of organic impurities in aggregates:

This test is designed to indicate the presence of organic impurities in aggregates used for making concrete.

A 350 cc graduated bottle shall be filled to the 120 cc mark with a sample of the aggregate to be tested and a 3% solution of sodium hydroxide in water added until the volume of aggregate and liquid after shaking gives a total volume of 200 cc. The bottle shall be stoppered, shaken thoroughly and allowed to stand for 24 hours. If, after 24 hours, the colour of the solution is not darker than a pale brown, the aggregate under test may be deemed satisfactory.

**d) Coarse Aggregate**

Coarse aggregate shall be clean, hard and durable crushed rock, crushed gravel or natural gravel complying with the requirements of SRN 110. The material shall not contain any iron pyrites, iron oxides, flaky or laminated material, hollow shells, coal or other soft or porous material, or organic matter unless the Contractor can show by comparative tests on finished concrete as set out in SRN 117 that the presence of such materials does not adversely affect the properties of the concrete. The pieces shall be angular, rounded or irregular as defined in SRN 107.

Coarse aggregate shall be supplied in the nominal sizes called for in the Contract and shall be graded in accordance with SRN 111 for each nominal size.

Other properties shall be as set out below:-

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

The content of hollow and flat shells shall be such as will not adversely affect the concrete quality when tested as set out in SRN 117.

The total content of aggregate shall not be more than the following:

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

Chlorides soluble in a 10 per cent solution by weight of nitric acid shall not exceed 0.03 per cent by weight, expressed as chloride ion when tested as set out in SRN 107 but subject also to the further restriction under the note on total chloride content hereunder. Sulphates soluble in a 10 per cent solution by weight of hydrochloric acid shall not exceed 0.4 per cent by weight expressed as SO3 when tested as set out in SRN 601 subject also to the further restriction given in the note on total sulphate content hereunder.

Soundness: After 5 cycles of the test in AASHO T104, the aggregate shall not show a weight loss of more than 12 per cent.

When tested in accordance with test C289 of the American Society for Testing of Materials, the aggregate shall be non-reactive.

Flakiness Index when tested in accordance with SRN 113 shall be as set out hereunder:

- For 40mm stone and above, not more than 40
- For 20mm stone and below, not more than 35

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

Impact value: Not more than 45 per cent when tested in accordance with SRN 107. Ten per cent fines value: Not less than 50kN when tested in accordance with SRN 107.

Shrinkage: When mixed with other ingredients in the approved proportions for concrete and tested as set out in SRN 117, the shrinkage factor shall not exceed 0.05 per cent.

Organic impurities: If the test for presence of organic impurities in aggregates shows that more than a trace of organic impurities is present, the aggregate shall not be used in the Works unless the Contractor can show by tests on finished concrete as set out in SRN 117 that the presence of organic impurities does not adversely affect the properties of the concrete.

Water absorption: The aggregate shall not have a water absorption of more than 2.5 per cent when tested as set out in SRN 112.

Aggregate Crushing Value (ACV): Not more than 35 per cent. Los Angeles Abrasion (LAA): Not more than 50 per cent.

**Note:** Total chloride and sulphate content:-

The total chloride content, expressed as chloride ion, arising from all ingredients in a mix including cement, water and admixtures shall not exceed the following limits, expressed as a percentage of the weight of cement in the mix:-

For prestressed concrete, steam cured concrete or concrete containing sulphate resisting or

super sulphated cement: 0.05 per cent.

For any other reinforced concrete: 0.3 per cent in 95 per cent of all test results provided no result is more than 0.5 per cent.

The total sulphate content expressed as SO3 of all the ingredients in a mix including cement, water and admixtures shall not exceed 0.4 per cent by weight of the aggregate or 4.0 per cent of the weight of cement in the mix, whichever is the lesser.

**e) Testing Aggregates**

**i) Acceptance Testing**

The Contractor shall deliver to the Engineer samples containing not less than 50 kg of any aggregate which he proposes to use in the Works and shall supply such further samples as the Engineer may require. Each sample shall be clearly labelled to show its origin and shall be accompanied by all the information called for in SRN 107.

Tests to determine compliance of the aggregates with the requirements of Clause 721(c) and (d) shall be carried out by the Contractor in a laboratory acceptable to the Engineer. If the tested materials fail to comply with the Specification, further tests shall be made in the presence of the Contractor and the Engineer and acceptance of the material shall be based on such tests.

A material shall be accepted if not less than three consecutive sets of test results show compliance with the Specification.

**ii) Compliance Testing**

The Contractor shall carry out routine testing of aggregates for compliance with the Specification during the period that concrete is being produced for the Works. The tests set out below shall be performed on aggregates from each separate source on the basis of one set of tests for each day on which aggregates are delivered to site provided that no set of tests shall represent more than 250 tonnes of fine aggregate nor more than 500 tonnes of coarse aggregate, and provided also that the aggregates are of uniform quality. If the aggregate from any source is variable, the frequency of testing shall be increased as instructed by the Engineer.

- Grading SRN 107
- Silt and clay contents SRN 107
- Moisture content SRN 107
- Check on organic impurities

In addition to the above routine tests, the Contractor shall carry out the following tests at the frequencies stated:

Moisture content: As frequently as may be required in order to control the water content of the concrete as required by the Specification.

Chloride content: As frequently as may be required to ensure that the proportion of chlorides in the aggregates does not exceed the limit stated in the Specification.

The Contractor shall take account of the fact that when the chloride content is variable it may be necessary to test every load in order to prevent excessive amounts of chloride contaminating the concrete. For this purpose the Contractor shall use the rapid field test (the Quantab test). In the event of disagreement regarding the results of the field test, the chloride content of the aggregate shall be determined in the laboratory as described in SRN 107 (the Volhard test).

### f) Delivery and Storage of Aggregates

Aggregates shall be delivered to site in clean and suitable vehicles. Different types or sizes of aggregate shall not be delivered in one vehicle.

Each type or size of aggregate shall be stored in a separate bin or compartment having a base such that contamination of the aggregate is prevented. Dividing walls between bins shall be substantial and continuous so that no mixing of types or sizes occurs.

The storage of aggregates shall be arranged so that as far as possible rapid drying out in hot weather is prevented in order to avoid sudden fluctuations in water content. Storage of fine aggregates shall be arranged so that they can drain sufficiently before use in order to prevent fluctuations in water content of the concrete.

### g) Water for Concrete and Mortar

Sea water or brackish water containing more than 1,000 ppm chloride ion or 2,000 ppm sulphate ion shall not be used for mixing or curing concrete.

Water shall be clean and free from harmful matter and shall comply with the requirements of SRN 114.

The Contractor shall carry out tests in accordance with SRN 114 to establish compliance with the Specification.

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.

### h) Admixtures

#### i) General

The use of the admixtures in concrete may be required under the Contract to promote special properties in the finished concrete or may be proposed by the Contractor to assist him to comply with the Specification.

In all cases the Contractor shall submit to the Engineer full details of the admixture he proposes to use and the manner in which he proposes to add it to the mix. The information provided shall include but not be limited to:-

i. The typical dosage, the method of dosing and the detrimental effects of an excess or deficiency in the dosage.

ii. The chemical names of the main active ingredients in the admixture.

iii. Whether or not the admixture contains chlorides, and if so the chloride ion content expressed as a percentage by weight of admixture.

iv. Whether the admixture leads to the entrainment of air when used at the manufacturer's recommended dosage, and if so, the extent to which it does so.

v. Details of previous uses of the admixture in Kenya.

The chloride ion content of any admixture shall not exceed 2 per cent by weight of the admixture nor 0.03 per cent by weight of the cement in the mix.

Admixtures shall not be mixed together without the consent of the Engineer

Calcium chloride or admixtures containing calcium chloride shall not be used in prestressed concrete.

**ii) Workability Agents**

Workability agents shall comply with SRN 149 and shall not have any adverse effect on the properties of the concrete.

**i) Reinforcement Steel**

Reinforcement which shall comply with the following Standards, covers plain and deformed bar reinforcement and steel fabric to be cast into concrete in any part of the Works but does not include prestressing tendons or any other embedded steel.

- SRN 126 for hot rolled plain bar and high yield deformed bar
- SRN 127 for cold worked steel bar
- SRN 128 for steel mesh fabric

All reinforcement shall be from an approved manufacturer and, if required by the Engineer, the Contractor shall submit a test certificate from the manufacturer.

All reinforcement for use in the Works shall be tested for compliance with the appropriate British Standard in a laboratory acceptable to the Engineer and two copies of each test certificate shall be supplied to the Engineer. The frequency of testing shall be as set out in the relevant Standard.

In addition to the testing requirements described above, the Contractor shall carry out additional tests as instructed by the Engineer.

Any reinforcement which does not comply with the Specification shall be removed from site.

All reinforcement shall be delivered to site either in straight lengths or cut and bent. No reinforcement shall be accepted in long lengths which have been transported bent over double.

Any reinforcement which is likely to remain in storage for a long period shall be protected from the weather so as to avoid corrosion and pitting. All reinforcement which has become corroded or pitted to an extent which, in the opinion of the Engineer, will affect its properties shall either be removed from site or may be tested for compliance with the appropriate Standard at the

Contractor's expense.

**Dowel Bars**

Dowel bars and tie bars shall consist of mild steel, or deformed bars of high yield steel all complying with SRN 126 and they shall be free from oil, paint other than bond-breaking compound, dirt, loose rust and scale.

Dowel bars and tie bars shall be of sizes as shown on the drawings and directed by the Engineer, and shall be straight, free from burred edges, or other irregularities and shall have their sliding ends sawn or, if approved, sheared.

Bond breaking compound for dowel bars shall consist of 66 per cent of 200 pen bitumen blended hot with 14 per cent light creosote oil and, when cold, brought to the consistency of paint by the addition of 20 per cent solvent naphtha or other approved compound meeting the following requirements.

i) It shall not retard or in any other way affect the setting of concrete.

ii) The average bond stress on bars coated with the compound with half their length cast into concrete specimens and subject to pull out tests at 7 days shall not exceed 0.14 newtons per square millimetre and the total movement of the dowel bar relative to the concrete shall not be less than 0.25 millimetres at that stress. The concrete specimens shall be 150 millimetres by 150 millimetres in section and 0.45 metre long and made with the same mix proportions as used in the Works

# 7. FORMWORK

## 701. 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.

## 702. CONSTRUCTION OF FORMWORK AND FALSEWORK

Before construction begins, the Contractor shall submit to the Engineer, drawings showing details of the proposed formwork and falsework.

Formwork and falsework shall be so constructed that they will support the loads imposed on them by the fresh concrete together with additional stresses imposed by vibrating equipment and by construction traffic, so that after the concrete has hardened the formed faces shall be in the positions shown on the drawings within the tolerances set out in Clause 806.

Ground supports shall be properly founded on footings designed to prevent settlement. Joints in formwork for exposed faces shall, unless otherwise specified, be evenly spaced and horizontal or vertical and shall be continuous or form a regular pattern.

All joints in formwork including formwork for construction joints shall be tight against the escape of cement, water and fines. Where reinforcement projects through formwork, the form shall fit closely round the bars.

Formwork shall be so designed that it may be easily removed from the work without damage to the faces of the concrete. It shall also incorporate provisions for making minor adjustments in position if required, to ensure the correct location of concrete faces. Due allowance shall be made in the position of all formwork for movement and settlement under the weight of fresh concrete.

Where overhangs in formwork occur, means shall be provided to permit the escape of air and to ensure that the space is filled completely with fully compacted concrete.

Formwork shall be provided for concrete surfaces at slopes of 30 degrees to the horizontal or steeper. Surfaces at slopes less than 20 degrees may be formed by screeding. Surfaces at slopes between 20 degrees and 30 degrees shall generally be formed unless the Contractor can demonstrate to the satisfaction of the Engineer that such slopes can be screeded with the use of special screed boards to hold the concrete in place during vibration.

Horizontal or inclined formwork to the upper surface of concrete shall be adequately secured against uplift due to the pressure of fresh concrete. Formwork to voids within the body of the concrete shall also be tied down or otherwise secured against floating.

The internal and external angles on concrete surfaces shall be formed with fillets and chamfers of the sizes shown on the drawings unless otherwise instructed by the Engineer.

Supports for formwork for non-water retaining structures may be bolted to previously placed concrete provided the type of bolt used is acceptable to the Engineer. If metal ties through the concrete are used in conjunction with bolts, the metal left in shall not be closer than 50mm to the face of the concrete.

Supports for formwork for water retaining structures may be bolted to previously placed concrete provided the type of bolts and positions of fixing are acceptable to the Engineer. After concreting the Contractor shall remove all support bolts and seal all holes with well rammed cement/sand mortar containing approved waterproofing cement additive. Metal ties which would be left in the concrete shall not be permitted.

Formwork shall not be re-used after it has suffered damage which in the opinion of the Engineer is sufficient to impair the finished surfaces of the concrete.

Where circumstances prevent easy access within the form for cleaning and inspection, temporary openings for this purpose shall be provided through the formwork.

Shear keys shall be provided in all construction joints of the size and shape indicated on the drawings.

Where precast concrete elements are specified for use as permanent formwork, or proposed by the Contractor and agreed by the Engineer, they shall comply with the requirements of the Specification. Such elements shall be set true to line and level within the tolerances prescribed for the appropriate class of finish in Clause 506 and fixed so that they cannot move when concrete is placed against them.

## 703. PREPARATION OF FORMWORK

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

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

In cases where it is necessary to fix reinforcement before placing formwork, all surface preparation of formwork shall be carried out before it is placed into position. The Contractor shall not allow reinforcement or prestressing tendons to be contaminated with formwork release agent.

Before placing concrete all dirt, construction debris and other foreign matter shall be removed completely from within the placing area.

Before concrete placing commences, all wedges and other adjusting devices shall be secured

against movement during concrete placing and the Contractor shall maintain a watch on the formwork during placing to ensure that no movement occurs.

## 704. REMOVAL OF FORMWORK

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

The minimum periods which shall elapse between completion of placing concrete and removal of forms are given in Table 8.1 and apply to ambient temperatures higher than 10 degrees centigrade. At lower temperatures or if cement other than ordinary Portland are involved, the Engineer may instruct that longer periods be used.

Alternatively, formwork may be removed when the concrete has attained the strength set out in Table 8.1, provided that the attained strength is determined by making test cubes and curing them under the same conditions as the concrete to which they refer.

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

**Table 7.1 - Minimum Periods for Formwork Removal**

| **Position of Formwork** | **Min. period for temp over 10 degrees Centigrade** | **Strength to be attained** |
|---|---|---|
| Vertical or near vertical faces of mass concrete | 24 hours | 0.2 C |
| Vertical or near vertical faces of reinforced walls, beams and columns | 48 hours | 0.3 C |
| Underside of arches, beams and slabs (formwork only) | 4 days | 0.5 C |
| Supports to underside of arches, beams and slabs | 14 days | C |
| Arched linings in tunnels and underground works | 24 hours | 4 $N/mm^2$ |

**Note:** C is the nominal strength for the class of concrete used.

If the Contractor wishes to strip formwork from the underside of arches, beams and slabs before the expiry of the period for supports set out above, it shall be designed so that it can be removed without disturbing the supports. The Contractor shall not remove supports temporarily for the purpose of stripping formwork and subsequently replace them.

As soon as the 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.

## 705. SURFACE FINISHES ON FORMED SURFACES

### Classes of Finish

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

**a) Class F1 Finish**

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

**b) Class F2 Finish**

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

**c) Class F3 Finish**

This finish is for surfaces which will be in contact with water flowing at high velocity, and for surfaces prominently exposed to view where good appearance is of special importance. To achieve this finish, which shall be free of board marks, the formwork shall be faced with plywood complying with B.S. 1088 or equivalent material in large sheets. The sheets shall be arranged in an approved pattern. Wherever possible, joints between sheets shall be arranged to coincide with architectural features or changes in direction of the surface.

All joints between panels shall be vertical and horizontal unless otherwise directed. Suitable joints shall be provided between sheets to maintain accurate alignment in the plane of the sheets. Unfaced wrought boarding or standard steel panels will not be permitted for Class F3 finish. The Contractor shall ensure that the surface is protected from rust marks, spillages and stains of all kinds.

**d) Curved Surfaces**

For curved surfaces where F2 or F3 finishes are called for, the formwork face shall be built up of splines cut to make a tight surface which shall then be dressed to produce the required finish.

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

## 706. TOLERANCES

All parts of formed concrete surfaces shall be in the positions shown on the drawings within the tolerances set out in Table 8.2.

In cases where the drawings call for tolerances other than those given in Table 8.2 the tolerances shown on the drawings shall take precedence.

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

**Table 7.2 - Tolerances**

| Class of Finish | Tolerances in mm (See Note) | | |
|---|---|---|---|
| | A | B | C |
| F1 | 10 | 10 | + 25 to - 10 |
| F2 | 5 | 10 | + or - 15 |
| F3 | 2 | 5 | + or - 10 |

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

1. Column A is an abrupt irregularity in the surface due to misaligned formwork or defects in the face of the formwork.
2. Column B is a gradual deviation from a plane surface as indicated by a straight edge 3m long. In the case of curved surfaces the straight edge shall be replaced by a correctly shaped template.
3. Column C is the amount by which the whole or part of a concrete face is displaced from the correct position shown on the drawings.

# 8. MISCELLANEOUS ITEMS AND MATERIALS

## 801. GENERAL

The approval in writing or otherwise by the Engineer of any materials shall not in any way whatsoever relieve the Contractor from any liability or obligation under the Contract and no claim by the Contractor on account of the failure, insufficiency or unsuitability of any such materials will be entertained.

a. All items shall be suitable for water works purposes and for use with cold water installation and operation being in a tropical climate.
b. All items hereinafter specified shall be to such other Standard or Specification which in the opinion of the Engineer provides for a quality of material and workmanship not inferior to the Standard Reference Number (SRN) quoted. The Standard or Specification must be submitted to the Engineer for approval before commencement of work.
c. All ferrous pipes and fittings shall be coated with a protective paint suitable for use in and transport through a tropical climate.
d. The Contractor shall supply to the Employer a certificate stating that each item supplied has been subjected to the tests hereinafter laid down and conforms in all respects to the said Specification.
e. The Contractor shall provide adequate protection to all piping, flanged items and valves so as to guard effectively against damage in transit and storage and ingress of foreign matter inside the valves.
f. All pipework and fittings shall be subjected to a works hydrostatic test pressure which shall be not less than twice the maximum operating pressure.
g. The Contractor should exercise diligence to provide the best material.
h. Where applicable the manufacturer's Specification should accompany all offers. The name of the manufacturer must in every case be stated.
i. Where necessary the Contractor shall provide rubber gaskets to comply with SRN 208 and all other bolts, nuts, washers, etc. to undertake jointing at fittings etc.
j. Any articles required under this Contract which are found to be faulty due to a crack, flaw or any other reason or is not in accordance with the Specification stipulated will not be accepted nor will the Employer be liable for any charges in respect of such an article. Where any such rejected article can, in the opinion of the Engineer, be rendered usable, the Contractor may deal with it accordingly and include it in the Contract at a price to be mutually agreed. Straight pipes which have been cut will be accepted at the discretion of the Engineer, provided the length is not less than 4 metres or two thirds of the standard length whichever is the lesser and will be priced pro-rata.
k. Wherever possible, samples of pipes and fittings shall be submitted for approval of the Engineer prior to the Contractor obtaining the total requirements.

## 802. SUBMISSION OF SAMPLES

As soon as possible after the contract has been awarded, the Contractor shall submit to the Engineer a list of the suppliers from whom he proposes to purchase the materials necessary for the execution of the Works. Each supplier must be willing to admit the Engineer or his representatives, to his premises during ordinary working hours for the purpose of obtaining samples of the materials in question. Alternatively, if desired by the Engineer, the Contractor shall deliver the samples of the materials to the Engineer's office without charge.

The information regarding the names of the suppliers may be submitted at different times, as may be convenient, but no source of supply shall be changed without the Engineer's prior approval once a supplier, source or material has been approved.

Samples of materials approved will be retained at the Engineer's office until the completion of the contract. Samples may be tested to destruction.

All materials delivered to site must be at least equal in all respects to approved samples, otherwise they shall be rejected. No special payment will be made for compliance with clauses specifying tests etc. to ensure quality control etc. unless specifically itemised in Bills of Quantities.

## 803. ARCHITRAVES AND STOPS

Architraves and stops shall be Class 1 Mvuli matching to the frames and linings.

## 804. BLOCKWORK

Building blocks shall be dense concrete blocks complying with the requirements of B.S. 2028, 1364, with faces for plastering and having a compressive strength of 14 N/sq.mm. (Table 2, Type A14).

Blocks shall be obtained from an approved manufacturer and shall be equal to sample blocks previously approved by the Engineer's Representative.

Blocks shall be carefully handled and stored on site and protected from the weather at all times.

Surfaces on which blockwork is to be built shall be kept clean. Blocks shall be well wetted before being laid and the tops of walls where blockwork has been left shall be well wetted before re-commencing. Blockwork shall be built plumb, true to line and level, with all perpends vertical and in line. Blocks shall be built in half bond and alternate courses shall be block bonded at all junctions, no cut block shall be less than half a block. Joints in concrete blockwork shall be well filled with gauged mortar and shall not exceed 10mm in width.

## 805. BOLTS AND NUTS

Bolts and nuts shall comply with the relevant requirements of the British Standards as set out below:-

- Black Hexagon Bolts, Screws and Nuts B.S. 4190, Grade 4.6
- Metal Washers for General Purpose B.S. 4320
- Black Cup and Countersunk Head Bolts B.S. 4993
- and Screws, with Nuts

The items shall preferably have coarse metric threads but items with B.S.W. threads may be used. Bolt lengths shall be sufficient to ensure that nuts are full threaded when tightened in their final position.

## 806. BONDING TIES

Bonding ties shall be 75mm wide x 250mm long galvanized bitumen-coated expanded metal strip, cast 100mm into concrete surfaces in contact with block work. The bonding tie used shall be approved by the Engineer's Representative.

## 807. BUILDING STONE

All building stone shall be capable of withstanding when wet a crushing stress of 3.5 N/sq.mm. The source of stone shall be approved by the Engineer and stone supplied therefrom shall be free from magadi, overburden, mudstone, cracks, sandholes, veins, laminations or other imperfections.

The stone shall be chisel dressed into true rectangular blocks, with each surface even and at right angles to all adjoining surfaces, to the size specified. For exposed stonework the maximum permissible variation of any of the specified dimensions shall be 6mm provided that cut stone, supplied as 'rock face' stone may be hammer dressed on one face only, or on one face and one end, if in other respects it conforms with this specification. Stones shorter than 375mm will not be accepted.

Unless the Engineer allows otherwise the Contractor shall at his own expense provide and dress four 100mm cubes of stone for testing.

The stone shall be sound when tested in accordance with SRN 870 except that:-

i) The treatment shall be repeated for 10 cycles only; and

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

## 808. CAST STONE

Cast stone shall be manufactured by an approved manufacturer to the shapes and dimensions shown on the drawings, and shall conform to the requirements of SRN 871: Cast Stone. It shall have a dense and even surface of the texture and colour detailed on the drawings or required by the Engineer. Where indicated exposed faces of the stone shall be formed of a specially graded mix. Metal bond ties of approved manufacture shall be cast in with the stone as shown on the drawings. Samples of the completed stone shall be submitted for the Engineer's prior approval.

All stones shall be protected from damage during transport and erection by means of cement slurry coatings or by other approved methods.

## 809. 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.

## 810. CEMENT MORTAR

Cement mortar shall consist of proportions by volume as specified of Portland Cement and natural sand or crushed natural stone or a combination of both as specified in SRN 135 and SRN 136: Building Sands from Natural Sources. The constituent materials shall be accurately gauged and mixed in an approved manner.

Cement mortar shall be made in small quantities only as and when required, and any mortar which has begun to set or which has been mixed for a period of more than one hour shall be rejected.

## 811. 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 712. The constituent materials shall be accurately gauged and mixed by volume in an approved manner in the proportions specified.

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

## 812. CONCRETE BLOCKS

Solid and hollow concrete blocks for walling shall comply with SRN 804 in every respect.

All solid and hollow concrete blocks used in the walling must be capable of withstanding a crushing pressure of not less than 0.35 kg per square millimetre after 28 days. The blocks shall be cast in Metric sizes.

## 813. CONCRETE DRAIN INVERT BLOCKS

Precast concrete invert blocks shall be manufactured to the detail drawings supplied from concrete Class 20/10 as specified in Table 7.2 using maximum 12mm size aggregates. If required, cube test certificates shall be supplied by the manufacturer.

## 814. CONCRETE SLABS FOR OPEN DRAINS

Precast concrete slabs for lining open drains shall be manufactured to the detail drawings supplied from concrete Class 20/10 as specified in Table 7.2 using maximum 12mm size aggregates. If required, cube test certificates shall be supplied by the manufacturer.

## 815. DAMP-PROOF COURSE (D.P.C.)

Hessian based metal cored bitumen for damp-proof courses shall be lead cored, complying with B.S. 743 paragraph 4, type D, weighing not less than 4.4 kg. per square metre. Damp-proof course shall be bedded horizontally in mortar as for blockwork with 115mm laps in length and full laps at angles.

## 816. DOORS

Internal doors shall be hardwood framed solid cored flush doors constructed in accordance with

B.S. 459 Part 3, faced both sides with 3mm thick Mvuli veneered plywood and lipped all round with matching hardwood lipping. Moisture content at delivery shall be 12% (+ or - 2%).

## 817. ELECTRICAL INSTALLATION

The electrical installations will be carried out by Licensed Electrician and complying with the following:-

a) Regulations for Electrical Equipment of Buildings issued by the Institution of Electrical Engineers.

b) Electric Power Act.

c) The Kenya Power Company's Bye-Laws.

d) Relevant current British Standards and Codes of Practice.

e) All the relevant clauses in this Specification.

## 818. FIRE HYDRANTS

Fire hydrants shall be in accordance with SRN 509. They shall be for installation underground and shall be in accordance with SRN 509.

The spindle shall be provided with a universal cast iron cap conforming to SRN 501.

The spindle of the fire hydrant shall be of the non-rising type and screwed so as to close the hydrant when rotated in a clockwise direction viewed from above. The direction of closing shall be clearly cast on the valve cap.

The flanged outlet of the outlet bend shall have a Bayonet Joint Outlet for a 63mm standpipe. The outlet of the hydrant shall be of the hooked type with hooks 112mm apart.

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

Both flanges shall be 63mm drilled to requirements of SRN 207.

The outlet bends shall be subject to a hydrostatic test in accordance with procedure set out in SRN 509 and shall be water-tight against a test pressure of 1.85 Pa. head of water.

## 819. FIXING IRONMONGERY

The rates for supplying and fixing ironmongery shall include for all sinking, cutting, boring, mortising etc., making good, replacing damaged screws, oiling, adjusting and leaving in good working order and for mastering all keys.

## 820. FIXING JOINERY

Doors shall be hung on one or one and a half pairs of butt hinges to give a maximum even tolerance of 2mm all round.

Sub-frames shall be fixed to blockwork with three fixing clamps per side and one dowel let 50mm into the floor and 50mm into the foot of each leg. Linings shall be fixed after completion of other

finishings by means of screwing and pellating to sub-frames with matching hardwood pellates. Architraves and stops shall be pinned on, heads punched and filled with tinted filler.

## 821. FRAMES AND LININGS

Door frames and linings shall be Class 1 Mvuli mortice and tenon jointed at angles. Sub- frames for internal doors shall be Class 1 Mvuli tongued at angles.

## 822. GABIONS

Gabions shall be of the hexagonal wire mesh type, with mesh dimensions of 80 mm x 100 mm. The minimum dimension shall not exceed 83 mm. Wire shall be galvanised prior to weaving the mesh to resist corrosion from water.

All wire used in the fabrication of the gabion and in the wiring operation during construction shall be in accordance with BS 1052/1980 Mild Steel wire appended having a tensile strength of 38-50 kg/mm$^2$

All wire shall be galvanised to BS 443: 1982 'Zinc coatings on steel wire' with the minimum weight of Zinc coating in accordance with Table below.

| | Diameter (mm) | Minimum Weight of Coating (g/m$^2$) |
|---|---|---|
| Mesh wire | 2.7 | 260 |
| Binding and connecting wire | 2.2 | 240 |
| Selvedge wire | 3.4 | 275 |

All wire used in the fabrication of gabions and in the wiring operations during construction shall, after galvanising, have extruded onto it a coating of polyvinyl chloride compound referred to as PVC. The coating shall be black in colour, not less than 0.4 mm thickness and shall be capable of resisting deleterious effects of exposure.

Gabions shall be of the following standard sizes:

2m x 1m x 0.5m

2m x 1m x 1m

6m x 2m x 0.3m

Gabions shall be provided with diaphragms to divide the boxes in compartments with a maximum dimension in any direction of 1m.

Joints shall be flexible and shall consist of not less than one and a half full turns of wire, at each mesh point of the joint line.

Gabions shall be as manufactured by Maccaferri, or equivalent. Alternative materials shall be subject to the approval of the Engineer.

Rockfill for gabions shall consist of hardcore i.e. sound hard stone or broken rock. The maximum size shall be 220mm, and the minimum size shall be 120mm; however, up to 10% of some smaller blinding material (min. 75mm) to fill the internal voids between the bigger rocks will be allowed.

Gabions shall be placed in their final positions prior to filling with rock, and shall then be tied

together and filled with rock. After filling with rock, the tops shall be closed and securely tied with connecting wire. The larger rocks shall be placed on the upper face of the gabion in order to present a reasonably closed surface. All assembly, erection, stretching, filling with rock and final filing shall be in accordance with the instructions as issued by the manufacturer.

## 823. GALVANISED WORK

Iron and steel, where galvanized, shall comply with B.S. 729, entirely coated with zinc after fabrication by complete immersion in a zinc bath in one operation and all excess carefully removed. The finished surface shall be clean and uniform.

## 824. GULLY GRATINGS AND FRAMES

Gully gratings and frames shall be basically in accordance with the requirements of SRN 846, nominal size 500mm x 350mm except that the gully gratings shall be constructed of mild steel concrete filled in accordance with the standard detail drawings.

Where indicated as being kerb inlet type, the gullies shall conform to the shape and dimensions given on the detail drawings supplied, but in respect of materials and workmanship conform to SRN 846.

## 825. HARDWOOD

Hardwood for joinery shall be sound, well conditioned and seasoned Mvuli complying with the requirements of B.S. 1186 Part 1, Class 1. A sample of each representative section for use in the work shall be previously submitted by the Contractor for approval by the Engineer's Representative. Moisture content shall be 12% (+ or - 2%).

## 826. HYDRATED LIME

Hydrated lime shall comply with SRN 801: Building Limes, and shall be of the semi- hydrated type.

## 827. IRONMONGERY

All ironmongery shall be obtained from a source approved by the Engineer's Representative. Samples shall be submitted before ordering and the articles ordered shall match up with the approved samples. Screws of a like metal shall be used for all fittings.

## 828. JOINERY

All exposed joiner's work shall have wrought faces. The prices of all joiner's work shall include for slightly rounded arises.

Where the term 'framing' or 'framed' is made use of, it shall be understood to mean all halvings, dovetails, tenons and hardwood pins and the best known means of putting the work together.

All framed work shall be put together loosely and stacked under cover where a free current of air can circulate and is not to be wedged and glued until it is required for fixing.

All joinery, when brought on the works, shall be stacked under cover.

The Engineer or his representative, shall have full right of access to the joinery works and power

to condemn any work not approved and any approval expressed or implied is not to relieve the Contractor from his responsibility and liability to make good any shrinkage or other defects that may appear after the work is fixed.

All joinery to be painted shall be knotted and primed.

The Contractor shall provide all materials, labour, framing, fixing, etc., nails, screws and everything necessary for the proper execution and completion of the work.

## 829. JOINT PRIMER

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

## 830. JOINT SEALING COMPOUND

Poured joint sealing material shall consist of an approved rubber-bitumen compound, complying with the requirements of SRN 879, or a two component, cold applied compound complying with SRN 879 as stated in the Bill of Quantities. Test Certificates, prepared by an approved testing laboratory, shall be supplied by the Contractor to show that the material does in fact comply in respect of cone penetration, flow and bond with the under-mentioned requirements:

| | Hot-poured Materials | Cold-poured Materials |
|---|---|---|
| Test Cone Penetration<br>0.15 kg. for 5 secs. at 25° centigrade using standard grease cone | Penetration not to exceed 9mm | Penetration to be not less than 5mm not more than 27.5mm |
| Flow<br>On a plane inclined at 75° to the horizontal, 5 hours at 60° centigrade | Flow not to exceed 5mm | Flow not to exceed 20mm |
| Bond<br>25mm wide joint extended 12mm at rate of 4mm per hour at 18° centigrade. No more than one specimen in three to develop a crack separation or other opening more than 4mm deep | Five cycles of extension and recompression | Three cycles of extension and recompression |

Approved hot-poured materials shall also comply with a requirement whereby when heated for a period of 6 hours at a temperature of 80 degrees centigrade above recommended pouring temperature or 30 degrees centigrade below the safe heating temperature whichever is the greater shall still comply with the flow requirements of this clause.

In addition to materials complying with SRN 879, the Engineer may approve the use of alternative materials provided that they meet the requirements of this clause relating to cold-poured joint sealing compounds.

## 831. LIME MORTAR

Lime mortar shall consist of proportions by volume as specified of hydrated lime and naturals and/or crushed natural stone or a combination of both as specified for cement mortar in Clause

1010. The constituent materials shall be accurately gauged and mixed in an approved manner.

## 832. MANHOLE COVERS AND FRAMES

Design standard for manhole covers and frames shall be DIN19555/EN13101. The material shall be Polypropylene copolymer plastic completely encapsulating either structural rebars Produced from Fibre Resin Compound (FRP ), a type of glass reinforced polyester resin (GRP). The covers and frames shall be 25 tonnes (C250) loadings capacity.

## 833. MANHOLE STEP IRONS

The step irons shall be produced as per design standard: DIN19555/EN13101 Polypropylene copolymer plastic completely encapsulating either structural rebars

## 834. MURRAM

Murram shall be from an approved source quarried so as to exclude vegetable matter, loam, top soil or clay. The California Bearing Ratio of the murram, as determined for a sample compacted to maximum density (as defined under SRN 601) and allowed to soak in water for four days, shall not be less than 30%. This C.B.R. is a guide to quality only and the compaction in the work will be judged by density.

## 835. PAINTS

All priming, undercoating and finishing paints shall be in accordance with SRN 877 or SRN 878 as appropriate.

The painting of all building works shall comprise a special paint recommended for external work while all other paints, plastic emulsion coating etc. are to be of an approved manufacturer. All paints, distempers etc. shall be delivered on site intact in the original drums or tins, and shall be mixed and applied in accordance with the manufacturer's printed directions. The only addition which will be allowed to be made will be liquid thinners, driers etc. supplied by the makers for the purpose.

All surfaces must be thoroughly cleaned down prior to painting and decorating work and no external painting shall be carried out in rainy weather. All paint must be thoroughly well worked on and excess of paint in any coat must be avoided.

All colours will be selected by the Engineer from the standard range of colours.

## 836. PENSTOCKS

Cast iron penstocks shall be all in accordance with SRN 906 and SRN 916. Seating faces shall be gun metal or bronze.

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

Handwheels shall be of cast iron and words "OPEN" and "SHUT" marked on upper side with appropriate direction arrows.

## 837. PLYWOOD

Plywood generally shall comply with B.S. 1455. That from sources not included in B.S. 1455 shall be of corresponding grades of veneers and types of bonding. Plywood for flush doors shall be Grade I Mvuli veneered.

## 838. PRECAST CONCRETE GULLIES

Precast concrete gullies shall be unreinforced and shall comply with the requirements of SRN 854: Concrete Cylindrical Pipes and Fittings including Manholes, Inspection Chambers and Street Gullies.

## 839. PRECAST CONCRETE MANHOLES AND INSPECTION CHAMBERS

Precast concrete manholes and inspection chambers shall comply with the requirements of SRN 854: Concrete Cylindrical Pipes and Fittings including Manholes, Inspection Chambers and Street Gullies, and they shall carry the relevant Standard Institution registered certification trade mark, or test certificates shall be furnished by the manufacturer.

## 840. PRECAST CONCRETE UNITS

Precast concrete covers to be precast units for use in the works, whether instructed under the Contract or proposed by the Contractor.

### a) Formwork for Precast Units

Moulds shall be so constructed that they do not suffer distortion or dimensional changes during use and are tight against loss of cement grout or fines from the concrete.

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

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

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

### b) Reinforcement for Precast Units

Reinforcement in precast units shall comply with the requirement of Clauses 721 i) and 719-720. When preformed cages are used the cages shall be made up on jigs to ensure dimensional accuracy and shall be carefully supported within the could in such a way that they cannot move when concrete is placed. Reinforcement complying with SRN 126 may be tack welded where bars cross to provide rigidity in the cage but reinforcement complying with SRN 127 shall not be welded.

Cover to main reinforcement shall be as shown on the drawings, or if not shown shall be not less than 25mm or the diameter of the bar, whichever is the greater. Cover on distribution steel shall not be less than 15mm or the diameter of the bar whichever is the greater.

Bars shall be spaced so that the minimum clear distance between them is the maximum nominal aggregate size plus five millimetres but in any case not less than the diameter of the bars.

Bars may be placed in pairs provided that there are no laps in the paired lengths.

### c) Casting of Units

Concrete for precast units shall comply with Clauses 1039/1040 and 701-710 using the class of concrete specified on the drawings.

If lightweight aggregates are specified, they shall comply with SRN 147.

The area in which units are cast shall be adequately protected from the weather so that the process is not affected by rain, sun or drying winds.

### d) Curing Precast Units

Requirements for curing shall be generally as set out in Clause 707.

The Contractor shall ensure that units do not suffer any loss of moisture or sudden changes of temperature for at least four days after casting. If a water spray is used for curing, the water shall be at a temperature within 5 degrees centigrade of the temperature of the unit being cured.

If Contractor proposes curing at elevated temperatures, the method shall be subject to the agreement of the Engineer and shall include means whereby units are heated and subsequently cooled evenly without sudden changes of temperature.

### e) Dimensional Tolerances of Precast Units

Units shall be accurately formed to the dimensions shown on the drawings unless closer tolerances are called for by the Engineer.

### f) Surface Finish of Precast Units

The formed faces of precast units shall be finished to Class F3 as set out in Clause 805c) unless another class of finish is specified on the drawings.

Free faces shall be finished to Class UF2 unless another class of finish is specified on the drawings

In cases where a special finish is required a trial panel shall be constructed by the Contractor which after approval by the Engineer shall be kept available for inspection at the place of casting and production units shall thereafter match the approved pattern.

Those parts of the unit which are to be joined to other units or to in-situ concrete shall be brushed with a stiff brush before the concrete has fully hardened. Alternatively, if the concrete has been allowed to harden, the surfaces shall be roughened by sand blasting or by the use of a needle gun.

### g) Handling and Storage of Precast Units

Precast units shall be handled in a manner which will not cause damage of any kind and shall be stored on a hard impermeable base.

Prestressed units and large precast normally reinforced units shall be handled and stored so that no stresses shall be induced in excess of those which they will incur in their final positions in the Works unless they have been designed to resist such stresses.

Units shall be provided with adequate lifting holes or loops, placed in the locations shown on the

drawings or agreed by the Engineer and they shall be lifted only by such holes or loops. Where it is not possible to provide holes or loops, suitable sling positions shall be indicated in paint on the units.

Units shall be marked indelibly with the reference number and date of casting and shall be stacked on suitable packers which will not damage the concrete or stain the surfaces. Not more than two packers shall be placed under each unit and these shall be located either at the positions of the permanent support points or in positions such that the induced stresses in the unit will be a minimum.

**h) Testing Precast Units**

Precast units shall be capable of safely sustaining the loads which they have been designed to carry. The Contractor shall subject units selected by the Engineer to load tests simulating the working conditions. Details of such tests shall be agreed between the Engineer and the Contractor.

In the case of units subject to bending loads the test piece shall be supported at full span and a loading equivalent to 1.25 times the sum of the live and dead loads which were assumed in the design shall be maintained for one hour without the appearance of any signs of distress. The recovery one hour after the removal of load shall be not less than 75 per cent of the full load deflection.

If the unit fails to meet the above requirements, further tests shall be carried out on two more units. If either of these fail the whole batch of units will be rejected

If the Engineer so requires, a test to destruction shall also be carried out which on units subject to bending shall be as follows:-

The units shall be supported at full span and a load applied in increments instructed by the Engineer up to 95 per cent of the designed ultimate load. This load shall be held for 15 minutes without failure of the unit. The deflection at the end of this period shall be not more than $1/40^{th}$ of the span. The load shall then be further increased until failure occurs.

If the unit fails to sustain the required load for the prescribed period or if the deflection exceeds the specified amount, the Engineer may order two further tests, and if either of these fail, the batch of units which they represent may be rejected.

## 841. PRECAST LINTELS

All precast items shall be marked with the date of casting and shall not be built into the works until they have matured for 28 days. Ends of bar reinforcement shall be hooked or bent as required. The cover for reinforcement shall be 25mm from internal faces and 38mm from external exposed faces. The 'top' of lintels shall be numbered for identification.

Lintels shall have timber or pre-formed inserts cast in for fixing metal windows where required and shall have fair face finish on all surfaces exposed to view and hacked surfaces where plastered.

## 842. PREFORMED JOINT FILLER

Preformed joint filler shall be of the thickness shown on the drawings or as stated in the Bill of

Quantities.

The material comprising joint filler shall be as stated on the drawings or approved by the Engineer.

## 843. STONE DUST

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

| | |
|---|---|
| Passing 10mm sieve | 100% |
| Passing No. 4 sieve | 85% - |
| 100% Passing No. 100 sieve | 5% - 25% |

## 844. STOP VALVES

All stop valves shall be in accordance with SRN 826. Samples of valves shall be submitted for test and approval to the Engineer.

## 845. STRUCTURAL STEEL FOR WELDED WORK

Structural steel for riveted and welded work shall comply with the requirements of SRN 125 : Structural Steel, SRN 126 : The Use of Structural Steel in Building and for Welded Work, SRN 125 : High Yield Stress and High Tensile Structural Steel, High Tensile (Fusion Welding Quality) Structural Steel for Bridges, etc. and General Building Construction.

## 846. STRUCTURAL STEELWORK

The whole of the structural steelwork and testing shall comply with the relevant clauses of B.S. 449. The Contractor shall include for the preparation of all shop details from the drawings supplied by the Engineer. All such details shall be approved in writing by the Engineer before the work is put in hand. Every drawing shall show the number and sizes of all rivets and bolts, complete details of welds, type of electrodes, welding procedure, whether the welds are to be made in the shop or elsewhere and any other relevant information. The Contractor shall be responsible for the accuracy of his shop details and for shop fittings and site connections.

The Contractor shall take the dimensions from the structure and he shall verify all dimensions given on the drawings before the work is put in hand.

Any damage to materials on the site due to inadequate precautions being taken during the erection of the steelwork shall be made good to the satisfaction of the Engineer's Representative at the Contractor's expense.

The fabrication and erection of the steelwork shall be carried out in accordance with Part 5 of B.S. 449.

## 847. TIMBER

Timber shall be sound, well seasoned and entirely free from worm, beetle, warps, shakes, splits, and all forms of rot and deadwood. Where required, all timber shall be treated with creosote, as specified in SRN 872 : Coal Tar Creosote for the Preservation of Timber or an alternative approved timber preservative.

## 848. WATER BARS

Water bars shall be "Dumbell" type and be of natural or synthetic rubber or extruded PVC. They shall be flexible, tough, elastic and durable and of dimensions detailed. They should be unaffected on contact with dilute acids or alkalis. Joints and junctions shall, when possible, be prefabricated by the manufacturer, but if made at site the manufacturer's instructions including recommended adhesives shall be followed and used. Samples shall be submitted for approval of the Engineer before use of any material.

## 849. WATERPROOF UNDERLAY

Waterproof underlay shall consist of either waterproof paper complying with SRN 856: Waterproof Building Paper, containing approved fibrous reinforcement, or 500 gauge polythene sheeting as stated in the Bill of Quantities.

# 9. PROJECT SPECIFIC INFORMATION AND CONTRACTOR'S GENERAL RESPONSIBILITY

## 901. PROJECT LOCATION

The project is located within the service area of Muranga South Water and Sanitation Company (MUSWASCO). MUSWASCO is one of the WSPs mandated to provide water and sanitation services in Muranga County. It focuses mainly on service provision in the rural areas within the County.

## 902. SCOPE OF WORKS

The scope of the assignment includes; Engineering construction of:

| | | |
|---|---|---|
| **KANGARI SCHEME** | | |
| *WATUHU LINE(BEHIND NJIIRIS)* | | |
| Description | **Unit** | **Qty** |
| Pipes | | |
| **63mm Hdpe pipe PN 16** | M | 780 |
| **50mm Hdpe PN 16 pipes** | M | 530 |
| *KENOL SCHEME* | | |
| DESCRIPTION | **UNIT** | **QTY** |
| Pipes | | |
| **63mm diameter Hdpe Pipe PN16** | M | 1890 |
| **50mm diameter Hdpe Pipe PN16** | M | 500 |
| **32mm diameter Hdpe Pipe PN16** | M | 200 |
| *catholic line 1 & 2* | | |
| **63mm diameter Hdpe Pipe PN16** | M | 2,120 |
| **50mm diameter Hdpe Pipe PN16** | M | 800 |
| | | |
| *Kahumbu-ini* | | |
| *PENKA & PENKA SCHOOL LINE* | | |
| Description | **Unit** | **Qty** |
| **63 mm diameter Hdpe PN16 pipes** | M | 493 |

| | | |
|---|---|---|
| **32 mm diameter Hdpe PN16 pipes** | M | 294 |
| *MUTARINGWA LINE* | | |
| Description | **Unit** | **Qty** |
| **32 mm diameter Hdpe PN16 pipes** | M | 580 |
| *Gakuyu TC 1* | | |
| Description | **Unit** | **Qty** |
| **25 mm diameter Hdpe PN 16 pipes** | M | 200 |
| *Gakuyu TC 2* | | |
| Description | **Unit** | **Qty** |
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Gakuyu TC 3* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16 pipes** | M. | 60 |
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Gakuyu TC 4* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16 pipes** | M. | 60 |
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Gakuyu TC 5* | | |
| Description | **Unit** | **Qty** |
| **32mm diameter Hdpe PN 16 pipes** | M | 100 |
| **25mm diameter Hdpe PN 16 pipes** | M | 82 |
| *Githuthu ini A* | | |
| Description | **Unit** | **Qty** |

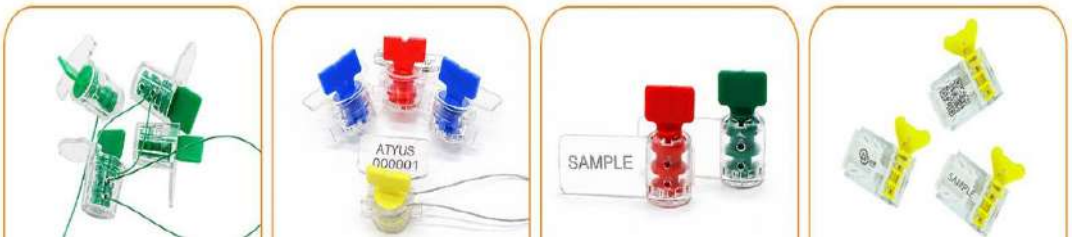
| | | |
|---|---|---|
| **32mm diameter Hdpe PN 16 pipes** | M | 400 |
| **25mm diameter Hdpe PN 16 pipes** | M | 400 |
| *Githuthu ini B* | | |
| Description | **Unit** | **Qty** |
| **32mm diameter Hdpe PN 16 pipes** | M | 200 |
| **25mm diameter Hdpe PN 16 pipes** | M | 464 |
| *MATHURI LINE* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16pipes** | M. | 1100 |
| **32mm diameter Hdpe PN 16 pipes** | M. | 400 |
| **25mm diameter Hdpe PN 16 pipes** | M. | 200 |
| *Kahuho Baptist* | | |
| Description | **Unit** | **Qty** |
| **50 mm diameter Hdpe PN 16pipes** | M | 550 |
| **32 mm diameter Hdpe PN 16pipes** | M | 890 |
| *Kahuho Baptist 1* | | |
| **32 mm diameter Hdpe PN 16pipes** | M | 906 |
| *Kahuho Baptist 2* | | |
| **25 mm diameter Hdpe PN 16pipes** | M. | 906 |
| *Kahuho Baptist 3* | | |
| **25 mm diameter Hdpe PN 16pipes** | M | 344 |
| *Kibingu line* | | |
| **50 mm diameter Hdpe PN 16pipes** | M | 642 |
| **32 mm diameter Hdpe PN 16pipes** | M | 498 |
| *Kibingu 2* | | |
| **32 mm diameter Hdpe PN 16pipes** | M. | 652 |
| *Kibingu 1* | | |

| | | |
|---|---|---|
| **32 mm diameter Hdpe PN 16pipes** | M. | 1000 |
| *Kandani and Distribution Lines* | | |
| **50 mm diameter Hdpe PN 16pipes** | M. | 280 |
| **32 mm diameter Hdpe PN 16pipes** | M | 420 |
| **25 mm diameter Hdpe PN 16pipes** | M | 435 |
| *Kihorwe Line* | | |
| **32 mm diameter Hdpe PN 16pipes** | M. | 791 |
| *Kahuho 1 line* | | |
| **50 mm diameter Hdpe PN 16pipes** | M | 219 |
| **32 mm diameter Hdpe PN 16pipes** | M | 221 |
| *Kahuho Gakindu lines* | | |
| **50 mm diameter Hdpe PN 16pipes** | M | 659 |
| **32 mm diameter Hdpe PN 16pipes** | M | 706 |
| *Kandani rehabilitation* | | |
| Description | **Unit** | **Qty** |
| **110mm diameter Hdpe PN16 Pipe** | M | 500 |

## Water Fittings Specifications:

### 1. METER SEALS SPECIFICATIONS – Plastic wired water meter seal

| | |
|---|---|
| **Material Base** | High-grade Polycarbonate (PC) |
| **Wire material** | Stainless steel wire, Galvanized steel wire length (min 25cm) |
| **Tamper Mechanism** | PC transparent cover visible to check the integrity of locking and locking process with a unique shell that adjusts the locking position and has a good anti-pry function |
| **Quality Compliance** | Manufactered under ISO9001 quality systems and complies with general EU utility regulations Certification： ISO9001, ISO14001 ISO18001,SGS |
| **Standard Colors** | High-visibility Orange, Blue, Yellow, and Green (Custom tones available per request) |
| **Traceability** | Exterior surface marked sequentially, with company logo and unique serial number or qr code or barcode |
| **Environmental Resilience:** | Engineered to withstand harsh outdoor conditions, including prolonged UV exposure, direct sub-surface water contact, and wide thermal fluctuations without decaying or self-releasing |




### 2. METER SEALS SPECIFICATIONS- Water Meter Lock & Anti-Tamper Security Coupling Seal

| | |
|---|---|
| **Material Base** | High-grade Polycarbonate (PC) or High-Impact Polypropylene (PP) |
| **Available Sizes** | Designed to fit meter diameters ranging from **15mm to 25mm** (DN15, DN20, DN25) |
| **Tamper Mechanism** | Single-use self-locking system featuring mechanical snap-tabs that cracks creating easy evidence of tampering |
| **Quality Compliance** | Manufactered under ISO9001 quality systems and complies with general EU utility regulations |
| **Standard Colors** | High-visibility Orange, Blue, Yellow, and Green (Custom tones available per request) |
| **Traceability** | Exterior surface marked sequentially, with company logo and unique serial number or qr code or barcode |
| **Environmental Resilience:** | Engineered to withstand harsh outdoor conditions, including prolonged UV exposure, direct sub-surface water contact, and wide thermal fluctuations without decaying or self-releasing |

### 3. GI Water Fittings Specifications

i. **Material and Grade:** Made of galvanized mild steel or malleable cast iron conforming to standards such as IS: 1239 / IS: 1879-1987, BS 1387 / BS 1740, or NS 199-2046.
ii. **Galvanizing & Coating:** Hot-dip galvanized or electro-galvanized zinc coating meeting IS: 4736 - 1986 standards to ensure heavy-duty corrosion resistance for outdoor or buried applications.
iii. **Thread Standards:** Outlets are precision-threaded (commonly BSP or NPT tapered threads) matching IS: 554 - 1985 tolerances for leak-proof assembly.
iv. **Pressure Ratings:** Must withstand an internal hydraulic pressure test of at least 2.1 MPa (or 1.05 MPa while fully immersed in water/oil) per IS: 1879 - 1987.
v. **Classes / Thickness:** Available in Light, Medium ("B" Class), and Heavy ("C" Class) schedules depending on structural and operational pressure demands

## 903. ADDITIONAL CONTRACTOR'S RESPONSIBILITIES

Briefly, the Contractor's Additional Responsibilities will include:

- Setting out and verification survey of pipeline/ sewerlines routes;
- Preparation of construction working drawings
- Preparation of "As-Built" drawings and O&M manuals for the whole Project;
- Compliance with the project specific Environmental and Social Management Plan, all according to NEMA Conditions. This shall include issues such as disposal of wastes, health and safety of workers, safety of public, access and avoid nuisance to the public and property owners, confirm to emissions requirements, drainage and excessive erosion, among others;
- Maintaining the works for a pre-determined period (12 months) following hand-over, to ensure that the materials and workmanship are performing as intended.
- The Client has no land available for Contractor's Camp or Camps. The Contractor will procure / rent adequate land for his camps including offices, workshops, stores, labour camp and other facilities within the vicinity of the Project Site. The Contractor will submit probable camp site(s) location details with the Bid.
- The Client has no land available for Storage of Materials including Pipes, Valves, Fittings, etc. The Contractor will procure / rent adequate land for proper storage and protection of all pipes, valves, fittings, etc. The Contractor will submit probable storage site(s) location details with the Bid.
- The Contractor shall be responsible for locating and protecting existing utilities and services, including existing bulk water supply trunk mains, electrical power cable routes (KPLC/Kenya Power), telephone (KPTC/Telekom) and other service providers), water and sewerage pipes, roads and drains (KeNHA, KURA, KERRA). In this respect, the Contractor shall be responsible for obtaining all Permits and Approvals, and in general complying with the requirements of the individual utilities and agencies.

- The Contractor will be required to liaise closely with the operator MUSWASCO when executing the works activities. Further, strict "rules" will apply to all such tie-in works since, in general, they may require for some time, a partial shut-down of the supply system and affected consumers to be informed well in advance.
- The water and sewer pipelines traverse along roads and densely populated commercial and residential areas. Working in these areas will require provision of safety barriers, warning signs and lighting, temporary accesses to properties, etc. The Contractor should indicate the cost of these works under Bill No. 1, Method Related Charges. If this item is not priced or inadequately priced, the Contractor's rates for Other Works will be deemed to cover this requirement.
- The Contractor shall be responsible for identifying and paying all Government Levies and Statutory costs such as training levy, licencing fee, etc. The costs of these are deemed to be covered in the Contractor's rates for the Works.

## 904. CONDITIONS OF CONTRACT

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## 905. CONSTRUCTION PERIOD

The proposed construction period will be 3 months. Potential Contractor will note that multiple teams will be required to comply with this requirement, and will provide documentation to demonstrate adequacy of resources in this respect. Additionally, potential Contractor to note that some disruptions to scheduled work may be expected to occur during the rainy seasons. This to be allowed for in their programme of implementation.

## 906. WAYLEAVE / EASEMENT FOR PIPELINE WORKS

The proposed sewerlines traverse along existing rivers and roads and are to be laid within the existing riparian and road reserves. Large sections of the road reserves also have other existing utilities such as fibre optic cables, electrical cables, water mains, sewer pipes, stormwater drains, manholes and chambers. In some instances, the road reserve is paved with concrete / cabro / pcc slabs / asphalt. Sections of the road reserve may have encroachment by temporary structures. As-built details of the existing utilities are not available and Contractor will be required to carry out pilot excavation to determine the location and extent of the existing utilities. Contractor will liaise with person(s) who have encroached within the road reserve and obtain clear right of way prior to commencement of work and to ensure no delay occurs in the construction work programme.

Any additional space required for purposes of construction including working space for plant, other access, storage and movement of materials, excavated materials/filling, etc. will have to be appropriately arranged and paid for by the Contractor. In case of limited space in some sections, the Contractor may have to revert to manual excavation, double haulage of excavated material or

any other means to execute the Works. The cost of all these exigencies will be deemed to be included in his rates for work.

The Employer will obtain and pay for the requisite permissions from Road Authorities - KeNHA, KURA, KERRA and Murang'a County Government to lay the pipes within the road reserves. However, the Contractor will allow in his rates all costs for conditions prescribed by the authorities during the construction of the pipeline and reinstatement of all reserve areas to the original condition.

## 907. RESTRICTIONS ON USE OF ROADS

The Contractor shall not run tracked vehicles or tracked plant on any public or private road without the written approval of the Engineer and the responsible authority or owner and subject to such conditions as each may reasonably require.

The Contractor shall observe all weight and dimensions restrictions which apply to roads and tracks in Kenya and he shall comply with all reasonable restrictions which may from time to time be imposed by the Engineer. Where damage to roads and tracks is caused by the Contractor, this shall be repaired at the Contractor's expense. In particular, the Contractor shall fill potholes in roads with roadstone when these are deepened by his plant.

The Engineer shall have the power to restrict the Contractor's use of any roads, either in direction of traffic, speed of traffic or numbers of vehicles in order to preserve such roads or to make such roads safe for use by the general public.

## 908. PREVAILING CONDITIONS

The Contractor is deemed to be fully familiar with local conditions and the potential effect (direct or indirect) on the planning and execution of the Works. The Contractor shall make his own studies / investigations in this respect. These conditions include, but are not limited to the following:

i) Climatic Conditions

There are generally two rainfall seasons, long rains between March and May and short rains between October and December.

ii) Access

The works are to be executed along roads, densely populated commercial and residential areas and along river riparian reserves. The pipelines also cross a number of rivers/ streams. Bidders to visit the Project Areas and familiarize themselves with the specific conditions in each area.

iii) Services

The Contractor shall make provision for the temporary supply of all services necessary for the execution of the works, including water, electricity, communications including Internet, fuels and consumables etc. The Contractor shall make all such applications and payments as necessary in order to obtain these services.

The Contractor is deemed to be familiar with the levels of service provided, and shall make all necessary backup provisions (such as generator sets, water tankers, on-site storage for key materials, etc.) to ensure that delays are not experienced.

iv) Local Materials

The Contractor shall be familiar with the supply of local materials with respect to sources and location, delivery times, prices, quality and standards of products, sizes, quantities available, reliability and customer service, delivery capability, etc.

With respect to quarries and borrow pits, the Contractor shall be responsible for all fees, royalties, permits and other obligations concerning such activities.

v) Laws and Regulations

The Contractor is deemed to be familiar with all laws and regulations pertaining to the implementation of the Contract, including relevant National Design And Construction Standards, Environmental Regulations, Transportation of Heavy Equipment by Road, Minimum Wage and Employment Standards, Health and Safety Regulations, Establishing / Operating / Decommissioning of Borrow Pits, Disposal of Wastes, Procedures and Regulations related to Procurement of Imported Goods, Local Customs, etc.

vi) Local Labour

The Contractor shall liaise with Local Authorities (Chiefs, Labour Office, etc.) to recruit casuals and semi-skilled / skilled labour from the Project Area sites.

vii) Ground Conditions

The Contractor is deemed to be familiar with the site soil conditions, rock depths (whether hard or soft) including the presence of groundwater.

No geotechnical information is available along the pipelines routes. Approximate rock excavation quantities have been appropriately provided for in the Bills of Quantities. These quantities are re-measurable. Contractor to verify site conditions through site inspections prior to tendering.

In addition, the Contractor shall be aware of maximum flood levels in all Rivers along which works will be carried out and schedule the construction works accordingly.

## 909. PROGRAM OF WORKS

If the Work Program submitted with the Bid requires revision, then the Contractor will within 28 days of signing the Contract, submit a Revised Program of Works to the Engineer for his acceptance.

The Program of Works shall be in bar chart format and shall indicate the major work components (including mobilization, any designs, procurement, substantial completion, etc.) and the main sub-activities. The program shall have a unit of time of one month (with part months indicated), unless the Engineer indicates otherwise.

The program (or, if necessary, a secondary program similarly formulated) shall clearly indicate the various work teams by discipline, including specialist sub-contracts and suppliers, as well as the Contractor's major plant and staff requirements, in order to demonstrate sequencing and non-conflict of resources.

The Engineer may request summary versions of the program, or additional detail for critical sections. The Contractor will comply with all such requests.

Once a Work Program has been approved by the Engineer it shall remain as the current version until such time as the Engineer instructs the Contractor to update or revise the program. The Contractor shall not modify his program without such instruction from the Engineer. Specifically, the Contractor's progress reports shall relate to the current program, and any delays shall be duly indicated.

The exact format of the Work Program shall be to the approval of the Engineer, but shall comprise the minimum of a detailed resource and cash flow schedule for the work, using Microsoft Project or a similar approved software system. This schedule, to be finalised and agreed between Employer and Contractor, will be used to measure Value of Work Done to enable the Contractor and Employer to monitor the progress of the project in terms of integrated cost, schedule and technical performance measures. In order for Value of Work Done to be estimated, the Contractor will provide a system that can accurately and demonstrably measure the following three fundamental factors:

i. The PLANNED VALUE COST also known as the Budgeted Cost of Work Scheduled (BCWS). This is the amount of expenditure the Employer anticipated he would have spent at time of reporting.

ii. The ACTUAL COST of the progress made, known as the Actual Cost of Work Performed (ACWP). This is the actual amount of expenditure the Employer incurs at time of reporting.

iii. The EARNED VALUE, known as the Budgeted Cost of Work Performed. This is the percentage complete

Payment within the Contract will be based on the achievement of earned value agreed between Employer and Contractor, Independently assessed by the Engineer, in accordance with the value achieved based on measured quantities of work done.

## 910. METHOD STATEMENTS

If the Method Statement submitted with the Bid requires revision, then the Contractor will within 28 days of signing the Contract, submit a Revised Method Statement to the Engineer for his Approval.

The Method Statement shall describe the Contractor's overall approach to the Contract, including issues such as type, number and layout of Contractor's buildings, stores and facilities; provision of temporary services: personnel issues including management structure, supervision and labour; Contractor's plant and equipment, and maintenance thereof; quality control management procedures; general methods for key work components such as structural works, electrical-

mechanical installation, construction of pipelines etc.; working adjacent to existing River Courses and any other special considerations, etc.

From time to time the Engineer may request detailed Method Statements for specific activities. The Contractor shall comply in full with the Engineer's requirements.

## 911. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

***[Refer to Clause 153 in Chapter 1 and Chapter 11]***

## 912. HEALTH AND SAFETY MANAGEMENT PLAN

***[Refer to Clause 154 in Chapter 1 and Chapter 11]***

## 913. PROGRESS REPORTS

The Contractor shall submit a Monthly Progress Report to the Engineer. The formal, content and level of detail shall be determined and agreed with the Engineer.

If the Engineer considers it necessary, the frequency of reporting may be increased. Alternatively, the Contractor may be instructed to provide a special progress report for a particular section of works (that is significantly delayed for example), on a more frequent basis (e.g. weekly, or even daily).

## 914. DAILY LOGS

The Contractor shall maintain a daily site log. The log book entries shall be prepared in triplicate, with one copy being delivered each day to the Engineer for comments and signing..

The content and format of the Daily Log shall be agreed with the Engineer upon commencement of the contract. However, typically the log shall include the date, weather conditions, numbers/movement of plant and labour, location/ main areas of work and daily activity/progress, deliveries of plant and materials to site, tests, issues, shut-downs, key instructions, accidents, among others.

In addition the log sheet shall have a space designated for comments by the Engineer.

The Engineer may, at his discretion, instruct the Contractor to provide daily labour and plant returns. Alternatively, the Engineer may request to review such information.

In addition, the Contractor shall provide the Engineer with copies of all delivery notes of plant and materials delivered to site.

## 915. TEST FORMS

The Contractor shall prepare, to the satisfaction of the Engineer, test forms to be used for the various components of the works.

All test forms shall be completed, signed and dated by the appropriate persons conducting the tests. The original copy of all test forms shall be submitted to the Engineer.

Tests forms shall be submitted to the Engineer regardless of whether the test passes or fails.

## 916. MISCELLANEOUS FORMS

The Engineer and/or Contractor shall prepare other forms as necessary. These may include, but are not limited to:

i. Site Instruction Form;
ii. Request for Information / Inspection / Approval Form;
iii. Materials Supply Form;
iv. Setting Out Works Form;
v. Pipeline Final Excavation Level Form;
vi. Pipeline Laying Form;
vii. Pipeline Backfilling Form;
viii. Pipeline Testing Form;
ix. Dayworks Form; and
x. Concrete Pour Form; etc.

## 917. CERTIFICATES OF COMPLETION

The Engineer shall prepare such forms in accordance with the Conditions of Contract. These include:

i. Taking-Over Certificate, issued upon successful completion of the Tests on Completion
ii. Performance Certificate, issued upon expiry of the Defects Liability Period and successful completion of defects and all other requirements under the Contract.

## 918. VERIFICATION BY CONTRACTOR

**Survey and Dimensional Checking**

The Contractor shall be responsible for checking the following prior to carrying out construction work:

i. Confirm the alignment and elevations of each proposed pipeline. All elevations shall be related to a single bench mark;
ii. Confirm the location and elevation of existing pipelines through excavation and backfilling of trial holes
iii. Verify the locations, depths and other details of existing services along the proposed pipeline alignment
iv. Confirm extent of existing road reserve and available wayleave;
v. Confirm proposed distances and lengths;
vi. Confirm location of proposed structures and pipeline routes, including preliminary setting out. Confirm elevations of pipelines at key locations such as crossings of rivers and roads. In particular this shall include sections where pipelines shall cross these locations. The Contractor shall excavate and backfill all necessary trial holes to confirm such elevations;

vii. The Contractor shall provide the Engineer with drawings and other such documentation confirming all surveys and setting out

# 10. MECHANICAL WORKS

## 1001. GENERAL

### 1001.1 Materials

Any non-metallic materials such as may be employed for bellows, packing or sleeves, coatings or linings etc. liable to contact with potable water shall be approved for the purpose by a recognized approval body.

i. **Materials in Contact with Sewage**

Materials in contact with sewage shall be suitable for the environment but particularly all bronze materials shall be true bronze (i.e. zinc free) alloys.

ii. **Indicator Gauges**

All gauges shall be constructed with non-corrodible metal cases and stainless steel bezels. They shall be located to enable easy readings by the plant operator and mounted to preclude damage due to vibration. The cases shall be at least 50mm diameter, unless otherwise specified, scaled in metric units and normally ranged over a 240º arc from zero to 20% - 40% above the system designed operating value for full load conditions; except where finite limits exist, e.g. level/contents gauges which shall be ranged 0-100%, or where restricted ranges are specified.

A schedule of gauges shall be provided for approval, detailing arrangements, scale ranges, designation label inscriptions and any alarm contacts.

Labels shall be securely attached on or adjacent to each gauge and groups of any such instruments shall be of matching appearance and approved layout.

Pressure gauges shall be of the Bourdon tube or diaphragm type. Each gauge shall incorporate a surge damping device and be fitted with its own stainless steel isolating cock.

Pressure gauges incorporating transducers for remote monitoring shall be damped to provide a steady output. The pressure at the tapping point shall give a direct indication on the gauge as well as driving the transducer. Any alarm contact settings shall be independent of the transducer function and nether shall interfere with the direct gauge indication.

Temperature gauges shall be of a type suitable for the application with the sensing element mounted within a thermal well. Where specified, the maximum working temperature under full load conditions shall be marked by means of a preset red pointer.

Pumping station water pressure gauges shall have a dial diameter of not less than 100mm and be calibrated in metres head. The gauges shall be uncorrected for datum and show actual pressure at the tapping point. The label bearing the designation given in the gauge schedule shall include the Ordnance Datum level of the tapping point.

Pump delivery and station delivery pressure gauges shall be mounted at a convenient height for reading on a gauge board of varnished hardwood, 20mm marine plywood or equivalent non-corrodible material with stainless steel capillary pipework, having an isolating cock at each end connecting the pressure tapping bosses and shall be adequately supported.

iii. **Fasteners**

All bolts, nuts, and studblots, including those required for installation at terminal points to existing equipment, shall be provided by the Contractor and shall have metric threads to BS 3643.

After tightening, the minimum engagement of the thread shall equal the thickness of the nut. The projection of the head beyond the outer face of the nut shall not exceed one quarter of the outside diameter of the thread. In no circumstances shall galvanised or coated bolts be shortened by cutting.

iv. **Washers shall be provided under all Nut and Bolt Heads**

All fastenings and accessories in contact with the process water shall be of stainless steel, cadium plated mild steel or other corrosion resistant material subject to the approval of the Engineer. All bolts, nuts, screws, washers and other fixings for anchoring the plant to walls, floors, ceilings, etc. shall be of corrosion resistant material or shall have a protective surface treatment to the approval of the Engineer.

All bolts in inaccessible positions shall be secured by either self locking nuts, spring washers and nuts, or castle nuts with split pins. Fasteners associated with items requiring removal during routine maintenance shall be of stainless steel. All other items shall be sheradised or hot dip galvanized in matched condition.

All holding-down or foundation bolts shall be supplied and shall be complete with hexagon nuts and washers. Bolts of steel round bar formed into a loop at one end are not acceptable.

v. **Fastenings to Concrete or Masonry**

Anchor bolts for the fixing of small items shall be of the torque-expanded type of approved make, installed strictly in accordance with the manufacturer's instructions. The size of hole required in the Civil work shall not exceed 38mm.

Where the base material will not withstand the expansion stresses imposed by the torque-expanded type or where the highest degree of resistance to vibration is required an approved type of chemically bonded anchor bolt may be used.

The minimum distance from any concrete edge shall be 100mm for expanding type fixings and 75mm for embedded bolts.

vi. **Baseplates**

Separately mounted items of plant which are required to maintain an accurate alignment shall be mounted on a common baseplate, together with all associated items and guards.The baseplate shall be of rigid construction, machined on all mating surfaces and drilled for foundation fixings. Machined datum faces shall be provided and leveling facilities incorporated in the underside.

Provision shall be made for the easy removal of any section of the drive and positive re-alignment using dowels or other approved means. Shims and packings shall be kept to a minimum and clearly identified for re-assembly.

All drain points on the assembled plant are to have easy access and drain piping shall extend beyond the baseplate.

vii. **Provision for Handling**

Suitable provision approved by the Engineer shall be made by the Contractor to facilitate the handling of all items in excess of 36kg.

Any item weighing one tonne or over and which may be required to be lifted during operation and maintenance shall be appropriately marked with its weight.

viii. **Protection of Moving Parts**

All moving parts where accessible to operational personnel shall be protected and guarded to meet relevant regulations. All guards shall be designed to facilitate easy removal.

ix. **Balancing**

All rotating parts of the machinery shall be statically and dynamically balanced unless otherwise agreed in writing by the Engineer. The complete rotating assembly shall be designed such that any critical speeds are outside the duty running speed range of the machine.

x. **Lubrication**

Any components requiring manual lubrication shall be provided with greasing nipples of an approved type mounted on a panel and identified.

A remotely mounted electrically operated lubricator of approved type shall be provided to serve components, if any, requiring continuous lubrication by external mechanical means.

The lubrication tubes, if any, shall be of approved material suitable for high pressure use. The Contractor shall include for all grease and oil required for testing at works and site.

The first filling after tests shall be provided by the Contractor who shall submit details of his recommended lubricants, which shall be available from any of the major oil companies, for approval by the Engineer.

All bearing surfaces shall be properly charged with grease before the plant is operated.

xi. **Nameplates and Labels**

Instruction plates, name plates and labels shall be provided for all items of the plant giving particulars of duty, size, serial number and full information for identification and operation. Their construction and engraving shall be to the Engineer's approval.

xii. **Plant References**

After final painting, all plant items shall be identified by a unique reference character as detailed on the specification drawings or otherwise specified. Such references to be affixed in a prominent position on the plant body with characters not less than 100mm high or as otherwise specified. Characters shall be bold capital letters and/or numerals. The abbreviation 'No' shall not be used.

Unit references shall include any associated main and auxiliary drives shall follow a logical sequence bases on layout or history. In any particular installation, a set of similar duty drives

where any number of units may run shall be suffixed 1, 2, 2,3, 4 etc. whereas alternative drives for the same duty where only one unit may run (i.e. duty/standby) shall be suffixed A & B.

xiii. **Tools and Tackle for Maintenance**

The Contractor shall supply a complete set of any special tools and other equipment necessary for the dismantling, re-erection and adjustment of the plant.

The tools provided shall be in new condition, adequately labeled as to their use and contained in stout and suitable padlocked boxes. The Engineer's instructions as to who shall be the recipient of the tools shall be sought before delivery is made.

Any special slings required shall be provided and clearly marked by embossed labels to show safe working loads. Test certificates shall be provided where applicable.

xiv. **Locks and Keys for Mechanical Plant**

All locks of the same size shall be of the same type as manufacture but having different keys.

Three keys shall be provided for each lock.

Each key shall have prominently attached to it an embossed brass label stating the following:

- Key number;
- Location of lock/Item of equipment.

xv. **Noise Level**

All plant shall run without undue vibration and with the least practicable amount of noise.

Vibration levels shall not exceed these set cut in ISO 2372 for the particular type of equipment.

Any items of plant which produce a noise level exceeding 65 dB (A) at 3 metres shall be listed by the Tenderer. It shall be deemed that all items of plant not so listed have a noise level of less than 65 dB (A) at 3 metres.

To meet the environmental requirements, the Contractor shall provide all necessary equipment to meet the following conditions, based on the site layout shown on the specification drawings and with 75% of the plant running simultaneously:

- the noise level generated at the site boundary by anynew plant shall not exceed that generated by the existing plant;
- the noise level at 100m from the source does not exceed 65dB (A);
- the noise level in the building (10m from the source) does not exceed 80 dB (A);
- the noise level in the plant room (5m from the source) does not exceed 80dB (A);
- warning notices shall be provided at all entrances to rooms where the noise level will exceed 75 dB (A).

xvi. **Frost Protection**

The plant shall be adequately protected against damage from freezing, using an approved means of insulation.

Particular attention shall be given to pipework, pump casings, etc. and any part of the plant and equipment likely to stand for periods charged with static water.

Where lagging is used, it shall be suitable for outside installation and completely impervious to all weather and atmospheric conditions on the works. Lagging materials containing asbestos shall not be used.

The lagging shall be sectional and easily removed for maintenance purposes. Joints shall be sealed together with an approved waterproof adhesive tape.

Areas where lagging may be vulnerable to damage shall be suitably protected by an approved means.

xvii. **Corrosion Protection**

Where dissimilar metals are in contact or close proximity and corrosion may occur through electrolytic action or differences in electrical potential, protection shall be afforded by electroplating, suitable gaskets, cathodic protection or other means approved by the Engineer.

Chromium plated parts shall not be used on sewage works or in any other damp or corrosive atmosphere.

All surfaces shall be adequately protected in transit, and any damage shall be removed immediately on off-loading and on completion of erection.

After cleaning and inspection but before the plant leaves the Contractor's works, the machined surfaces of steel and ironwork shall be covered with preserving fluid of an approved type, or otherwise protected to the Engineer's satisfaction.

All external steel screw fittings shall be supplied in the galvanized condition, stainless steel, or sheradised to comply with BS 4921, Class 1 or Class 2 with passivation treatment.

xviii. **Surface Preparation and Painting**

The whole preparation and paint system shall be suitable for operating environment specified and a painting schedule giving details of preparatory treatment, types of paint, number of coats and method of application shall be submitted with the Tender. (See Particulars of Plant).

Proprietary items may be used in their standard finish subject to the approval of the Engineer. For specified applications, adequate supervision shall be provided for all stages of preparation, application and testing.

All steelwork shall be protected in accordance with BS 5493 and based on a 'long' time to first maintenance. The exterior environment shall be regarded as 'polluted inland' (Table 1 Pt. 2) and the interior environment shall be regarded as 'frequently damp' (Table 1 Pt. 7) unless otherwise specified. Items below water level or subject to immersion shall be treated as Table 1 Pt 8.

After all machining, forming and welding has been completed, all steelwork surfaces shall be thoroughly cleaned of rust, scale, welding slag or spatter and other contaminations prior to any painting.

The system proposed shall be abrasion resistant and conform to the following typical requirements.

Preparation of steelwork at the works shall be either:

- Hot dip galvanized to BS 729 with a median thickness of 85 microns (0.0034"); or
- Grit blasted to BS 7079 Grade SA 2.5 and zinc sprayed within 4 hours to BS 2569 Part 1 to a thickness of 125 microns (o.oo5") followed by one coat of approved etch primer.

Typical finishes (with compatible primers) based on BS 5493 are given below:
Steelwork and ferrous castings exposed above water/sewage level.

Either high build micaceous iron oxide or chlorinated rubber to give a minimum total dry film thickness of 300 microns, or one coat of two pack epoxy primer and further coats of epoxy paint to give a total dry film thickness of 270 microns;

xix. **Steel Work below Water/Sewage Level**

Either epoxy system as above or coal tar epoxy paint system to give a minimum total dry film thickness of 450 microns;

Ferrous castings and fittings without substrate below water level.

Coal tar epoxy paint system to give a minimum total dry film thickness of 450 microns. These coatings shall be subject to the Holiday Test.

The surface of all non-ferrous parts usually painted shall be cleaned, rubbed down, stopped, filled and given one priming coat of paint.

Anti-corrosion coatings used for any steel or iron used in pipework, pumps, valves, etc. in contact with potable water, shall either be a compatible bitumen material to BS 3416 or a polymeric anti-corrosion coating complying with Water Industry Specification WIS 4-52- 01.

Any damage occurring to any part of a painting scheme shall be made good to the same standard of protection and appearance as that originally employed. Any finish coat applied onsite shall be considered for decorative purposes only.

Manufactured articles to be galvanized shall be hot dip galvanized after complete fabrication and no bending, cutting, drilling, riveting or threading shall be permitted after galvanizing.

The care of galvanized articles when transporting, storing and erecting them shall be in accordance with the recommendations of BS 729. The renovation of small areas of damaged coating not exceeding 40mm$^2$ shall be in accordance with Appendix D of BS 729 and subject to the Engineer's approval.

xx. **Paint Colours**

The colours of the primer, intermediate and finishing coats of a paint system shall be easily distinguishable from each other, and the materials used shall be suitable for the method of application and preferably be supplied by one manufacturer who shall ensure that all coatings are compatible.

The final colours and finish for the equipment shall be as specified in Appendix 8 unless otherwise advised.

## 1002. VALVES AND PENSTOCKS

### 1002.1 Types and Operating Conditions

Valves shall be designed to meet the operational and environmental conditions specified for the types indicated in the specific valve schedule.

The closure rates of all valves shall be designed to prevent the effects of surge. Where necessary, valves with a varying closure rate shall be used.

Valve flanges or couplings shall be as specified in the valve schedule and match those specified for the pipework installation.

### 1002.2 Identification

Each valve shall be identified by a unique reference as approved which shall identify the medium/plant controlled and be numbered in a logical sequence.

The reference shall wither be engraved on a 3mm thick laminated white/black/white traffolyte disc or stamped on a1.0mm (19g) thick brass disc. The disc shall be at least 35mm diameter with reference letters and numerals not less than 4mm and 8mm high respectively.

The discs shall be mounted on the hub of the handwheel or where this is impractical, they shall be attached to the valve stem by means of suitable brass 'S' hooks and/or jack chain through a hole at the top of the disc.

### 1002.3 Access

All valves, spindles and handwheels shall be position to give good access for operational personnel. It shall be possible either to remove and replace or to recondition seats, gates or gland packings which shall be accessible without removal of the valve from the pipework or, in the case of power operated valves, without removal of the actuator from the valve.

Extension spindles shall be supplied wherever necessary to achieve the specified operating requirements.

### 1002.4 Hand Operation

All handwheel shall be arranged to turn in a clockwise direction to close the valve or penstock, the direction of rotation for opening and closing being indicated on the handwheels.

The handwheels shall be coated with black plastic and incorporate facilities for padlocking in either the open or closed position.

The operating gear of all valves and penstocks shall be such that they can be opened and closed by one man against an unbalanced head 15% in excess of the maximum specified service value and any gearing shall be such as to permit manual operation on a reasonable time and not exceed a required rim pull of 200kg.

Power operated valves shall include equipment for manual operation by means of a handwheel or other suitable device which shall be interlocked with, and fixed to, the power unit.

Headstocks and valves of 50mm nominal bore and above shall be fitted with mechanical position indicators to show the amount which the valve is open or closed in relation to its full travel, i.e. 0.25, 0.50, 0.75, 1 etc.

### 1002.5 Valve Materials

Valve bodies and other components shall be of corrosion resistant materials, compatible with the medium and of robust industrial design.

For water applications and where specified, valve bodies, discs and wedges shall be of cast iron, with facing rings, wedge nut and other trim of carrions resistant bronze or gun metal.

The valve stem, thrust washers, screws, nuts and other components exposed to the water shall be of a corrosion resistant grade of bronze or stainless steel.

For water works applications, wedge gate, metal seated valve materials shall be in accordance with BS 5163 Table 6A, fitted with a stuffing box and gland seal on the stem. Oil or grease shall not be used on any bearing or seal that may be in contact with the water being controlled.

### 1002.6 Wedge Gate Valves for Manual Operation

Valves up to and including DN 300 shall be of the resilient seal type and valves larger than DN 300 shall have metal seals.

Spindles shall be of the non-rising type and screwed so as to close the valves when rotated in the clockwise direction. The direction of closing shall be clearly cast on the valve cap or hand wheel as appropriate.

The valves shall be constructed of the following materials:

| | | |
|---|---|---|
| body | - | cast iron; |
| spindle | - | forged bronze or stainless steel; |
| metal faces and seal | - | gunmetal. |

The valves shall be suitable for the unbalanced head as specified or indicated in the schedules.

Suitable gearing and anti-friction devices such as ball bearing thrust collars shall be provided as necessary to enable opening and closing by manual operation at the pressure stated, using an effort no greater than 26kg on the tee key or hand wheel supplied. Handwheels shall not exceed 500mm diameter. A bypass with gate valve forming an integral part of the valve shall be provided where recommended by the valve manufacturer for the pressures specified.

Gearing on valves of DN 300 and less shall be enclosed in a sealed gearbox suitable for buried installation and operated with a tee key. Except where shown in the Drawings, all valves exceeding DN 300 shall be provided with bevel gearing and handwheels.

Valves to be used for washouts and isolating air valves shall have screwed seats.

Extension spindles shall be galvanized or stainless steel adequately supported with cast iron brackets, and of sufficient diameter to prevent any whiplash effect through twisting when being used to operate the valves. The spindles shall be capped for key operation.

Valve caps shall be fitted with hexagonal set screws.

Valves shall be coated with cold applied bitumen conforming to the requirements of BS 3416 (material Type II).

Keys for valve operation shall be of sufficient length so that the valves can be operated by a man standing, but shall not exceed 1.2m in length, and shall have a detachable cross bar.

All valves shall be open end tested in accordance with BS 5163, and pressure and materials test certificates shall be submitted to the Engineer for Approval.

### 1002.7 Telescopic Valves

All bellmouth telescopic valves shall have cast iron outer sleeves and bellmouths. The outer sleeves shall have machined labyrinth seals and the sliding tubes shall be manufactured from zinc free bronze.

A cast iron shall be stirrup shall be affixed over the top of each bellmouth and these shall be connected to the rising screw thread by means of a stainless steel 'Rose' type coupling. To minimize fouling by rags etc. the valves shall not be fitted with outer guide rods.

### 1002.8 Butterfly Valves

Butterfly valves shall conform to BS EN 593.

Butterfly valves shall have a high grade cast iron body to BS EN 1561 designed to the specified working and test pressures. The pressure rating valve shall be cast in the valve body.

The disc shall be of high grade cast iron to BS EN 1561 or nodular cast iron to BS 2789 to the defined working and test pressures. It shall have a convex shape designed to achieve low head loss characteristics. The valve shafts shall be of stainless steel operating in self- lubricating bushes in the body.

The valve seat shall be of gunmetal to BS 1400. The sealing ring shall be a renewable Ethylene Propylene Diene Monomer (EPDM) rubber attached to the disc edge by a sectional bronze retaining ring to form a resilient and durable seal.

The valves shall be fitted with hand wheel actuators not exceeding 500mm diameter incorporating gearing to allow opening and closing by manual operation at the pressure stated using an effort no greater than 36kg on the hand wheel supplied.

In all cases the gearing shall be designed to close the valve, from fully open to fully closed in a period of not less than ten minutes with this effort. Actuators shall be designed so as to close the valves when the hand wheel is turned in a clockwise direction; the direction of closing shall be clearly cast on the hand wheel. Position indicators shall be fitted to all actuators.

Where required valves shall be electrically actuated with a manual override. Remote actuation shall be provided with a visual indication of valve open, valve closed and percentage opening together with fault indication.

A performance curve, relating percentage valve travel, open area and discharge coefficient shall be submitted to the Engineer. The head loss coefficient with valve fully open shall be defined.

All valves shall be tested in accordance with BS EN 593 and pressure and material test certificates shall be submitted to the Engineer for approval.

### 1002.9 Extension Spindles

Extension spindles shall be adequately sized to prevent buckling and shall be attached to the valve/penstock stem by a suitable adaptor incorporating two muff couplings, scarf lap jointed and pinned with at least two coupling joints included. Universal joints and waterproof sleeves shall be provided where specified. Extension spindles shall be manufactured from 080M40 (EN 8) steel.

Intermediate bearing support or guide brackets of cast iron, with slotted holes for site adjustment, shall be fitted to long shafts where necessary. Bearings shall be of PTFE or similar approved type.

### 1002.10 Pedestal and Spindle Covers

Penstock and valve pedestals shall be of cast iron or heavy duty, welded, mild steel construction with a substantial base and fixing provision. The base and top of the pedestals shall be machined normal to the axis of the drive shaft.

Where necessary, support guide bushes shall be fitted as the base of the pedestal.

The pedestal height shall be such that the handwheel is approximately 1 metre above the operator's floor level.

Covers of an approved type shall be provided for all rising spindles to totally enclose them when in the fully raised position.

### 1002.11 Penstocks

All penstocks shall be designed and installed so that the maximum working pressure acts in a seating direction on the gate.

Both gate and frames shall be sufficiently rigid to withstand twice the maximum working pressure and any eccentric pressures created by the tightening of the anchor bolts during installation. All penstock frames shall have a spigot back.

The frame shall be of the rising spindle type unless otherwise specified, and the spindles shall be of adequate size to avoid buckling under load.

All spindle nuts shall be self aligning and their length shall be not less than twice the spindle diameter.

The top part of the penstock frames shall be sufficiently robust and substantial to prevent the frames bowing and if necessary, additional holding down bolts shall be fitted. The penstocks shall be fitted with matching wedges on doors and guides, the wedges shall be fitted with renewable seatings of zinc free bronze. Under no circumstances shall wedges be fitted to the bottom or lower section of the penstock doors. The wedges shall be adjustable with stainless steel adjusting screws and shall be readily removable.

On rectangular penstocks the inverts shall be flush with renewable synthetic rubber seals on the bottom of the doors. The rubber shall be suitable for the application and of an approved type.

The doors shall have lifting eyes cast in, or eye bolts of sufficient size to permit the lifting of the door against seating pressure.

### 1002.12 Penstock Materials

Penstock doors, wedge support beams, frames, guides, frame extensions, headstocks and bridge pieces shall be cast iron, of minimum grade 220 to BS 1452. Doors and frames shall be fitted with renewable seatings of zinc free bronze.

Spindles shall be manufactured from stainless steel 431s29 (EN 57) or similar approved material.

### 1002.13 Templates

Simple templates shall be supplied as soon as possible after approval of drawings to enable the Civil engineer to position the holes for holding down bolts for all penstocks over 1.0 m square.

## 1003. PIPEWORK

### 1003.1 Systems Design

All pipe systems shall be arranged, installed, supported and provided with all necessary means of venting, draining and expansion subject to the approval to the Engineer before erection commences.

The pipework layout shall be designed so that items of equipment and sections of pipework can be removed from the pipelines without major disturbance to the adjacent pipework. Particular care shall be taken to ensure that pipework thrusts are not transmitted to machinery or associated apparatus. The Contractor shall indicate on his detailed drawings the thrust blocks required to anchor his pipework.

Dead legs shall be avoided, but where this is not possible provision shall be made for flushing the pipework. Changes in pipe bore sizes shall be by the use of proprietary fittings or fabricated sections to avoid sudden changes.

Where relevant, formed bends and offsets shall be used and be cold formed in a standard pipe bending machine. They shall have an inside radius of not less than 4 times the outside diameter of the pipe.

Hydraulic pipework. Pipework for pressurized hydraulic fluid shall be sized to maintain fluid velocities below those which specified and provide a safety factor of 4:1 on the design pressure, which shall be taken as 120% working pressure;

Compressed air pipework. Air pipework shall be sized such that the air flow velocity does not exceed 8m/sec. To provide adequate condensate drainage, the pipework system shall be run with a horizontal fall of not less than 1 in 50 in the direction of air flow and incorporate drainage points at distances of not less than 30m. Drainage points shall be formed by the use of equal tees with a down-pointing leg fitted preferably where changes of direction of flow occur.

Any branch take-off shall be from the top of the main and the bottom of any falling pipe shall be drained.

### 1003.2 Flanges

Unless otherwise specified flanges shall be faced and drilled to conform to the dimensions specified in BS 4504. Flanges shall be compatible with the pressure rating of the adjacent pipework but not less than 14 bar. Bolts, nuts and washers (two washers per bolt) shall be to BS BS EN 1092-3;2003. No bolt shall project more than two full threads beyond its nut after tightening. In no circumstances shall the shortening of excessively long bolts by cutting be allowed.

Gaskets shall comply with replaced by BS EN 1514 (1997) and replaced by BS EN 681-2 (200) and BS 681-1 (1996) Type W.

Flanges shall be painted with two coats of epoxy resin paint.

### 1003.3 Mechanical Couplings

Unless otherwise specified or shown in the Drawings pipes and fittings shall be supplied with flexible joints.

Mechanical couplings shall be of the Dresser, Viking Johnson type without a centre register. Joints rings used shall be of the ethylene propylene rubber (EPDM) or other material approved by the Engineer.

All mechanical couplings and flange adapters including nuts, bolts and washers shall be supplied with 'Rilsan' nylon thermoplastic polyamide applied by fluidized bed dipping.

### 1003.4 Materials for the Assembly of Flexible Joints

Lubricant shall be of a kind not conducive to the growth of bacteria and shall have no deleterious effects on either the joint rings or pipes. Lubricants for water supply shall not impart to water, taste, colour, or any effect known to be injurious to health.

### 1003.5 Materials

Pipework materials, sizes, pressure rating, fittings, coupling arrangements and median carried shall be as detailed in the Particular Specification, pipework being in standard metric sizes where possible.

General purpose steel pipework with screwed fitting shall be of galvanized mild steel to BS 1387 heavy grade with fittings of galvanized malleable iron to BS 143/1256, having tapered internal and external threads to BS 21.

Flange joints shall be as specified below for the application and all necessary bolts, nuts and washers shall be cadium plated. Welded joints in carbon steel pipe shall be to Class II quality to BS 2640 or BS 2971. Welding shall only be carried out by welders who are approved in accordance with the relevant BS.

Water pressurized system shall use pipe-work of carbon steel in accordance with BS 3601 with pipe sizes to BS 3600. Sizes greater than 80mm shall be selected from the preferred sizes 100, 150, 200, 300, 450, 600 and 800mm.

Flange sizes shall to BS 4505 rated NP16 unless otherwise specified.

All flanged joints shall be made with 3mm thick rubber canvas reinforced insertion rings complying with BS 4865 Part 1 table 16A.

Low pressure large bore systems shall use steel pipes and fittings to BS 4622 unless ductile iron pipes and fittings to BS 4772 are specified. Screwed or cast flanges shall have a minimum NP16 rating and be fitted with 3mm thick rubber canvas-reinforced insertion rings.

Hydraulic pipework shall be of stainless steel high pressure tubing grade CFS 316 to BS 3605 or mild steel grade CDS 23/S to BS 3602 as specified.

Flexible hoses shall be of the twin wire braid reinforced type complying with BS 3832.

Pipe fittings not normally visible or accessible after installation shall be of the welded socket type with break joints at suitable positions for maintenance.

All other fittings shall be of the compression type in mild steel with an electroplated corrosion resistant finish.

Air pipework. - As for general purpose pipework except where otherwise specified. Low pressure air pipework shall be cast iron to BS 2035 Class C, flanged to BS 10 Table E. Internal surfaces to be cleaned and treated suitable for passing clean, humid air.

Gas pipework. As for general purpose pipework unless otherwise specified.

Fuel oil pipework. As for general purpose pipework except that pipework fittings shall not be galvanized.

Exhaust pipework. As for general pipework except that pipework and fittings shall not be galvanised. Flanges shall be to BS 10 Table D.

### 1003.6 Joint and Pipe Fastenings

All nuts, bolts, washers, flanges, gaskets, flanged tied adaptors, drain valves, special connection pieces, supporting hangers, brackets or clips and temporary supports for the pipework, together with all terminal point connection material shall be supplied and installed under this Contract.

All flanged joints shall be fitted with suitable insertion ring gaskets which shall be carefully adjusted concentric to the bore of the pipe so that no undue strain is placed on any of the bolts or flanges of the pipe when bolting up.

Joints on flanges that exist or have been installed under other contracts shall be made with the same material and suitable for the flange faces.

Flushing and drain connections on pipework below 150mm shall be made using proprietary welded fittings with G series internal parallel threads to BS 2779 which shall be immediately

sealed with steel hexagon headed shouldered plugs and seals. Holes thus made in the pipe shall have any burrs removed and be finally pulled through to remove loose particles.

### 1003.7 Template Pipes

Template or closure pipes shall be provided where necessary to facilitate erection. The design and construction of the template pipes shall be to the approval of the Engineer, and the Contractor will be responsible for establishing the dimensions of the template pipes such that there will be no strain on the connected items after installation.

### 1003.8 By-passes

Where pipeline flow meters are used, particularly electromagnetic meters, by-pass pipework and valves shall be installed to allow removal of the meter without interrupting the process flow. Draining shall either be via backflow or drain valves.

### 1003.9 Flanged Adaptors

Flanged adaptors shall be provided as indicated in the Specification drawings. Each adaptors shall be complete with all associated fittings and shall be installed in accordance with the manufacturer's instructions.

### 1003.10 Reference Marking

Prior to dispatch from the manufacturer's works each pipe section shall be marked with an appropriate reference number for future identification.

### 1003.11 1304.14 Protection of Pipework

Immediately after the completion of fabrication at the works or on site and during transport and storage, pipe ends shall be protected from external damage and sealed against ingress of dirt by suitable caps, plugs or other similar means. After cleaning and inspection, machined surfaces of all steel and ironwork shall be covered with preserving fluids of approved type otherwise protected and all flanges shall be fitted with blank discs bolted to each face.

### 1003.12 Ductile Iron Pipe Work

i. General

Ductile iron pipes and fittings for water supply shall comply with BS EN 545 (1995). Pipes and fittings shall have spigot and socket joints unless otherwise specified. Pipes shall be class K9. Spigot and socket flexible joints shall be of the push-fit type with gaskets of ethylene propylene rubber (EPDM).

ii. Corrosion Protection

Pipes and fittings shall be protected externally with an extruded polyethylene or polyurethane coating complying with DIN 30674. Pipes and fittings shall be lined internally with centrifugally applied cement mortar and complying with DIN 30674. Joint areas shall be coated with epoxy or polyurethane to DIN 30674. All lining and coating materials shall be approved for contact with potable water by an internationally recognized body like the Drinking Water Inspectorate of UK.

### 1003.13 Steel Pipe Work

xxi. General

Steel pipes shall be manufactured to BS EN 10224 or AWWA C200 and shall be suitable for the pressure ratings required by the Contract. Fittings shall conform dimensionally to BS EN 10224, AWWA 208-59 or AWWA M11. Unless otherwise specified or necessary to meet the requirements of the Contract steel pipes shall be manufactured as follows:

a) DN300mm and below shall be manufactured to minimum of Grade L235 or API 5L Grade B

b) DN350mm and above shall be manufactured to a minimum of Grade L275 or API 5L Grade X42.

The pipes and fittings of diameter 600mm or less shall be supplied with push-fit spigot and socket type joints with integral gasket of EPDM rubber or similar to BS EN 10224 or BS CP 2010. Pipes greater than 600mm shall be supplied with ends cut square suitable for use with flexible couplings and the external weld ground back sufficiently.

Each pipe shall be supplied complete with a coupling for jointing.

xxii. Corrosion Protection

Steel pipes and fittings shall be protected externally at the manufacturer's works with fusion bonded epoxy resin in accordance with AWWA C213. Pipes greater than 600mm and all fittings shall also be lined internally with fusion bonded epoxy. Pipes 600mm or less shall be lined with cement mortar to AWWA C205 or BS EN 10298.

All lining and coating materials shall be approved for contact with potable water by an internationally recognized body like the Drinking Water Inspectorate of UK.

Where required by the Bills of Quantities, the Supplier shall also price for the provision of an alternative 3LPE coating to DIN 30670 or AWWA C316 of a triple wrap system of fusion bonded or sprayed epoxy primer, an intermediate polymer adhesive layer and an extruded high density polyethylene coating in general conformance with ISO/DIS 21809-1 Class B as appropriate.

### 1003.14 Expansion Joints

Expansion joints shall permit expansion or contraction of the pipeline over a range of at least 50 mm either way, i.e. a total movement of 100 mm. Tie bolts shall be provided across the joint to restrict excessive movement of the joint. The expansion joint shall be coated internally and externally with the same material as the adjoining pipework. All bolts, nuts and washers shall be 316 stainless steel.

# 1004. PLATFORMS AND WALKWAYS

## 1004.1 General

All necessary platforms, toe-plates, ladders, stanchions, handrails, chains and all associated fittings, support structures and curbing shall be supplied to provide a safe and efficient installation.

## 1004.2 Steelwork

All mild steel item shall be protected to BS 5493 Section II by hot dip galvanizing after fabrication to BS 729 with a minimum thickness of 85 microns (0.0034") unless otherwise specified.

No cutting, drilling, bending, riveting, threading or similar operation will be permitted after galvanizing, and due care shall be exercised in transporting, handling and fixing galvanised metalwork to prevent damage to zinc coating. Under no circumstances shall damage to zinc coating be repaired with rust inhibiting paint.

## 1004.3 Platforms

Platforms as indicated on the Specification drawings shall be provided. All platform panels shall be individually secured to the supporting structure and be of suitable size and weight for ease of handling. They shall be cut and fixed to maintain a continuity of pattern.

Platforms, walkways and floor covers shall be adequately supported to prevent undue flexing and have supporting rebates with a minimum landing width of 30mm. Where the supporting structure is concrete, galvanised mild steel angle curbs shall be provided and securely grouted into rebates left in the concrete such that the tops of the panels are flush with the top of the concrete.

Normal access ways shall be suitable for a minimum uniformly distributed load of 5 $kN/m^2$ (105 $lbf/ft^2$). Where platforms and floor covers are specified for concentrated loads or machinery support, the uniformly distributed loading shall be not less than 15 $kN/m^2$ (315 $lbf/ft^2$).

Plated flooring shall be aluminum chequer plate having a minimum base thickness of 8mm with a non-slip tread pattern, secured to the supporting steelwork with countersunk screws, which shall be cadium plated when used with aluminum plate. For manoeuvring small- wheeled items e.g. switchboards trucks, plain floor sheeting 8mm thickness shall be provided over specified areas.

Open mesh platforms shall be open type, galvanised mild steel flooring.

## 1004.4 Hinged Covers

Hinged covers provided in platforms shall have a galvanised, fabricated steel framework, covered to match the surrounding floor strength and pattern.

Covers provided for permanent man access shall be located as indicated on the specified drawings. They shall have a minimum clear opening of 750 x 750 mm and have a locking stay fitted, arranged so that in the fully open position, the stay will hold the cover open until released. Provision for padlocking the cover in the open or closed position shall be provided.

Covers for valve keys or other small openings shall be sized to suit the application and not include either stays or padlocking facilities.

### 1004.5 Ladders

Ladders shall be of mild steel construction except where they are subject to prolonged immersion in water where they shall be of stainless steel.

Permanently fixed ladders of the step type shall have flat section, non-slip, open type treads not less than 450mm wide between stringers, with handrails fitted to each side extended to meet the platform handrails at the upper end. Tread width shall be not less than 120mm with a pyramid pattern nosing.

Vertical or near vertical fixed ladders for emergency use shall be in accordance with BS 4211 with equally spaced rungs between 230mm and 260mm apart with a width between stringers not exceeding 400mm. Safety hoops shall be provided where ladders rise more than 2.3m from the ground or platform. The stringers shall be extended at least 1100mm above the upper platform, and suitably opened out for access, or where ladders are below manhole covers, a separate hand hold shall be fixed to the upper platform.

### 1004.6 Railings

Guardrails shall be provided for all platforms elevated greater than 500mm and the upper rail shall form the handrail. A knee rail shall be included an located approximately at mid- height.

Stanchions and rails shall be of mild steel or aluminum alloy tubing as specified, not less than 31mm overall diameter and tube thickness 10 SWG set in a twin-rail arrangement with the upper rail not less than 1.1m above the platform level or 900mm above the stringer pitch line for stair flight. Ball type tubular standards are to support the rails at not more than 1.5m centres and arranged so that there is a standard not more than 300mm away from any bend and 150mm from any rail joint. Rails are to be secured to prevent movement within the standards. Standards and rails shall be attached to the platform/walkway and not to any non-structural floor or toe plates.

Any roughness on the external surfaces shall be removed in an approved manner to produce a safe surface to the satisfaction of the Engineer.A plastic coated finish shall be applied where specified and care should be taken to preserve from damage the plastic coating which may, if desired, be applied at a later date. The Contractor is to include all cleaning and derusting operations necessary.

Whenever possible, runs of guardrail shall be continuous and sharp vertical changes of direction shall be avoided. Handrails shall terminate in swept ends either to the wall or return to the knee rail by means of a U bend which shall not extend greater than 350mm beyond the centre line of the last standard.

### 1004.7 Safety Chains

Access openings in guardrailing to ladders and platforms having a direct drop of more than 300mm shall be protected by a double row of safety chains of galvanised or electro-plated zinc

mild steel 3 SWG x 3 links per 100mm complete with 'S' hook attachments at one end and permanently fixed at the other.

### 1004.8 Toe Plates

All platform and walkway frames shall have toe plates attached to the sides where guardrails are fitted. Only around cut-outs provided in floor plates shall the toe plate be secured to the floor plate by welding.

Toe plates shall be at least 100mm high and 6mm thick, any gaps between the toe plate and the floor should not exceed 15mm.

### 1004.9 Trench Covers

Trench covers shall be of minimum or galvanised mild steel chequer plate (min 3mm thick) supported to prevent undue flexing and having suitable holes to allow removal by standard lifting keys. Support shall be by means of steel curbing rebates cast into the trench top edges, such that the top of the covers are flush with the top of the finished floor level and providing a landing width of at least 30mm.

Additional or alternative support for switchboards etc. shall be from at least 75 x 35 mm channel section cross bearers and transverse trimmers, fixed or cast into the floor and located to suit equipment fixings, access requirements and floor cover spans.

To prevent differential deflection, butt straps shall be fitted to the underside of floor plates which have no other support.

Edging curbs suitable for mild steel chequer plate shall be painted in red oxide primer, the curbing may be tapped to accept cover securing screws. Where aluminum plates are used in contact with any mild steel supports, a bitumen coating on the points of contact shall be used.

# 11. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

## 1101. MANAGEMENT PLAN PRINCIPLES

This project is geared towards enhancing social and economic benefits to the people living in the informal settlements however; the project should also observe environmental protection requirements in accordance to the established laws and regulations to ensure sustainability. To realize this goal, acceptability by a majority of the beneficiaries and minimal effects to the physical environment will require to be integrated in the project through constant consultations, evaluations and review of the design aspects throughout the project coverage. Among the factors that need to be considered in this particular project implementation will include:

- The Contractor shall hire qualified Community Liaison Officers who will be act as an inter-phase between the contractor and community. The Community Liaison Officers will be responsible for continuous engagement of the community.
- Ensure prevention of pollutants discharge into the drainage systems and pollution of public water bodies,
- Enhance integration of environmental, social and economic functions in the project implementation.
- Consider preventive measures towards possible social and economic disruptions that may arise from the project implementation in accordance with the laid down guidelines.
- The contractors and other players in the project activities be prevailed upon to implement the EMP through a sustained supervision and continuous consultations.

## 1102. SPECIFIC MANAGEMENT ISSUES

### Management Responsibilities

In order to implement the management plan, it is recommended that a supervisor is identified to oversee environment and management aspects during construction of the project. The supervisor would also be expected to co-ordinate and monitor environmental management during construction and provide monitoring schedules during operations.

The contractor shall be required to submit, under due consideration of the ESMMP as part of the ESIA the below listed management plans.

- Occupational health and safety plan
- Traffic management plan
- Public health and safety management plan
- The provisions for the workers grievance mechanism
- Environmental and social monitoring plan (with further detail to the outline of monitoring indicators as presented in the ESMMP) below.

### Environmental Management Guidelines

Upon completion and commissioning the priority projects, it will be necessary to establish appropriate operational guidelines on environmental conservation and social linkages to enable the operations' management identify critical environmental and social issues and institute appropriate actions

towards minimizing associated conflicts.

Basically, the guidelines should cover among other areas environmental management progammes, standard operation procedures, compliance monitoring schedule and environmental audit schedules as required by law. Social harmony of the facilities and associated component will be achieved through collaborations with the stakeholders and settlement executive committees at the project level.

**Environmental Education and Awareness Rising**

The county government field staff and the other beneficiaries will need to understand the basic environmental principles associated with the projects. In this regard, therefore, the following steps will need to be considered:

- Creation of liaisons on all matters related to environment management of the facilities once commissioned
- Encourage contribution of improvement ideas from the beneficiaries on specific issues related to the management of the facilities
- Establish initiatives that would instil a sense of ownership of the facilities and related components to all beneficiaries,

**Decommissioning Process**

Due to the long-term life of the intervention facilities and related components, a decommissioning audit will be undertaken at least 1 year before the process for any of the components commences, following a notice to decommission. The decommissioning process will be guided by a comprehensive decommissioning plan developed through the decommissioning audit process. However, the following features will need to be decommissioned upon completion of the works:

- Contractor's camp and installations that will need to be removed without compromising on the safety and general welfare of the immediate residents. Special care to be given to associated wastes and dust emitted in the process,
- Materials stores that will comprise fresh materials and used items. Each category will be moved safely out of site ensuring minimal or no impacts to the related environment and social setting,
- Wastes and debris holding sites will be cleared with maximum re-use of the debris either on surfacing the passageways or other grounds such as schools and church compounds.

**Table 8.1: Construction Phase: Environmental and Social Management and Monitoring Plan**

| Activity | Associated Impacts | Impact Levels | Management Actions | Target Areas & Responsibilities | Monitoring Indicator |
|---|---|---|---|---|---|
| Seeking approvals from NEMA for ESIA and Approval of plans from County and National Government | Delay in implementation of the project due to objections and stop orders | Low | ▪ The Contractor shall ensure that all pertinent permits, certificates and licences have been obtained prior to any activities commencing on site and are strictly enforced/ adhered to;<br>▪ The Contractor shall maintain a database of all pertinent permits and licences required for the contract as a whole and for pertinent activities for the duration of the contract | All the settlements<br><br>Responsibility<br>NYANDAWASNYANDAWAS | • Degree of completion of set of required approvals / permits issued (%),<br><br>Number and type of findings during any audits based on conditions of approvals |
| construction<br>campsites<br>*(see also requirement for sub-plans to this ESMMP as described under ESMMP management below* | Environmental degradation risks | Low | ▪ Undertake ESIA studies for the target<br><br>camp sites and obtain approval from the relevant authorities (including NEMA)<br>▪ Isolate through fencing the camp sites from access by the public for their safety<br>▪ Preferably to be located on land already cleared land wherever possible<br>▪ The Contractor's Camp layout shall take into account availability of access for deliveries and services and any future works | Campsites<br><br>Responsibility<br>Contractor | • Environment licence<br>• Number of public outcry due to accidents |
| Access to campsites and construction sites<br><br>*(see also requirement for sub-plans to this ESMMP as described* | Environmental degradation risks | Low | ▪ Utilize to the extent possible the existing public roads to avoid social and economic disruption<br>▪ Ensure road safety measures for the construction vehicles to the extent possible by observing all traffic regulations | Access Roads | • Cases of private land required<br>• Accidents occurrence incidences |

| Activity | Associated Impacts | Impact Levels | Management Actions | Target Areas & Responsibilities | Monitoring Indicator |
|---|---|---|---|---|---|
| *under ESMMP management below* | | | | Responsibility<br>Contractor | |
| Environmental Training and Awareness<br>*(see also requirement for sub-plans to this ESMMP as described under ESMMP management below* | Risks of Environmental degradation risks and occupational health and safety related accidents | High | ▪ The Contractor and sub-contractors shall be aware of the environmental requirements and constraints on construction activities contained in the provisions of the EMP<br>▪ The Contractor will be required to provide for the appropriate Environmental Training and Awareness as described in this EMP in his costs and programming<br>▪ An initial environmental awareness training session shall be held prior to any work commencing on site, with the target audience being all project. | All Workers<br>Responsibility<br>Contractor | • Number of Trainings Held<br>• Availability of Training reports<br>• Attendance list of participants during the training sessions |
| HIV/AIDS awareness and prevention campaign<br>*(see also requirement for sub-plans to this ESMMP as described under ESMMP management below* | Risks of Increased HIV and Aids transmission in the area | | ▪ The Contractor shall institute HIV/AIDS awareness and prevention campaign amongst his workers for the duration of the contract, contracting an implementing organisation, with preference for an organisation already working on this issue in the project area;<br>▪ The campaign shall include the training of facilitators within the workers, information posters in more frequented areas in the campsite and public areas, availability of promotional material (T-shirts and caps), availability of condoms (free), and theatre groups | All Workers and selected workshops targeting communities<br>Responsibility<br>Contractor | • Number of Trainings Held<br>• Availability of Training reports<br>• Attendance list of participants during the training sessions |
| Setting out and clearance of project | Delay in project implementation due to | High | ▪ Implementation of Resettlement Action Plan (RAP) recommendations before commencement of civil | All the | • Numbers of satisfied PAPS |

| Activity | Associated Impacts | Impact Levels | Management Actions | Target Areas & Responsibilities | Monitoring Indicator |
|---|---|---|---|---|---|
| routes and site | opposition from PAPs | | works<br>▪ In the event that the contractor requires additional land, the contractor will apply the provisions of the RAP.<br>▪ if the respective land setting is not reflected in the RAP, to comply with WB OP 4.12; prior to the acquisition of any additional land, the contractor shall submit the respective plan for compensation to the PEA and this plan has to be approved by the relevant authorities as well as by the PEA. | settlements<br><br>Responsibility<br>NYANDAWASNYANDAWAS– Implement RAP<br>Contractor – extra compensation on site | • Extend of route opened to the contractor |
| Local Labour / Employment<br><br>*(see also requirement for sub-plans to this ESMMP as described under ESMMP management below* | Delay in project implementation due to opposition from aggrieved community members | High | ▪ Wherever possible, the Contractor shall use local labour, and women must be encouraged to be involved in construction work<br>▪ The contractor shall ensure compliance to the gender balance as required by the 2/3 gender rule<br>▪ Comply with IFC PS 2 on labour and Working Conditions including ILO conventions on Labour and Working Condition described in section 7 of the Report. | All the settlements<br><br>Responsibility<br>Contractor | • Number of workforce employed from the local community<br>• Number of females employed<br>• Complaints from disgruntled work force |
| ESMP management records<br>*(see also requirement for sub-plans to this ESMMP as described under ESMMP* | Risks of non-conforming to ISO 9001 on QMS and ISO 14001 on EMS | Medium | ▪ The updated version of the EMP should be kept on site<br>▪ Copies of all necessary permits and licences should be kept on site<br>▪ All site specific plans prepared as part of the updated EMP | All the settlements<br><br>Responsibility<br>Contractor | • Number of available permits on site<br>• ISO audit report on non-conformities<br>• Number of corrective measure adopted |

| Activity | Associated Impacts | Impact Levels | Management Actions | Target Areas & Responsibilities | Monitoring Indicator |
|---|---|---|---|---|---|
| *management below* | | | ▪ All related Environmental, Social, Health and Safety Management registers and correspondence, including any complaints<br>▪ A register of audit non-conformance reports and corrective actions | | |
| Stakeholder Engagement<br>*(see also requirement for sub-plans to this ESMMP as described under ESMMP management below* | Risk of delays in Project Implementation due to disputes / grievances from Stakeholders | High | ▪ Contractor to hire community liaison officers who will act as a link between the community and contractor<br>▪ Identification and Engagement of all Stakeholders to be undertaken<br>▪ A working Grievance Redress Mechanism to be established before commencement of Works.<br>▪ This is as guided by KfW Sustainability Guidelines 2016, World Bank Environment and Social Standard 10 (Draft) | All work areas<br><br><u>Responsibility</u><br>NYANDAWASNYANDAWAS and Contractor | • No. of Complaints recorded in the Grievances Book<br>• Number of community liaison officers employed by the contractor |
| Earth moving and excavations (channeling and site preparations)<br><br>*(see requirement for sub-plans to this ESMMP as described under ESMMP management above)* | ▪ Safety risks<br>▪ Air pollution<br>▪ Social nuisance | Medium | ▪ Provide notices, signage and information to the public for their safety at all locations<br>▪ Install barriers along walkways, crossings and public places affected by the works for public safety<br>▪ Where there are potential for nuisance from dust generation, ensure earth moving is under dump conditions (consider watering where necessary)<br>▪ Inform immediate communities or stakeholders of the activities | All work areas<br><br><u>Responsibility</u><br>Contractor | • Accidents occurrence incidences<br>• Cases of respiratory complication at nearby health centre |

| Activity | Associated Impacts | Impact Levels | Management Actions | Target Areas & Responsibilities | Monitoring Indicator |
|---|---|---|---|---|---|
| | | | | | |
| | ▪ Vegetation Cover destruction | Low | ▪ Construction activities will be limited to project sites / routes which already exist therefore limited destruction to vegetation cover | All work areas<br><br><u>Responsibility</u><br>Contractor | • Soil erosion extend and intensity on site |
| | ▪ loss of top soil | Low | ▪ Stock piling of top soil, construction material and wastes should be done only at designated sites approved by the supervising engineer, erosion prevention through berming of loose soil sites should be done in all areas susceptible to agents of erosion. | All work areas<br><br><u>Responsibility</u><br>Contractor | • Soil erosion extend and intensity on site |
| | ▪ Public safety risks<br>▪ Worker Occupational safety risks | Medium | ▪ Notify public the intent to cut sections of the road for safety precautions<br>▪ Provide signage and safety information in all work areas.<br>▪ Ensure compliance by workers with safety safeguards including the OHS, provision of safety gear and enforcement of application | civil works areas<br><br>Responsibility<br>Contractor<br>Supervision Team | • Accidents occurrence incidences |

| Activity | Associated Impacts | Impact Levels | Management Actions | Target Areas & Responsibilities | Monitoring Indicator |
|---|---|---|---|---|---|
| | Disruption of amenities<br><br>(access roads, services lines and driveways) causing inconveniences to the community | Medium | ▪ Notify other services providers and<br>▪ Open small sections that can be reinstated within the shortest period to avoid public disruption<br>▪ Mark the lines to avoid conflicts with other activities | civil works areas<br><br><u>Responsibility</u><br>Contractor<br>Supervision Team | • Number of complaints from community due to lack of certain services |
| Materials sourcing, from burrow pits and quarries delivery and storage<br><br>*(see requirement for sub-plans to this ESMMP as described under ESMMP management above)* | Environmental and Safety risks associated with burrowing and opening up of new quarry sites | High | ▪ The Contractor will be responsible for ensuring that appropriate authorisation to use the proposed borrows pits and quarries has been obtained before commencing activities<br>▪ Topsoil shall be stripped prior to removal of borrow and stock piled onsite. This soil shall be replaced on the disturbed areas once the operation of the borrow site or quarry is complete<br>▪ Construction material sources should be environmentally sustainable (approved accordingly)<br>▪ Delivery routes and modes of transport should be approved<br>Material storage on site not to be internal or external nuisance | Burrow Pits and Quarry Site<br><br><u>Responsibility</u><br>Contractor<br>Supervision Team | • Environmental Status of reinstated burrow pits<br>• Complains from the community on burrow pits and material transportation |
| Concrete / cement batching plant<br><br>*(see requirement for sub-plans to this ESMMP as* | Risks associated with water resource pollution and air pollution from dust this could lead to respiratory | | ▪ Where required, a Concrete batching plant shall be located more than 20m from the nearest stream/river channel;<br>▪ Top soil shall be removed from the batching plant site and stockpiled | Concrete / cement batching plant<br><br><u>Responsibility</u><br>Contractor | • Number of incidence of Environment pollution around the plant |

| Activity | Associated Impacts | Impact Levels | Management Actions | Target Areas & Responsibilities | Monitoring Indicator |
|---|---|---|---|---|---|
| *described under ESMMP management above)* | problems | | ▪ Contaminated storm water and wastewater runoff from the batching area and aggregate stock piles shall not be permitted to enter streams but shall be led to a pit where the water can soak away<br>▪ Suitable screening and containment shall be in place to prevent windblown contamination associated with any bulk cement silos, loading and batching<br>▪ Cleaning of equipment and flushing of mixers shall not result in pollution of the surroundingenvironment | Supervision Team | |
| Wastes removals and disposal<br><br>*(see requirement for sub-plans to this ESMMP as described under ESMMP management above)* | Risks of contaminating surface and underground water resources | High | ▪ Construction wastes (residual earth, debris and scrap materials) to be<br><br>removed for safe disposal<br>▪ Encourage recycling where possible (concrete debris for access road surfacing),<br>▪ Contaminated organic matter in the work areas to be isolated for safe disposal<br>▪ Material residuals to be disposed off in accordance with established regulations | Construction areas<br><br><u>Responsibility</u><br>Contractor<br>Supervision Team | • Number of complaints from community not happy with waste management of the contractor |
| Spoil Storage site<br><br>*(see requirement for sub-plans to this ESMMP as described* | Risks of solid waste mismanagement leading to pollution | Medium | ▪ Preferably to be located on land already cleared wherever possible. Communities shall be involved in the site location to avoid conflict<br>▪ The need to be more than 20 meters from water courses and in apposition that will facilitate the prevention of storm-water runoff from the site from | Construction areas<br><br><u>Responsibility</u> | • Number of complaints from community not happy with waste management of spoil material |

| Activity | Associated Impacts | Impact Levels | Management Actions | Target Areas & Responsibilities | Monitoring Indicator |
|---|---|---|---|---|---|
| *under ESMMP management above)* | | | entering the watercourse<br>▪ Contouring of spoil site to approximate natural topography and drainage and/or reduce erosion impacts on the site<br>▪ The Contractor shall ensure that the placement of spoil is done in such a manner to minimise the spread of materials and the impact on surrounding vegetation and that no materials' creep' into' no-go' areas | Contractor Supervision Team | |
| Occupational Health and Safety<br>*(see requirement for sub-plans to this ESMMP as described under ESMMP management above)* | Risks of Accidents, Injuries or death of workers or community member | High | ▪ Provide construction workers with personal protective gear (gloves, gum boots, overalls and helmets),<br>▪ Provide temporary toilets and bathrooms for the construction workers at the work sites<br>▪ Provide onsite first aid kit accessible by the workers on need,<br>▪ Isolate the site for access by the local communities during the construction for their safety and health<br>▪ Contractor to provide a Healthy and Safety Plan prior to the commencement of works to be approved by the resident engineer.<br>▪ Contractor to follow provisions of Kenya Occupational Health and Safety Act 2007<br>▪ Contractor to follow provisions of The World Bank Group Environment Health and Safety General | All work areas<br><br><u>Responsibility</u><br>Contractor Supervision Team | Accidents occurrence incidences recorded in the Incidence Book |

| Activity | Associated Impacts | Impact Levels | Management Actions | Target Areas & Responsibilities | Monitoring Indicator |
|---|---|---|---|---|---|
| | | | Guidelines and specific Guidelines on Water and Sanitation and the World Bank Environmental and Social Standard No. 4 on Community Health and Safety (Draft) | | |
| Storage of fuel oils, lubricants, chemicals and flammable materials<br>*(see requirement for sub-plans to this ESMMP as described under ESMMP management above)* | Hazards of fire outbreak, oil and chemical spills. | High | ▪ Follow specifications of the Occupational Health and Safety Act, EMCA 1999 and others in the development and operation of stores. | All work areas<br><br><u>Responsibility</u><br>Contractor<br>Supervision Team | Incidence of reported cases of fuel leaks and fire incidences |
| Sanitation issues resulting from both solid and liquid wastes on site.<br>*(see requirement for sub-plans to this ESMMP as described under ESMMP management above)* | Risks associated with water born diseases exposed to community and workforce | Medium | ▪ The Contractor shall comply with all laws and any by-laws relating to public health and sanitation<br>▪ All temporary/ portable toilets or pit latrines shall be secured to the ground to the satisfaction of the RE to prevent them from toppling over<br>▪ A wash basin with adequate clean water and soap shall be provided alongside each toilet .Staff shall be encouraged to wash their hands after use of the toilet, in order to minimise the spread of possible disease | All work areas<br><br><u>Responsibility</u><br>Contractor<br>Supervision Team | Incidence of reported cases of water related diseases among the workforce and neighbor community |

| Activity | Associated Impacts | Impact Levels | Management Actions | Target Areas & Responsibilities | Monitoring Indicator |
|---|---|---|---|---|---|
| Noise and Vibration control from plant and equipment<br>*(see requirement for sub-plans to this ESMMP as described under ESMMP management above)* | Risk to health and safety of community and workers | Medium | ▪ The Contractor shall keep noise level within acceptable limits 55dB (A) at day time and 35dB(A) at night and construction activities shall, where possible, be confined to normal working hours in the residential areas<br>▪ Hospitals and other noise sensitive areas shall be notified by the Contractor at least 5days before construction is due to commence in their vicinity<br>▪ Any complaints received by the Contractor regarding noise will be recorded and communicated to the Resident Engineer (RE) | .Civil works areas and access roads<br><br><u>Responsibility</u><br>Contractor<br>Supervision Team | Reported complaints from neighbor community and institutions |
| Traffic management on site<br><br>*(see requirement for sub-plans to this ESMMP as described under ESMMP management above)* | Risks of Accidents, Injuries or death of workers or community member | high | ▪ Strict use of warning signage and tapes where the trenches are open and active sites<br>▪ Employ and train road safety Marshalls who will be responsible for management of traffic on site<br>▪ Contractor to provide a traffic management plan during construction to be approved by the resident engineer | Civil works areas and access roads<br><br><u>Responsibility</u><br>Contractor<br>Supervision Team | Accidents occurrence incidences |
| Air Quality Control<br><br>*(see requirement for sub-plans to this ESMMP as described under ESMMP* | Air pollution causing respiratory disorders to human | High | ▪ Workers shall be trained on management of air pollution from vehicles and machinery. All construction machinery shall be maintained and serviced in accordance with the contractor's specifications<br>▪ The removal of vegetation shall be avoided until such time as clearance is required and exposed | All work areas<br><br><u>Responsibility</u><br>Contractor | Cases of respiratory complication at nearby health centre |

| Activity | Associated Impacts | Impact Levels | Management Actions | Target Areas & Responsibilities | Monitoring Indicator |
|---|---|---|---|---|---|
| *management above)* | | | surfaces shall be re-vegetated or stabilised as soon as practically possible<br>▪ The contractor shall not carry out dust generating activities (excavation, handling and transport of soils) during times of strong winds<br>▪ Vehicles delivering soil materials shall be covered to reduce spills and wind blown dust<br>▪ Water sprays shall be used on all earthworks areas within 200 metres of human settlement. | Supervision Team | |
| Contractor de-mobilization and site reinstatement<br><br>*(see requirement for sub-plans to this ESMMP as described under ESMMP management above)* | Associated risks of environmental degradation | High | ▪ The site is to be cleared of all construction materials, including litter prior to hand over<br>▪ Fences, barriers and demarcations associated with the construction phase must be removed from the site<br>▪ Fences, barriers and demarcations associated with the construction phase must be removed from the site<br>▪ Rehabilitation Activities of Environmental Cases identified must continue throughout the defect liability period | All work areas<br><br><u>Responsibility</u><br>Contractor<br>Supervision Team | Closeout audit report findings |

# 12. STANDARD REFERENCE NUMBERS

## 1. Introduction

The Engineer has agreed to use a method of modifying the text of Engineering specifications by referring to a Standard Specification Reference Number (SRN) instead of a National Standard and then providing a tabulated comparison between British and German Standards, cross-referenced further where appropriate to an International Standard (ISO), an International Electro-technical Standard (IEC), to an American Waterworks Standard (AWWA) or other appropriate National Standards.

## 2. General Clause on Standard Specification

A general introductory clause to be inserted into general specification documents has been prepared. It is quoted below to assist in the preparation of Future Specification Volumes.

### Standards

The Contractor shall observe these Specifications and shall carry out all work in a skilled and workmanlike manner in keeping with modern methods of mechanical and construction Engineering.

In addition, the Contractor shall conform with all conditions currently in force with regard to the execution of construction work and shall follow all instructions issued by the competent Authorities, the Employer and the Engineer.

Where Standard Specifications are referred to in the Text of the Specifications this is done by reference to a Standard Specification Reference Number (SRN). A table of comparison is annexed to this Specification where the SRN is cross-referenced to Standard Specifications issued by the International Standards Organization (ISO) and to National Standard Specification that will be accepted in their English version by the Engineer as providing for the quality of workmanship etc. required.

The Bidder shall at his discretion base his Bid on one or other of the National Standard Specifications indicated in that table save that where a relevant Standard Specification issued by the ISO exists at the date of Bid, such an International Standard should as a minimum be compiled with. As the National Standards referred to in the table of comparison may expand on or strengthen further the requirements of ISO, Bidders choosing not to comply with one of the National Standards indicated may either indicate an alternative National Standard with which they shall comply or provide with their Bid a full and detailed description of the Standards they propose to attain.

Where a Bidder offers a particular item to a National Standard not specified in the table of comparison he shall comply with the requirements of the Instructions to Bidders in this respect and shall enclose a copy in English of the alternative National Standard offered with his Bid. Alternative National Standards or Bidder's own detailed description of the Standards they propose shall be subject to the approval of the Engineer.

## 3. List of National Specification Cross Referenced

The list has been sub-divided into sections as follows: -

| SRN No. | Specification |
|---|---|
| 001-099 | Electrical and Mechanical |

| | |
|---|---|
| 100-199 | Concrete |
| 200-299 | Metallic Pipes and Fittings |
| 300-399 | Plastic Pipes and Fittings |
| 400-499 | Other Pipes and Fittings |
| 500-599 | Valve, Meters, Hydrants and Other Specials |
| 600-649 | Testing Methods and Equipment |
| 650-699 | Site Work Codes of Practice |
| 700-749 | Drawing Practice, Standard Symbols, etc. |
| 750-799 | Glossary |
| 800-899 | Building Materials (exclu. In-situ Concrete) |
| 900-999 | Miscellaneous |

## 3.1 CONCRETE

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 100 | METHOD FOR SPECIFYING | 1045 | TBL. 1 | 5328 | TBL. 3 | KS 02-594 | |
| 101 | STANDARD OF MATERIAL & | See | VOB | 8110 | | VOB 2 | |
| 102 | STANDARDS OF MATERIAL, | | SUB. | 8007 | | | |
| 103 | ORDINARY PORTLAND CEMENT | 1164 | 1 | 12 | | KS 02-1262 | |
| 104 | SULPHATE RESISTANT CEMENT | 1164 | 1;CL. 4 | 4027 | | | |
| 105 | MORTAR CUBES - | 1164 | 1;CL. 4- | 12 | METHOD 2 | | |
| 106 | CEMENT - TEST FOR SOUNDNESS | | 6, EN.112 | 12 | CL.9 | | |
| 107 | SAMPLING AND TESTING OF AGGREGATES | 4226 | 1-4 | 812 | 1, 2, 3 | BS EN 1097-3 BS EN 932-1 | BS 812 Part 1 Replaced by BS 882 Part 2 Replaced by BS EN 1097-3 Part 102 Replaced by BS EN 932-1 but remains current |
| 107 | SAMPLING AND | 1045 | | 812 | 101-119 | | |
| 108 | FINE AGGREGATE FOR CONCRETE - GENERAL | 4226 | 1-4 | 882 | CL.4.1 | | |
| 108 | FINE AGGREGATE FOR CONCRETE - GENERAL | 1045 | | | | | |
| 109 | FINE AGGREGATE FOR CONCRETE - GRADING | 4226 | 1-4 | 882 | TBL.2 | | |
| 110 | COARSE AGGREGATES FOR CONCRETE - GENERAL | 4226 | | 882 | CL.4.1 | | |
| 110 | COARSE AGGREGATES FOR CONCRETE | 1045 | | | | | |
| 111 | COARSE AGGREGATES FOR CONCRETE - GRADING | 4226 | | 882 | TBL.2 | | |
| 111 | COARSE AGGREGATES FOR CONCRETE - GRADING (CONT.) | 1045 | | | | | |
| 112 | COARSE AGGREGATES FOR CONCRETE - SHRINKAGE & ABSORPTION | 4226 | | 812 | 2 | ISO 6783 BS EN 1367 | BS 812 Part 120 Replaced by BS EN 1367 but remains current |
| 112 | COARSE AGGREGATES FOR CONCRETE - SHRINKAGE & ABSORPTION (CONT.) | 1045 | | | | | |
| 113 | COARSE AGGREGATES FOR CONCRETE - FLAKINESS | 4226 | | 812 | 105.1 | | |

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|---|---|---|---|---|---|---|---|
| 113 | COARSE AGGREGATES FOR CONCRETE - FLAKINESS (CONT.) | 1045 | | | | | |
| 114 | WATER FOR MAKING CONCRETE | 4226 | | 3148 | | | |
| 114 | WATER FOR MAKING CONCRETE (CONT. 1) | 4030 | | | | | |
| 114 | WATER FOR MAKING CONCRETE (CONT. 2) | | | | | | |
| 115 | CONCRETE MIX DESIGN - GENERAL | | | 5328 | | | |
| 115 | CONCRETE MIX DESIGN - GENERAL (CONT.) | 1084 | 1 | | | | |
| 116 | TRIAL MIXES - CUBES | 1048 | | 1881 | 108 | | |
| 117 | SAMPLING & TESTING OF CONCRETE | 1048 | | 1881 | 5, 114, 121, 122 | ISO 1920, 4012, 4108, 4013 | |
| 118 | CONCRETE BATCH MIXER | | | 1305 | | | BS 1305 Obsolescent |
| 119 | CONCRETE BATCH TYPE MIXERS | 459 | | 3963 | | | BS 3963 Obsolescent |
| 120 | STRUCTURAL USE OF R/C IN BUILDING | 1045 | | 8110 | 1 | | |
| 121 | CONCRETE TRUCK-MOUNTED MIXERS | 1084 | 3 | 4251 | Withdrawn | | BS 4251 Withdrawn |
| 122 | BITUMEN RUBBER JOINT SEALING COMPOUND | | | 2499 | TYPE A1 | | |
| 123 | POLYSULPHIDE JOINT SEALING COMPOUND | | | 4254 | | | BS 4254 Obsolescent |
| 124 | WATERPROOF BUILDING PAPERS | | | 1521 | (CLASS B) | | |
| 125 | IMPACT TESTING OF MILD STEEL | 488 | 3 | 7613 7668 | Grade NDI, CL.B | | BS 4360 Withdrawn. Replaced by BS 7613, BS 7668, BS EN 10029 Parts 1 to 3 of BS EN 10113, BS EN |
| 126 | STEEL R/F HOT-ROLLED STEEL BARS | 488 | 1-3 | 4449 | | | |
| 127 | STEEL R/F COLD TWISTED | 488 | 1-3 | 4449 | | | |
| 128 | STEEL R/F STEEL FABRIC | 488 | 4-5 | 4483 | | | |
| 129 | BAR REINFORCEMENT AND BENDING | | | 4466 | | | |
| 130 | SAND FOR INTERNAL PLASTERING | 4226 | | 1199 | | | |

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|---|---|---|---|---|---|---|---|
| 131 | PLYWOOD SHUTTERING | 68791 | | 6566 | 1-8 | | BS 6566 Withdrawn. Replaced by various BS EN standards on the same subject |
| 131 | PLYWOOD SHUTTERING (CONT.) | 68792 | | | | | |
| 132 | CONCRETE COMPACTION | 4235 | 1,2 | | | | |
| 133 | CONCRETE - SITE QUALITY CONTROL | 1084 | 1 | | | | |
| 134 | DESIGN OF CONCRETE MIXES | 52171 | | See | | HMSO RD | |
| 135 | SAND FOR MORTAR | 4226 | | 1200 | | | |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 136 | SAND FOR RENDERING | 4226 | | 1199 | | | |
| 137 | HOT APPLIED JOINT SEALER | | | 2499 | | | |
| 138 | WATER STOPS AND WATER BARS | 7865 | 1, 2 | 8007 | | | |
| 139 | TESTING CONCRETE STATIC MODULES (COMPARISON ELASTICITY) | | | 1881 | 121 | | |
| 140 | TESTING CONCRETE - WATER ABSORPTION | | | 1881 | 122 | | |
| 141 | TESTING CON-SAMPLING, TESTING FRESH CONCRETE, ETC. | 1048 | | 1881 | 101-110 & 113 | KS 02-595 : 1-8 | |
| 142 | PRECAST CONCRETE COMPONENTS (COPING UNITS) | | | 5642/2 | 2 | | |
| 143 | STRUCTURAL USE OF CONCRETE DESIGN & CONSTRUCTION | | | 8110 | 1 | | |
| 144 | STRUCTURAL USE OF CONCRETE - SPECIAL CIRC. | | | | | | |
| 145 | IN-SITU CONCRETE DIAPHRAGM WALLS | 4126 | | | | | |
| 146 | TEST SIEVES FOR AGGREGATES | | | 410 | | | |
| 147 | LIGHT WEIGHT AGGREGATES FOR CONCRETE | 4226 | 2, 3 | 3797 | 2 | | BS 3797 Partly Replaced by BS EN 1744-1: 1998 |
| 148 | SUPERSULPHATED CEMENT | | | 4248 (4550) | | | BS 4248 Partly Replaced by Parts and Section of BS 4550 |
| 149 | CONCRETE ADMIXTURES | | | 5075 | | | |

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|---|---|---|---|---|---|---|---|
| 150 | GRADUATE MEASURING CYLINDER | | | 604 | | ISO 4788 | |
| 151 | COLD REDUCED STEEL WIRE FOR THE REINFORCEMENT OF CONCRETE | | | 4482 | | | |
| 152 | FUSION BONDED EPOXY COATED CARBON STEEL BARS FOR THE REINFORCEMENT OF CONCRETE | | | 7295 | 1 & 2 | | Part 1: Coated bars<br>Part 2: Coatings |

## 3.2 METALLIC PIPES AND FITTINGS

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 200 | GREYCAST IRON PRESSURE PIPES AND FITTINGS | | | 1211 | | ISO 13; ISO 49 | BS 1211 Obsolescent Partially replaced by BS 4772 |
| 200 | GREY IRON PIPES AND FITTINGS (CONT) | | | 4622 | | ISO 13 | BS 4622 Obsolescent |
| 201 | CAST IRON FLANGED PIPES & FITTINGS | | | 2035 | | ASME/ANSI B16.1 - 1998 | BS 2035 Obsolescent Partially replaced by BS 4772 |
| 202 | DUCTILE IRON PIPES & FITTINGS (WATER) | | | | | ISO 2531, EN 545 | |
| 202 | DUCTILE IRON PIPES & FITTINGS (SEWERAGE) | | | | | EN 598 | |
| 202 | DUCTILE IRON PIPES & FITTINGS (GAS) | | | | | EN 969 | |
| 203 | STEEL TUBES WITH PLAIN OR THREADED ENDS | | | 1387 | | ISO 65 | |
| 203 | STEEL TUBES WITH THREADED ENDS (CONT) | 2440 | | | | | |
| 203 | STEEL TUBES WITH THREADED ENDS )CONT) | 2441 | | | | | |
| 203 | STEEL TUBES WITH THREADED ENDS (CONT) | 2442 | | | | | |
| 203 | STEEL TUBES WITH THREADED ENDS- THREADS | 76 | 2 | 21 | | ISO 7/1:1982 ; ISO 7/2:1982 | |
| 204 | WROUGHT STEEL PIPE FITTINGS TO SSRN 203 | | | 1740 | 1 | ISO 4145 | |
| 204 | TH. STEEL PIPE FITTINGS TO SSRN 203 | 2980 | | | | | |
| 204 | TH. STEEL PIPE FITTINGS TO SSRN 203- LONG THREAD | 2981 | | | | | |
| 204 | TH. STEEL PIPE FITTINGS TO SSRN 203- NIPPLES | 2982 | | | | | |
| 204 | TH. STEEL PIPE FITTINGS TO SSRN 203- BENDS | 2983 | | | | | |
| 204 | TH. STEEL PIPE FITTINGS TO SSRN 203- TEES ETC. | 2987 | 1, 2 | | | | |
| 204 | W. STEEL PIPE FITT. TO SSRN 203- BUSHINGS | 2990 | | | | | |
| 204 | W. STEEL PIPE FITT. TO SSRN 203-PLUGS & CAPS | 2991 | | | | | |
| 204 | TH. STEEL PIPE FITTINGS TO | 2986 | | | | ISO 7- | |

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|---|---|---|---|---|---|---|---|
| | SSRN 203- SOCKETS | | | | | 2:1982 | |
| 204 | W. STEEL PIPE FITT. TO SSRN 203- RED'NG SOCKETS | 2988 | | | | | |
| 205 | COPPER TUBES FOR WATER | | | | | EN 1057, ISO 8493 (TESTS) | |
| 205 | COPPER TUBES FOR WATER (CONT) | 1754 | 3 | | | | |
| 205 | COPPER TUBES FOR WATER (CONT) | 1755 | 3 | | | | |
| 206 | COPPER TUBES - GENERAL PURPOSE | | | 2871 | 2 | ISO 196:1978 | |
| 206 | COPPER TUBES - GENERAL PURPOSE (CONT) | 1754 | 1,2 | | | | |
| 206 | COPPER TUBES - GENERAL PURPOSE (CONT) | 1755 | 1,2 | | | | |
| 207 | FLANGES FOR FERROUS PIPES - STEEL BY PN | 2500 | | 4504 | 3-3.1 | ISO 7005-1:1992 | BS 4504 Part 3: Sections 3.2 (1989) Withdrawn. Replaced by BS EN 1092-2 (1997) |
| 207 | FLANGES FOR FERROUS PIPES - STEEL BY CLASS | 2501 | 1 | 1560 | 3-3.1 | ISO 7005:1988; ANSI B 16.5 | |
| 207 | FLANGES FOR FERROUS PIPES - C.I. BY CLASS | 2519 | 1 | 1560 | 3-3.2 | ISO 7005-2 | |
| 207 | FLANGES FOR FERROUS PIPES - C.I. BY PN | | | | 2 | EN 1092, ISO 2531:1991; ISO 7005-2:1988 | |
| 207 | FLANGES FOR FERROUS PIPES-SLIP ON FOR WELDING | 2576 | | | | | |
| 207 | FLANGES FOR FERROUS PIPES-WELDING NECK | 2627-38 | | | | | |
| 207 | FLANGES FOR FERROUS PIPES-SCREWED | 2566 | | | | | |
| 207 | FLANGES FOR FERROUS PIPES-LAPPED- PLAIN COLLAR | 2655-56 | | | | | |
| 207 | FLANGES FOR FERROUS PIPES-LOOSE- WELDING NECK | 2673 | | | | | |
| 207 | FLANGES FOR FERROUS PIPES-CONTACT SURFACE | 2526 | | | | | |

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| 207 | FLANGES FOR FERROUS PIPES-BLANK | 2527 | | | | | |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 208 | GASKET DIMENSIONS TO SSRN 207 (a) & (d) | | | | 1 | EN 1514 | |
| 208 | GASKET DIMENSIONS TO SSRN 207 (a) & (d) (CONT) | | | | 2 | EN 1514 | |
| 208 | GASKET DIMENSIONS TO SSRN 207 (a) & (d) (CONT) | | | | 3 | EN 1514 | |
| 208 | GASKET DIMENSIONS TO SSRN 207 (a) & (d) (CONT) | | | | 4 | EN 1514 | |
| 208 | GASKETS-FOR GROOVED FLANGES | 2693 | | | | | |
| 208 | GASKETS-GROOVED O-RINGS | 2697 | | | | | |
| 209 | C.I. PIPE FITTINGS, MALLEABLE, SCREWED | | | | | ISO 49:1994 | |
| 210 | STEEL PIPES & FITTINGS - GENERAL | | | 534 | | | |
| 210 | STEEL PIPES - WATER-GENERAL | 2460 | | 534 | | EN 10224, AWWA C200-97, NFA 49-150 JIS G 3460-88 | |
| 210 | STEEL PIPES & FITTINGS - DESIGN | 2413 | 1, 2 | 80102.1 | | AWWA M11 | |
| 210 | STEEL PIPES & FITTINGS - WELDING JOINTS | 2559 | 1, 2, 3 | 80102.1 | | AWWA M11 ASTM A333/A333M-99 | |
| 211 | CEMENT MORTAR LINING - D.I. PIPES | | | EN 545 | | EN 545, AWWA C.104A, C602-95 | |
| 211 | CEMENT MORTAR LINING - D.I. PIPES | 2614 | | | | | |
| 211 | CEMENT MORTAR LINING - D.I. PIPES (CONT) | | | | | DVGW W343 ISO 4179:1985, ISO 6600:1980, | |
| 212 | CEMENT MORTAR LINING - STEEL PIPES | 2614 | | 534 | | AWWA C 205, NFA 49-701DVG | |

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|---|---|---|---|---|---|---|---|
| | | | | | | W-W343/W346 | |
| 212 | CEMENT MORTAR LINING - STEEL PIPES (CONT) | 2614 | | | | AWWA C 602-95 ISO / DIS 8324 | |
| 213 | S. PIPES & TUBES-MATERIAL, PROP., TESTS | 1629 | | 3600 | | AWWA C200-97 | |
| 213 | CARBON STEEL PIPES AND TUBES | | | 3601 | | ISO 2604/2 /3 /6 | |
| 213 | STEEL PIPES AND TUBES-SPECIAL REQUIREMENTS | 1626 | | | | | |
| 213 | STEEL PIPES AND TUBES-SEAMLESS | 2448 | | | | | |
| 213 | STEEL PIPES AND TUBES-WELDED | 2458 | | | | | |
| 214 | BITUMEN PROTECTION TO IRON AND STEEL - HOT | | | 4147 | | (BS 4147 type I, grade 'd') | |
| 214 | BITUMEN PROTECTION TO IRON AND STEEL-COLD | | | 3416 | | (BS 3416 type II) | |
| 214 | BITUMEN PROTECTION TO STEEL PIPES ETC. | 30673 | Type E4 | | | | |
| 214 | BITUMEN PROTECTION TO DUCTILE IRON PIPES | 30674 | 4 | | | | |
| 215 | EXT. PROTECTION - IRON & STEEL- EPOXY C. | | | none | | AWWA C210-97 | |
| 216 | STEEL FITTINGS - REINFORCING | | | none | | AWWA C208-59 AWWA M11 | |
| 216 | STEEL FITTINGS - DIMENSIONS | | | 534 | | AWWA C208-59 AWWA M11 | |
| 217 | D.I. PIPES & FITT.-SCREWED GLAND JOINTS | | | | | See SSRN 219 | |
| 218 | D.I. PIPES & FITT.-BOLTED GLAND JOINTS | | | | | See SSRN 219 | |
| 219 | D.I. PIPES & FITT.-S & S JOINTS | | | 8010 | 2-2.1 | | |
| 219 | D.I. PIPES & FITT.-S & S JOINTS (CONT) | | | | | EN 545 | |
| 219 | D.I. PIPES & FITT.-S & S JOINTS (CONT) | 28603 | | | | | |
| 219 | PIPELINES ON LAND; DESIGN, CONSTRUCTION AND INSTALLATION: STEEL FOR OIL AND GAS | | | 8010 | 2.8 | | |
| 220 | D.I. PIPES-ZINC | 30674 | 3 | non | | | |

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|---|---|---|---|---|---|---|---|
| | COATING & PROT. SHEATHS | | | e | | | |
| 221 | IRON AND STEEL PIPES-ENAMEL-HOT APPLIED | | | 787 3 | | AWWA C203-97 | |
| 221 | STEEL FLANGED PIPES & FITTINGS- ENAMELLED | 2873 | | | | | |
| 222 | ELASTOMERIC JOINTS RINGS-REQUIREMENTS | | | 249 4 | | | Partly replaced by BS 7874 and BS EN 681-1 |
| 222 | ELASTOMERIC JOINTS RINGS-VULCANISED RUBBER | | | | 1 | EN 681 | |
| 222 | ELASTOMERIC JOINTS RINGS-DRAINS & SEWERS | 4060 | | | | | |
| 223 | PIPE THREADS-TUBES & FITT. (WATERTIGHT | See ISO DI N | | 21 | | ISO 7/1:198 2; ISO 7/2:198 2 | |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 224 | CAST IRON S & S PIPES AND FITTINGS | | | 78 | 2 | | BS 78 Withdrawn, Replaced by BS 4622 Part 2 Obsolescent, Partially replaced by BS 4772 |
| 225 | STEEL PIPES-HOT DIP GALVANISING | | | | | EN 10240 | |
| 226 | CARBON STEEL FITTINGS - BUTT-WELDING-GENERAL | 2609 | | 196 5 | 1 | | BS 1965 Part 2 Withdrawn |
| 226 | STEEL FITTINGS - BUTT-WELDING-TEES | 2615 | 1, 2 | | | | |
| 226 | STEEL FITTINGS - BUTT-WELDING- REDUCERS | 2616 | 1, 2 | | | | |
| 226 | STEEL FITTINGS - BUTT-WELDING-CAPS | 2617 | | | | | |
| 227 | POLYTHENE SLEEVING FOR STEEL PIPES & FITTINGS | none | | non e | | ISO 8180:1985 | |
| 227 | POLYTHENE SLEEVING FOR D. I. PIPES | 30674 | 5 | | | | |
| 228 | ST. PIPES-DIMENSION & MASSES-PRESS. PURPOSE | 2413 | 1, 2 | 360 0 | | | |

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|---|---|---|---|---|---|---|---|
| 228 | S. PIPES-DIMENSION & MASSES-PRESS. (CONT) | 2460 | | | | | |
| 229 | STAINLESS STEEL TUBES AND WIRES | | | 1554 | | | |
| 229 | STAINLESS STEEL TUBES AND WIRES (CONT) | | | 4825 | 1 | ISO 2037:1980 | |
| 229 | STAINLESS STEEL TUBES AND WIRES (CONT) | | | 6362 | | ISO 7598 | |
| 229 | STAINLESS STEEL TUBES AND WIRES (CONT) | 17457 | | | | | |
| 229 | STAINLESS STEEL TUBES AND WIRES (CONT) | 17440 | | | | | |
| 230 | STEEL PIPES FOR WATER FLEXIBLE SOCKET & SPIGOT JOINTS | 2460 | | CP2010-2 | | EN 10224, ISO 559 | |
| 230 | STEEL PIPES FOR WATER FLEXIBLE SOCKET & SPIGOT JOINTS | 2460 | | CP2010-2 | | EN 10224, AWWA C200-97 | |
| 231 | FERROUS P. DEFINITION OF NOMINAL PRESSURE | | | none | | ISO 7268:1983 | |
| 232 | STEEL PIPELINES - TAPE COATING SYSTEMS | 30672 | 1 | none | | AWWA C214-95 | |
| 233 | BURSTING DISCS & DEVICES | | | 2915 | | ISO 6718:1991 | |
| 234 | STEEL PIPES FOR PETROLUEM AND GAS INDUSTRY | 17172 | | | | EN 10208-2, API 5L | |
| 235 | FITTINGS TO STAINLESS STEEL TUBES | | | 4825 | 2 | ISO 2851:1973 | |
| 235 | FITTINGS TO STAINLESS STEEL TUBES (CONT) | | | 4825 | 3 | ISO 2852:1974 | |
| 235 | FITTINGS TO STAINLESS STEEL TUBES (CONT) | | | 4825 | 4 | ISO 2853:1976 | |
| 235 | FITTINGS TO STAINLESS STEEL TUBES (CONT) | | | 4825 | 5 | | |
| 236 | FITTINGS TO BRASS TUBES | | | 2051 | 1 | | |
| 237 | RUBBER GASKET MATERIAL JOINTS FOR PIPELINES | | | 2494 | | ISO 4633; ISO 6447; ISO 6448 | |
| 238 | STORAGE OF VULCANISED RUBBER | | | none | | ISO 2230:1973 | |
| 239 | BITUMINOUS VARNISH TO DUCTILE IRON PIPES | | | none | | ISO 8179-2:1995 | |
| 240 | FOUNDING - SPHEROIDAL GRAPHITE CAST IRON | | | | | EN 1563 | |

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|---|---|---|---|---|---|---|---|
| 240 | FOUNDING - AUSTEMPERED DUCTILE IRON CASTINGS | | | | | EN 1564 | |
| 241 | FUSION BONDED EPOXY COATINGS FOR STEEL PIPES | 30671 | | none | | EN 10309, AWWA C213, NFA 49-706 | |
| 241 | FUSION BONDED EPOXY LININGS FOR STEEL PIPES | | | | | AWWA C213 | |
| 242 | FLEXIBLE BOLTED SLEEVE COUPLINGS | | | 534 | | AWWA C219 | |
| 243 | FLEXIBLE GROOVED AND SHOULDERED COUPLINGS | | | | | AWWA C606 | |
| 244 | SPHERICAL JOINTS FOR WELDING, STEEL PIPES | | | 534 | | UNI 6363 | |
| 245 | BIT. SEAL COAT'GS ON D.I. PIPE CEM. MOR. LINING | | | 7892 | | | |
| 246 | POLYMERIC FILM PROT. SLEEV'G FOR IRON PIPES | 30674 | 5 | 6076 | | EN 534 | |
| 247 | HOT ENAMEL COATING TO IRON & STEEL PIPES | | | 7873 | | | |
| 248 | EXTERNAL ZINC COATINGS ON DI PIPES | 2444 | | none | | ISO 8179-1:1995 | |
| 249 | BOLTS & NUTS FOR PIPELINES | 2507 | | none | | | |

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|---|---|---|---|---|---|---|---|
| 250 | STEEL PIPELINES - THERMOSET PLASTIC COATINGS | 30671 | | BGC/CW6 | | AWWA C213, NFA 49-706 | |
| **SRN** | **SUBJECT** | **DIN** | **PART** | **BSS** | **PART** | **OTHER** | **REMARKS** |
| 251 | STEEL PIPES - POLYPROPYLENE COATING | 30678 | | none | | EN 10286, NFA 49-711 | |
| 252 | STEEL TUBES - ELECTROMAGNETIC TESTING - LEAKS | | | | 1 | EN 10246 | |
| 253 | TWO & THREE LAYER POLYTHENE COATINGS FOR STEEL PIPES | 30670 | | 534 | | AWWA C215, NFA 49-704, NFA | |

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|---|---|---|---|---|---|---|---|
| | | | | | | 49-710 | |
| 254 | LIQUID EPOXY COATINGS FOR STEEL PIPES | | | | | AWWA C210 | |
| 255 | LIQUID EPOXY LININGS FOR STEEL PIPES | | | | | AWWA C210, NFA 49-709 | |
| 256 | LIQUID POLYURETHANE COATINGS FOR STEEL PIPES | 30671 | | | | AWWA C222 | |
| 257 | LIQUID POLYURETHANE LININGS FOR STEEL PIPES | | | | | AWWA C222, NFA 49-709 | |
| 258 | EXTRUDED POLYTHENE COATINGS FOR D.I. PIPES | 30674 | 1 | EN 545 | | EN 545 | |
| 259 | CEMENT MORTAR COATINGS FOR D.I. PIPES | 30674 | 2 | | | | |
| 260 | LIQUID EPOXY COATINGS FOR D.I. PIPES | | | EN 545 | | EN 545 | |
| 261 | FUSION BONDED EPOXY COATINGS & LININGS FOR D.I. FITTINGS | | | | | AWWA C116 | |
| 262 | LIQUID POLYURETHANE COATINGS FOR D.I. PIPES | | | EN 545 | | EN 545 | |
| 263 | LIQUID POLYURETHANE LININGS FOR D.I. PIPES | | | EN 545 | | EN 545 | |
| 264 | TWO LAYER EPOXY-NYLON COATINGS & LININGS FOR STEEL PIPES | | | | | EN 10310, AWWA C224 | |

### 3.3 PLASTIC PIPES AND FITTINGS

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 300 | uPVC PIPES FOR COLD WATER | 19532 | | 3505 | | ISO 2505, 3114, 3606 | |
| 300 | uPVC PIPES FOR COLD WATER (CONT. 1) | 8062 | | | | ISO 3472, 3472, 3473, 3474 | |
| 300 | uPVC PIPES FOR COLD WATER (CONT. 2) | | | | | ISO 161/1 | |
| 300 | uPVC PIPES FOR COLD WATER (CONT. 3) | | | | | KEBS 06-149:2 | |
| 301 | JOINTS AND FITTINGS FOR uPVC PRESSURE PIPES | 8063 | 1, 12 | 4346 | 1-3 | ISO 2035, 2044 | |
| 301 | JOINTS AND FITTINGS FOR uPVC PRESSURE PIPES (CONT. 1) | 16450 | | | | ISO 2045, 2048, 2536 | |
| 301 | JOINTS AND FITTINGS FOR uPVC PRESSURE PIPES (CONT. 2) | 16451 | | | | | |
| 302 | uPVC PIPELINES - LAYING AND JOINTING | 16928 | | See CP | | CP 312 | |
| 303 | uPVC PIPELINES - PRESSURE TESTING | 4279 | 1, 7 | | | | |
| 304 | uPVC PIPELINES - ADHESIVES FOR JOINTING | 16970 | | | | | |
| 305 | uPVC PIPES - GENERAL | 8061 | | 3505 | | | |
| 305 | uPVC PIPES - GENERAL (CONT. 1) | 8062 | | 3506 | | | |
| 305 | uPVC PIPES - GENERAL (CONT. 2) | 19532 | | | | | |
| 306 | uPVC PIPES - PRESSURE TESTS TO DESTRUCTION | | | 4728 | | ISO 1167 | Obsolescent (but still remains current) Replaced by BS EN 921 and partially |

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|---|---|---|---|---|---|---|---|
| | | | | | | | replaced by BS EN 2782 Part II method 1127P - 1997 but remains current |
| 307 | HDPE PIPES, JOINTS, FITTINGS | 16963 | 1-3 | 3284 (6572) (6730) | | | Obsolescent - Partially replaced by BS<br><br>6572, BS 6730 |
| 308 | RUBBER RINGS FOR MECHANICAL JOINTS | | | 2494 | | | |
| 309 | uPVC UNDERGROUND DRAIN PIPES & FITTINGS | | | 4660 | | | Partially replaced by BS EN 1401-1 |
| 310 | uPVC PIPES IMPACT TEST 20 DEGREES CENTIGRADE | | | 3505 | | ISO 3127 | |
| 311 | uPVC PIPES SHORT TERM HYDROSTATIC TEST | | | 3505 | | | |
| 312 | uPVC PIPES LONG TERM HYDROSTATIC TEST | | | 3505 | | | |
| 313 | uPVC PIPES INTERNAL PRESSURE ENDURANCE TEST | 8061 | | | | | |
| 314 | uPVC WATER ABSORPTION TEST | 8061 | | | | ISO 2508 | |
| 315 | uPVC PIPES - VARIOUS OTHER TESTS | | | | | ISO 2505, 3114,<br><br>3472, 3473, 3474 | |
| 316 | PIPES - RATE OF LEAKAGE | | | 8010:2 | | | |
| 317 | G.R.P. PIPES | | | 6464 | | | |
| 318 | PLASTICS PIPES AND FITTINGS FOR USE AS SUB SOIL FIELD DRAINS | | | 4962 | | | |
| 318 | POLYPROPYLENE WASTE PIPE AND FITTINGS (EXTERNAL DIAMETER 34.6MM,<br><br>41.0MM AND 54.1MM) | | | 5254 | | | |
| 319 | THERMOPLASTICS WASTE PIPE AND FITTINGS | | | 5255 | | | |

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|---|---|---|---|---|---|---|---|
| 320 | GLASS REINFORCED PLASTICS (GRP) PIPES, JOINTS AND FITTINGS FOR USE FOR WATER SUPPLY OR SEWERAGE | | | 5480 | | | |
| 321 | UNPLASTICIZED PVC PIPE AND FITTINGS FOR GRAVITY SEWERS | | | 5481 | | | |
| 322 | PLASTICS PIPEWORK (THERMOPLASTICS MATERIALS) | | | 5955 | 6 | | Part 6: Installation of unplasticized PVC pipework for gravity drains and sewers |
| 323 | BLUE POLYETHYLENE PIPES UP TO NOMINAL SIZE 63 FOR BELOW GROUND USE FOR POTABLE WATER | | | 6572 | | | |
| 324 | BLACK POLYETHLENE PIPES UP TO NOMINAL SIZE 63 FOR ABOVE GROUND USE FOR COLD POTABLE WATER | | | 6730 | | | |

## 3.4 OTHER PIPES AND FITTINGS

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 401 | ASBESTOS CEMENT (A/C) PRESSURE PIPES | 19800 | 1-3 | 486 | | ISO 160<br>BS EN 512 | BS 486 Withdrawn<br>Replaced by BS EN 512 |
| 401 | ASBESTOS CEMENT (A/C) PRESSURE PIPES (CONT.) | | | 4624 | | | |
| 402 | A/C SEWER PIPES, JOINTS, FITTINGS | | | 3656 | | ISO 881<br>BS EN 588-1 | BS 3656 Withdrawn<br>Replaced by BS EN 588-1 |
| 402 | A/C SEWER PIPES, JOINTS, FITTINGS (CONT. 1) | | | | | | |
| 402 | A/C SEWER PIPES, JOINTS, FITTINGS (CONT. 2) | 19850 | 1, 2 | | | | |
| 403 | A/C PIPES FOR THRUST BORING | | | | | ISO 4488 | |
| 404 | A/C PIPES - GUIDE FOR LAYING | | | 5927 | | ISO 4482 | |
| 405 | A/C PIPES - FIELD PRESSURE TESTING | 4279 | 1, 6, 9, 10 | 5886 | | ISO 4483 | |
| 406 | PIPE SUPPORTS | See DVGW | | 3974 | 1 | DVGW 310 PT. 2 | |
| 407 | UNREINFORCED CONCRETE PIPES (OGEE) | 4032 | | 5911 | 3 | | |
| 408 | PRESTRESSED CONCRETE PRESSURE PIPES | 4035 | | 4625 | | | |
| 409 | PRECAST CONCRETE PIPES - DRAINS & SEWERS | 4032 | | 5911 | 1, 3 | | |
| 409 | PRECAST CONCRETE PIPES - DRAINS & SEWERS (CONT.) | 4035 | | | | | |
| 410 | CONCRETE POROUS PIPES - UNDER DRAINS | | | 5911 | 114 | | |
| 411 | NON-PRESSURE DUCTILE IRON PIPES ETC. | | | | | ISO 7186 | |
| 412 | RUBBER AND PLASTIC HOSES AND ASSEMBLIES | | | | | ISO 7751 | |
| 413 | CONCRETE CYLINDRICAL PIPES & FITTINGS METRIC | | | 5911 | 1-3 | AWWA C602-83 | BS 5911 Part I: 1981 Withdrawn<br>Replaced by BS 5911 Part 100: 1988<br>BS 5911 Part 200: 1989 |

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|---|---|---|---|---|---|---|---|
| | | | | | | | BS 5911 Part 200: 1994 |
| 414 | CLAY PIPES (SEWERAGE) | | | 65 | | | |
| 415 | TESTING OF JOINTED PIPES AND MANHOLES | | | 2005 | | | BS 2005 - Obsolescent |
| 416 | CONCRETE PRESSURE PIPES INCLUDING JOINTS AND FITTINGS | | | | | BS EN 639 | |

## 3.5 VALVES, METERS, HYDRANTS

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 501 | DOUBLE FLANGED C.I. GATE VALVES (WATER) | | | 5163 | | AWWA C203-78 | |
| 501 | DOUBLE FLANGED C.I. GATE VALVES (WATER) (CONT. 1) | 3230 | 1-3 | | | | |
| 501 | DOUBLE FLANGED C.I. GATE VALVES (WATER) (CONT. 2) | | | | | | |
| 501 | DOUBLE FLANGED C.I. GATE VALVES (WATER) (CONT. 3) | 3352 | 1, 4 | | | | |
| 502 | C.I. GATE VALVES - GENERAL | | | 5150 | | | |
| 502 | C.I. GATE VALVES - GENERAL (CONT.) | 3352 | 1, 4 | | | | |
| 503 | C.I. (PARALLEL SLIDE) GATE VALVES - GENERAL | | | 5151 | | | |
| 504 | C.I. GLOBE VALVES - GENERAL | 3356 | 1-5 | 5152 | | | |
| 505 | C.I. CHECK VALVES - GENERAL | 3202 | | 5153 | | AWWA C508-82 | |
| 505 | C.I. CHECK VALVES - GENERAL (CONT.) | See DVGW | | 6282 | 1, 4 | DVGW-W376 | |
| 506 | C.I. AND STEEL BUTTERFLY VALVES - GENERAL | 3354 | 1-4 | 5155 | | BS EN 593: 1998 | BS 5155 Withdrawn<br>Replaced by BS EN 593,: 1998 |
| 507 | BOURDON TYPE PRESSURE GAUGES | | | 1780 | | BS EN 837: 1998 | BS 1780 Withdrawn<br>Replaced by BS EN 837-1: 1998 |
| 508 | FLOAT OPERATED VALVES N.D. 500MM | | | 1212 | 1, 2, 3 | | |
| 509 | FIRE HYDRANTS | 3221 | 1, 2 | 750 | | | |
| 510 | WATER METERS | 19648 | 1-3 | 5728 | 1, 2 | ISO 4064-1 | BS 5728 Part 1 Withdrawn<br>Replaced by BS 5728: Part 7 |
| 510 | WATER METERS (CONT.) | | | | | KS 06-248 1, 2 | |
| 511 | COPPER ALLOY GATE, CHECK, ETC. VALVES | 3352 | 11 | | | | |

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|---|---|---|---|---|---|---|---|
| 511 | COPPER ALLOY GATE, CHECK, ETC. VALVES (CONT.) | | | 5154 | | | |
| 512 | FIRE HOSE COUPLINGS & EQUIPMENT | 14244 | | 336 | | | |
| 513 | SURFACE BOXES | | | 5834 | 2, 3 | | |
| 513 | SURFACE BOXES (CONT. 1) | | | | | | |
| 513 | SURFACE BOXES (CONT. 2) | | | | | | |
| 513 | SURFACE BOXES (CONT. 3) | | | | | | |
| 513 | SURFACE BOXES (CONT. 4) | | | | | | |
| 514 | METALLIC BALL VALVES | 3357 | 1-7 | | | | DIN 3357 Part 6, 7 Witihdrawn |
| 515 | uPVC VALVES | 3441 | 2 | | | | |
| 517 | FIRE HYDRANT SYSTEMS FOR BUILDINGS | | | 5041 | 1-5 | | |
| 518 | BUTTERFLY VALVES | | | 5155 | | | |
| 519 | DIAPHRAGM VALVES | | | 5156 | | | |
| 520 | CAST IRON PLUG VALVES | | | 5158 | | | |
| 521 | UNDERGROUND STOPVALVES FOR WATER SERVICES | | | 5433 | | | |

## 3.6 TESTING METHODS AND EQUIPMENT

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 600 | NON-DESTRUCTIVE TESTING OF WELDS (TUBES) | 8564 | 1 | 3889 (6072) | 1, 2A | AP15LS | BS 3889 Partially Replaced by 6072 |
| 600 | NON-DESTRUCTIVE TESTING OF WELDS (TUBES) (CONT.) | 50120 | 1, 2 | 6072 | | | |
| 601 | SOILS FOR CIVIL ENGINEERING PURPOSE - TEST METHODS | 18196 | | 1377 | | | |
| 602 | TESTING OF PIPELINE FOR WATER (INTERNAL PRESSURE) | 4279 | 1-7, 9, 10 | | | | |
| 603 | TESTING OF CEMENT | See EDIN | | 4550 | 1, 2, 3 | BS EN 196-7<br>EDIN EN75, 112,<br>114, 15 | BS 4550 Part 1 & Part 2 Withdrawn<br>Replaced by BS EN 196-7: 1992 |
| 604 | MATERIAL TESTING - DOCUMENTATION | | | | | ISO 404, EURONORM 21 | |
| 605 | MEASUREMENT OF WATER FLOW (WATER METERS) | | | | | ISO 4064/3 | |
| 606 | DRINKING WATER QUALITY - TESTING | | | | | KS 05-459:5 | |
| 607 | RECOMMENDATIONS AND CLASSIFICATION FOR TOPSOIL | | | 3882 | | | |
| 608 | METHODS OF TESTING MORTARS, SCREEDS AND PLASTERS | | | 4551 | | | |
| 609 | STRUCTURAL FIXINGS IN CONCRETE AND MASONRY | | | 5080 | 1 & 2 | | Part 1: Method of test for tensile loading<br>Part 2: Method for determination of resistance to loading in shear |
| 610 | SIZE OF HARDWOODS AND METHODS OF MEASUREMENT | | | 5450 | | | |
| 611 | RECOMMENDATIONS FOR TESTING OF AGGREGATES | | | 5835 | 1 | | Part 1: Compactibility test for graded aggregates |

## 3.7 SITE WORK CODES OF PRACTICE

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 650 | SITE INVESTIGATIONS | 18196 | | 5930 | | | |
| 650 | SITE INVESTIGATIONS (CONT.) | 18307 | | | | | |
| 651 | WATER SUPPLY | 2000 | See BS | BS 6007 | | CP 310 | CP 310 Withdrawn<br>Replaced by BS 6007 |
| 651 | WATER SUPPLY (CONT. 1) | 2425 | 3, 5 | BS 8301 | | CP 301 | CP 301 Withdrawn<br>Replaced by BS 8301 |
| 651 | WATER SUPPLY (CONT. 2) | 4046 | | | | | |
| 651 | WATER SUPPLY (CONT. 3) | 19630 | | | | | |
| 652 | BUILDING DRAINAGE | 1986 | 2-4 | BS 8301 | | CP 301 | CP 301 Withdrawn<br>Replaced by BS 8301 |
| 653 | WATER PIPELINE CONSTRUCTION | 19630 | | | | | |
| 654 | TRENCHING FOR PIPELINES | 4124 | | | | | |
| 655 | SEWAGE PIPELINE CONSTRUCTION | | | | | | |
| 656 | WALLING (BRICK & BLOCK MASONRY) | 18330 | See BS | 5390<br>5628 | | CP 121 | CP 121 Withdrawn<br>Replaced by BS 5390 and BS 5628<br>Part 3 |
| 657 | USE OF STRUCTURAL STEEL IN BUILDING | 18203 | 1, 2 | 449<br>BS 5950 | 2 | GB 7101-91<br>SABS 1431 | BS 449 Parts 1 and 2 Withdrawn Part 2: Addendum No. 1 (1975) Replaced by BS 5950 Part 5 (1987) |
| 658 | SEWERAGE | | | 8005 | | BS EN 1610 | |
| 659 | SMALL SEWAGE TREATMENT WORKS AND CESSPOOLS | | | 6297 | | | |
| 660 | TEST PUMPING OF WATER WELLS | | | 6316 | | | |
| 661 | METHODS OF MEASUREMENT OF LIQUID FLOW IN OPEN CHANNEL | | | 3680 | 1-10 | BS ISO 748<br>BS ISO 1100-2 | BS 3680 Part 3A Withdrawn<br>Replaced by BS ISO 748: |

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|---|---|---|---|---|---|---|---|
| | | | | | | ISO TR 8363 | 1997<br>BS 3680 Part 3C Withdrawn<br>Replaced by BS ISO 1100-2<br>BS 3680 Part 3G Withdrawn<br>Replaced by ISO TR 8363<br>BS 3680 Parts 3J, 8F, 8G Withdrawn |
| 662 | MEASUREMENT OF FLOW IN CLOSED CONDUITS (BY CURRENT METERS OR PITOT STATIC TUBES) | | | | | ISO 7194 | |
| 663 | CONSTRUCTION AND DEMOLITION OF CONCRETE AND MASONRY | | | | | ANSI A10, 9-1983 | |
| 664 | DRAINAGE OF ROOFS AND PAVED AREAS | | | 6367 | | | |
| 665 | FOUNDATIONS | | | 8004 | | CP 2004 | CP 2004 Withdrawn<br>Replaced by BS 8004 |
| 666 | STRUCTURAL USE OF TIMBER | | | 5268 | | CP 112, 2 | CP 112, 2 Withdrawn<br>Replaced by BS 5268 Part 2<br>BS 5268 Part 3 |
| 667 | RETAINING WALLS | 4085 | | | | | |
| 668 | WATERPROOFING OF BUILDINGS & STRUCTURES | 18195 | 1-4 | | | | |
| 669 | WATER QUALITY - SAMPLING | | | | | ISO 5667/2/3 | |
| 670 | WELDING PROCEDURES - APPROVAL TESTING | | | 4870 | 1 | BS EN 288-3<br>BS EN 288-4 | BS 4870 Part 1 Withdrawn<br>Replaced by BS EN 288-3<br>BS 4870 Part 2 Withdrawn<br>Replaced by BS EN 288-4 |
| 671 | WELDING - APPROVAL TESTING | | | 4871 | 1 | BS EN 287-1<br>BS EN 287-2 | BS 4871 Part 1 Withdrawn |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | Replaced by BS EN 287-1<br>BS 4871 Part 2 Withdrawn<br>Replaced by BS EN 287-2 |
| 672 | LOGGING OF ROCK CORES | | | | | LOGGING OF ROCK CORES FOR ENGINEERING PURPOSES, GEOL. SOC. OF LONDON | |
| 673 | TEST FOR STABILISED SOILS | | | 1924 | | | |
| 674 | DRAIN AND SEWER SYSTEMS OUTSIDE BUILDINGS | | | | 1, 2 & 3 | BS EN 752 | Part 1: Generalities and definitions Part 2: Performance requirements Part 3: Planning |
| 675 | CONSTRUCTION AND TESTING OF DRAINS AND SEWERS | | | | | BS EN 1610 | |
| 676 | IDENTIFICATION OF PIPELINES AND SERVICES | | | 1710 | | | |
| 677 | WELDING OF STEEL PIPELINES ON LAND AND OFFSHORE | | | 4515 | | | |
| 678 | PERFORMANCE REQUIREMENTS FOR JOINTS AND COMPRESSION FITTINGS FOR USE WITH POLYETHYLENE PIPES | | | 5114 | | | |
| 679 | STRUCTURAL USE OF TIMBER | | | 5268 | 2, 3 & 5 | | Part 2: Permissible stress design, materials and workmanship<br>Part 3: Trussed rafter roof<br>Part 5: Preservative treatment of structural timber |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| 680 | STAIRS, LADDERS AND WALKWAYS | | | 5395 | 1, 2 & 3 | | Part 1: Design of straight stairs Part 2: Design of helical and spiral stairs<br><br>Part 3: Design of industrial type stairs, permanent ladder and walkways |
| 681 | INTERNAL PLASTERING | | | 5492 | | | |
| 682 | GUIDE TO ACCURACY IN BUILDING | | | 5606 | | | |
| 683 | SAFE USE OF EXPLOSIVES IN THE CONSTRUCTION INDUSTRY | | | 5607 | | | |
| 683 | USE OF MASONRY | | | 5628 | 3 | | Part 3: Materials and components, design and workmanship |
| 684 | EARTHWORKS | | | 6031 | | | |
| 685 | PAINTING OF BUILDINGS | | | 6150 | | | |
| 686 | LOADING FOR BUILDINGS | | | 6399 | 1 | | Part 1: Dead and imposed loads |
| 687 | GUIDE TO INSTALLATION AND USE OF VALVES | | | 6683 | | | |
| 688 | DESIGN, INSTALLATION, TESTING AND MAINTENANCE OF SERVICES<br><br>SUPPLYING WATER FOR DOMESTIC USE WITHIN BUILDINGS AND THEIR CURTILAGES | | | 6700 | | | |
| 689 | GUIDE FOR STRUCTURAL DESIGN OF PAVEMENTS CONSTRUCTED WITH CLAY OR CONCRETE BLOCK PAVER | | | 7533 | | | |
| 690 | SEWERAGE | | | 8005 | 1 | | Part 1: Guide to new sewerage construction |
| 691 | PROTECTION OF STRUCTURES AGAINST | | | 8102 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | WATER FROM THE GROUND | | | | | | |
| 692 | DESIGN AND INSTALLATION OF DAMP-PROOF COURSES IN THE MASONRY CONSTRUCTION | | | 8215 | | | |
| 693 | CODE OF PRACTICE FOR BUILT-UP FELT ROOFING | | | 8217 | | | |

## 3.8 DRAWING PRACTICE, STANDARD SYMBOLS ETC.

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 700 | IDENTIFICATION OF PIPELINE ACCORDING TO FLUID CONVEYED | 2403 | | | | | |
| 701 | GRAPHICAL SYMBOLS FOR GENERAL ENGINEERING - PIPING SYSTEMS | 2406 | | 1553 | 1 | | |
| 701 | GRAPHICAL SYMBOLS FOR GENERAL ENGIINEERING - PIPING SYSTEMS (CONT.) | 2429 | 1 | | | | |
| 702 | PROJECT NETWORK TECHNIQUES | | | 4335 | | | |
| 703 | DRAWING OFFICE PRACTICE - ARCHITECTS AND BUILDERS | | | 1192 | 1-4 | | BS 1192 Part 2 Obsolescent |
| 704 | CONSTRUCTION DRAWING PRACTICE | | | 1192 | 1-4 | | BS 1192 Part 2 Obsolescent |
| 705 | ENGINEERING DRAWING PRACTICE | | | 308 | 1 | ISO 128, 2162,<br>2203 | |
| 706 | DRAWING PRACTICE FOR ENGINEERING DRAWINGS | | | 5070 | 1-3 | BS EN 61082 | BS 5070 Part 1 Partially Replaced by<br>BS EN 61082-1<br>BS 5070 Part 2 Withdrawn<br>Replaced by BS EN 61082-2 |
| 707 | BUILDING AND CIVIL ENGINEERING TERMS | | | 6100 | 1-6 | | |
| 708 | WATER SUPPLY - MAPS AND PLANS | 2425 | 3, 5 | | | | |
| 709 | CARTOGRAPHIC REPRESENTATION OF CLIMATE | 50019 | 1 | | | | |
| 750 | CONCRETE (INC. R/F) - GLOSSARY | | | 6100 | 6.2, 6.3 | | |
| 751 | VALVES - GLOSSARY | | | | | | |
| 752 | IRON AND STEEL - GLOSSARY FOR PIPES | | | 6562 | 1-2 | | |

## 3.9 BUILDING MATERIALS

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 801 | LIME FOR MORTAR | 1060 | 1, 2, 3 | 890 | CL.B | | DIN 1060 Part 2 & 3 Withdrawn |
| 802 | QUARRY TILES FOR SILLS | | | 6431 | | BS EN ISO 10545-<br>2, 3, 4, & 6 | BS 6431 Parts 10, 11, 12 & 14<br>Replaced by BS EN ISO 10545-2, BS EN ISO 10545-3<br>BS EN ISO 10545-4<br>BS EN ISO 10545-6<br>Respectively but remain current |
| 803 | DAMP-PROOF COURSE (BITUMINOUS FELT) | | | 743 (6398: BS 6398, BS<br>6515 and BS<br>8215) | | | BS 743 Partially Replaced by |
| 804 | CONCRETE BLOCKS | | | 6398 | | KENYA M.O.W. ST. SPEC. | |
| 804 | CONCRETE BLOCKS (CONT.) | | | 6073 | 1, 2 | | BS 6073 Partially Replaced by<br>BS EN 772-2 |
| 805 | HOLLOW CLAY PARTITION BLOCKS | 278 | | 3921 | | | BS 3921 Partially Replaced by<br>BS EN 772-3 & 7 |
| 806 | BRICK WALLING | 105 | 1-5 | 3921 | | | BS Partially Replaced by<br>BS EN 772-3 & 7 |
| 806 | BRICK WALLING (CONT.) | 106 | 1, 2 | | | | |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 807 | ASBESTOS ROOF SLATES AND SHEETING | | | 690 | 3, 4 | | BS 690 Part 3 & 4 Withdrawn Replaced by BS EN 494 and 492 respectively |
| 808 | FIXING BOLTS & SCREENS FOR ROOFING | | | | | | |
| 809 | INSULATION BOARD AND HARD BOARD | | | 1142 | 1, 2, 3 | ISO 766/7/9, 818/19, 2695, 3340, 3546, 3729 | BS 1142 Partially Replaced by BS EN 120, 310, 316-323, 324: 1 & 2, 325, 382-1 and BS EN 622: 1-5 |
| 809 | INSULATION BOARD AND HARD BOARD (CONT.) | | | | | | |
| 810 | BLOCKBOARD | 68705 | 1, 3 | 3444 | | ISO 1096, 97, 98, 2074, 2426-30 | DIN 68705 Part 1 Withdrawn |
| 811 | PLYWOOD (TROPICAL HARDWOOD) | 4078 | | 6566 | 1-8 | ISO 1096, 1097 | BS 6566 Replaced by various BS EN Standards on the same subject |
| 811 | PLYWOOD (TROPICAL HARDWOOD) (CONT.) | 68705 | 1, 5 | | | ISO 1098 | DIN 68705 Part 1 Withdrawn |
| 812 | SEALING OF EXT. WALL JOINTS | 18540 | SH. 1, 2, 3 | | | | |
| 813 | CHIPBOARD | 68761 | 4 | 5669 | | | BS 5669 Part 1 Partially Replaced by BS EN 120, 309, 310, 311, 312, Parts 1-6 and 317 BS 5669 Part 4 Partially Replaced by BS EN 634-2 & BS EN 1328 BS 5669 Part 5 Withdrawn Replaced by BS 7916 |
| 813 | CHIPBOARD (CONT.1 ) | 68763 | | | | | |
| 813 | CHIPBOARD (CONT. 2) | 68764 | | | | | |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 814 | LAMINATED PLASTIC SHEETING | 16922 | | 3794 | | BS EN 438 | BS 3794 Withdrawn<br><br>Replaced by BS EN 438 Parts 1 & 2 |
| 814 | LAMINATED PLASTIC SHEETING (CONT. 1) | | | | | | |
| 814 | LAMINATED PLASTIC SHEETING (CONT. 2) | | | | | | |
| 815 | WOOD WOOL SLABS | 1101 | | 1105 | | | BS 1105 Obsolescent |
| 815 | WOOD WOOL SLABS (CONT. 1) | 1102 | | | | | |
| 816 | QUALITY OF TIMBER - WORKMANSHIP | 68141 | | 1186 | 2 | | |
| 817 | MATERIAL FOR FLUSH DOORS | 68706 | | 459 | | | BS 459 Part 3 Withdrawn |
| 817 | MATERIAL FOR FLUSH DOORS (CONT. 1) | 18101 | | | | | |
| 817 | MATERIAL FOR FLUSH DOORS (CONT. 2) | | | | | | |
| 818 | WATERPROOF ADHESIVE | 53255 | | 1203 | TYPE MR | | |
| 819 | STRUCTURAL STEEL & METALWORK | | | 4360<br><br>7316<br><br>7668 | | ISO 630, 6891<br><br>BS EN 10029: 1-3<br><br>BS EN 10113<br><br>BS EN 10155<br><br>BS EN 10210-1 | BS 4360 Withdrawn - Replaced by<br><br>BS 7316, BS 7668,<br><br>BS EN 10029 Parts 1 to 3<br><br>BS EN 10113, BS EN 10155 and<br><br>BS EN 10210-1 |
| 819 | STRUCTURAL STEEL & METALWORK (CONT. 1) | | | | | JIS G30101-87 | |
| 820 | SPLIT RING TIMBER CONNECTORS | | | 1579 | | | |
| 821 | METAL WINDOWS | | | 6510 | | | |
| 822 | GLASS FOR GLAZING | 1249 | 1 | 952 | 1 | | |
| 822 | GLASS FOR GLAZING (CONT.) | 18301 | | | | | |
| 823 | GALVANISED M.S. TUBING (MILD STEEL) | 2440 | | 1387 | | ISO 65, 7/1, 7/2 | |
| 823 | GALVANISED M.S. TUBING (MILD STEEL) (CONT. 1) | 2441 | | 21 | | | |
| 823 | GALVANISED M.S. TUBING (MILD STEEL) (CONT. 2) | 2442 | | | | | |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 823 | GALVANISED M.S. TUBING (MILD STEEL) (CONT. 3) | 2999 | 1 | | | | |
| 824 | FITTINGS TO M.S. TUBING MILD STEEL | 2460 | | 1256, 143 | | | |
| 824 | FITTINGS TO M.S. TUBING MILD STEEL | | | 143 | | BS EN 10242 | |
| 824 | FITTINGS TO M.S. TUBING MILD STEEL (CONT. 2) | | | 1740 | 1 | | |
| 825 | POLYTHENE TUBING FOR COLD WATER SERVICES | 19533 | | 2782 | | ISO 161-1<br>BS ISO 4065<br>BS ISO 11922-1 | |
| 825 | POLYTHENE TUBING FOR COLD WATER SERVICES (CONT. 1) | 8072 | | 6572<br>6730 | | | |
| 825 | POLYTHENE TUBING FOR COLD WATER SERVICES (CONT. 2) | 8073 | | | | | |
| 825 | POLYTHENE TUBING FOR COLD WATER SERVICES (CONT. 3) | 8075 | | | | | |
| 825 | POLYTHENE TUBING FOR COLD WATER SERVICES (CONT. 4) | 8074 | | | | | |
| 826 | BRASSWORK & FITTINGS FOR TAPS & STOP VALVES | | | 1010 | 2 | | |
| 827 | BALL VALVES FOR CISTERNS | | | 1212 | 3 | | |
| 828 | PLASTIC FLOATS FOR BALL VALVES | | | 2456 | | | |
| 829 | CAST IRON SOIL, WASTE & VENT PIPES | | | 416 | | | |
| 829 | CAST IRON SOIL, WASTE & VENT PIPES (CONT. 1) | | | | | | |
| 829 | CAST IRON SOIL, WASTE & VENT PIPES (CONT. 2) | | | | | | |
| 829 | CAST IRON SOIL, WASTE & VENT PIPES (CONT. 3) | 19522 | 1, 2 | | | | |
| 830 | GALVANISED MILD STEEL COLD WATER TANKS | | | 417 | 2 CL.A | | |
| 831 | ENAMELLED CAST IRON BATH | | | 1189 | | | |
| 831 | ENAMELLED CAST IRON BATH (CONT. 1) | | | | | | |
| 831 | ENAMELLED CAST IRON BATH (CONT. 2) | 4774 | | | | | |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 832 | PILLAR TAPS | 7572 | | 1010 | 2 | | |
| 833 | GLAZED VITREOUS CHINA W.C. PAN | 1387 | | 5503 | | | |
| 833 | GLAZED VITREOUS CHINA W.C. PAN (CONT.) | 1381 | | | | | |
| 834 | HINGED PLASTIC SEAT TO W.C. PAN | | | 1254 | | | |
| 835 | GLAZED VITREOUS CHINA LAVATORY BASIN | 4462 | | 1188 | | | |
| 835 | GLAZED VITREOUS CHINA LAVATORY BASIN (CONT.) | | | 5506 | 2 | | |
| 836 | STAINLESS STEEL SINK | 4465 | | 1244 | 2 | | |
| 837 | BRASS “S” AND “P” TRAPS | | | 1184 | | | BS 1184 Obsolescent |
| 839 | A/C DRAIN PIPES AND FITTINGS | 19831 | | 3656 | | BS EN 588-1 | BS 3656 Withdrawn<br>Replaced by BS EN 588-1 |
| 839 | A/C DRAIN PIPES AND FITTINGS (CONT. 1) | 19841 | | | | | |
| 839 | A/C DRAIN PIPES AND FITTINGS (CONT. 2) | 19850 | 1, 2 | | | | |
| 840 | CONCRETE DRAIN PIPES | See 409 | | 2870 | | | |
| 841 | PITCH FIBRE DRAIN PIPES | | | 2760 | | | BS 2760 Withdrawn |
| 842 | CAST IRON DRAIN PIPES | 19500 | | 437 | | ISO 6594 | |
| 842 | CAST IRON DRAIN PIPES (CONT. 1) | 19501 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 2) | 19502 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 3) | 19503 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 4) | 19504 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 5) | 19505 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 6) | 19506 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 7) | 19507 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 8) | 19508 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 9) | 19509 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 10) | 195010 | | | | | |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 842 | CAST IRON DRAIN PIPES (CONT. 11) | 195011 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 12) | 195014 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 13) | 195019 | | | | | |
| 842 | CAST IRON DRAIN PIPES (CONT. 14) | 19521 | | | | | |
| 843 | JOINTING COMPOUND FOR C.I. DRAIN PIPES | | | BS 6956 | 1, 5, 6, 7 | | |
| 844 | C.I. S & S FITTINGS FOR DRAINS | 19519 | | 437 | | | |
| 845 | STEP-IRONS TO MANHOLES & SEPTIC TANKS | 1211 | 1 | 1247 | | | |
| 845 | STEP-IRONS TO MANHOLES & SEPTIC TANKS (CONT. 1) | 1212 | 1 | | | | |
| 845 | STEP-IRONS TO MANHOLES & SEPTIC TANKS (CONT. 2) | 1213 | | | | | |
| 845 | STEP-IRONS TO MANHOLES & SEPTIC TANKS (CONT. 3) | 4281 | | | | | |
| 846 | C.I. MANHOLE COVERS AND FRAMES | 1229 | | 497 | 1 | BS EN 124 | BS 497 Withdrawn<br>Replaced by BS EN 124 |
| 846 | C.I. MANHOLE COVERS AND FRAMES (CONT. 1) | 4271 | 1, 3 | | | | |
| 846 | C.I. MANHOLE COVERS AND FRAMES | 19593 | 1, 2, 3 | | | | |
| 846 | C.I. MANHOLE COVERS AND FRAMES (CONT. 3) | 19594 | 1, 2 | | | | |
| 846 | C.I. MANHOLE COVERS AND FRAMES (CONT. 4) | 19596 | | | | | |
| 846 | C.I. MANHOLE COVERS AND FRAMES (CONT. 5) | 19597 | | | | | |
| 847 | STEEL LADDERS FOR PERMANENT ACCESS | 3620 | | 4211 | | | |
| 848 | HANDRAILING | 24533 | | 6180 | | | |
| 849 | GALVANISED CHAIN LINK FENCING | 11991 | | 1722 | 1 | | |
| 850 | OPEN MESH STEEL FLOORING | | | 4592 | 1 | | |
| 851 | MASTIC ASPHALT FOR ROOFING | | | 6925 | | | |
| 852 | ALUMINIUM FOR LOUVRE WINDOWS | | | 1470 | | BS EN 485 | BS 1470 Withdrawn |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | BS EN 515<br>BS EN 573 | Replaced by BS EN 485 Parts 1-4, BS EN 515, BS EN 573 Parts 1-4 |
| 853 | FIXING ACCESSORIES FOR BUILDING PURPOSES | | | 1494 | 1 | | BS 1494 Part 2 Withdrawn |
| 854 | PRECAST CONCRETE MANHOLES | 4034 | | 5911 | 2, 3 | | BS 5911 Part 1 Withdrawn<br>Replaced by<br>BS 5911 Part 100 (1988)<br>Bs 5911 Part 200 (1989) and BS 5911<br>Part 200 (1994) |
| 855 | PRECAST CONCRETE KERBS & CHANNELS | 483 | | 7263 | 1 | | |
| 856 | WATERPROOF BUILDING PAPERS | 4122 | | 1521 | | | |
| 856 | WATERPROOF BUILDING PAPERS (CONT. 1) | 52126 | | | | | |
| 856 | WATERPROOF BUILDING PAPERS (CONT. 2) | 52127 | | | | | |
| 856 | WATERPROOF BUILDING PAPERS (CONT. 3) | 52128 | | | | | |
| 856 | WATERPROOF BUILDING PAPERS (CONT. 4) | 52129 | | | | | |
| 856 | WATERPROOF BUILDING PAPERS (CONT. 5) | 52130 | | | | | |
| 857 | METAL TIES FOR CAVITY WALL | | | 1243 | | | |
| 858 | A/C BUILDING PRODUCTS (TESTS FOR SHEETS) | 274 | 1-4 | 4624 | | | |
| 859 | PRECAST CONCRETE FLAGSTONES | 485 | | 7263 | 1 | | |
| 860 | ASBESTOS CEMENT RAIN WATER GOODS | 19831 | 1-9 | 569 | | | |
| 860 | ASBESTOS CEMENT RAIN WATER GOODS (CONT. 1) | 19841 | 1-6 | | | | |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 860 | ASBESTOS CEMENT RAIN WATER GOODS (CONT. 2) | 19850 | 1 | | | | |
| 861 | LINTELS - PREFABRICATED | | | 5977 | 2 | | |
| 862 | uPVC SOIL AND VENT PIPES, FITTINGS, ETC. | 1187 | | 4514 | | | |
| 863 | STRUCTURAL STEEL IN BUILDINGS | | | 449 (5950) | 2 | | BS 449 Part 2 Withdrawn<br><br>Replaced by BS 5950 Part 5 |
| 864 | PROTECTIVE BARRIERS IN AND ABOUT BUILDINGS | | | 6180 | | | |
| 866 | BITUMENS FOR BUILDING & CIVIL ENGINEERING | | | 3690 | 1, 3 | | |
| 867 | SOLAR WATER HEATERS | | | | | AS 2813-85 | |
| 868 | FLOORING - INITIAL TREAMENT MAINTENANCE | | | 6263 | 2 | | |
| 869 | RIGID FLAT SHEET BUILDING MATERIALS | | | | | | |
| 870 | BUILDING STONE | | | 1438 | | | |
| 871 | CAST STONE | | | 1217 | | | |
| 872 | WOOD PRESERVATIVES - CREOSOTE | | | 144 | | | |
| 873 | WASTE TRAPS - PLASTIC | | | 3943 | | | |
| 874 | COPPER FLOATS FOR FLOAT OPERATED VALVES | | | 1968 | | | |
| 875 | VITREOUS CHINA SANITARY FITTINGS | | | 3402 | | | |
| 876 | PAINTS - LEAD BASED | | | 2523<br><br>(5082, 5358) | | | BS 2523 Obsolescent, Partially<br><br>Replaced by BS 5082 and BS 5358 |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 877 | READY MIXED OIL-BASED PRIMING PAINTS | | | 2521/4 (See 2523) | | | |
| 878 | READY MIXIED OIL-BASED UNDERCOATING AND FINISHING PAINTS | | | | | | |
| 879 | COLD POURED SEALING MATEIALS FOR CONCRETE PAVEMENTS | | | 5212 | | | |
| 880 | GULLY TOPS AND MANHOLE TOPS FOR VEHICULAR PEDESTRIAN AREAS. DESIGN REQUIREMENTS, TYPE TESTING, MARKING QUALITY CONTROL | | | | | BS EN 124 | |
| 881 | STRUCTURAL TIMBER. STRENGTH CLASSES | | | 338 | | | |
| 882 | CLAY ROOFING TILES AND FITTINGS | | | 402 | 1 | | Part 1: Specification for plain tiles and fittings |
| 883 | BITUMEN ROAD EMULSIONS (ANIONIC AND CATIONIC) | | | 434 | 1 | | Part 1: Bitumen road emulsions |
| 884 | DRESSED NATURAL STONE KERBS, CHANNELS, QUADRANTS AND SETTS | | | 435 | | | |
| 885 | CONCRETE ROOFING TILES AND FITTINGS. PRODUCT SPECIFICATION | | | | | BS EN 490 | |
| 886 | AIR BRICKS AND GRATINGS FOR WALL VENTILATION | | | 493 | | | |
| 887 | EAVES GUTTERS AND FITTINGS MADE OF PVC-C | | | | | BS EN 607 | |
| 888 | EAVES GUTTERS AND RAINWATER DOWN-PIPES OF METAL SHEET | | | | | BS EN 612 | |
| 889 | PLYWOOD | | | | | BS EN 635 | |
| 890 | TIMBER IN JOINERY | | | | | BS EN 942 | |
| 891 | PRESSED STEEL GUTTERS, RAINWATER PIPES, FITTINGS AND ACCESSORIES | | | 1091 | | | |
| 892 | WC FLUSHING CISTERNS (INCLUDING DUAL FLUSH CISTERNS AND FLUSH PIPES) | | | 1125 | | | |
| 893 | NAILS | | | 1202 | 1, 2 & 3 | | Part 1: Steel |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | nails Part 2: Copper nails Part 3: Aluminium nails |
| 893 | FIXING ACCESSORIES FOR BUILDING PURPOSES | | | 1494 | 1 | | Part 1 Fixings for sheet, roof and wall coverings |
| 894 | AUTOMATIC FLUSHING CISTERNS FOR URINALS | | | 1876 | | | |
| 895 | WASTES (EXCLUDING SKELETON SINK WASTES) AND BATH OVERFLOWS | | | 3380 | | | |
| 896 | LIGHTWEIGHT AGGREGATES FOR MASONRY UNITS AND STRUCTURAL CONCRETE | | | 3797 | | | |
| 897 | TERRAZO TILES | | | 4131 | | | |
| 898 | WELDABLE STRUCTURAL STEELS | | | 4360 | | | |
| 899.1 | UNPLASTICIZED POLYVINYL CHLRIDE (PVC-U) RAINWATER GOODS AND ACCESSORIES | | | 4576 | | | |
| 899.2 | INDUSTRIAL TYPE METAL FLOORING, WALKWAYS AND STAIRS TREADS | | | 4592 | 1, 2, 3 & 4 | | Part 1: Open bar gratings<br>Part 2: Expanded metal grating panels<br>Part 3: Cold formed planks<br>Part 4: Glass reinforced plastics open bar gratings |
| 899.3 | READY-MIX BUILDING MORTARS | | | 4721 | | | |
| 899.4 | INTERNAL AND EXTERNAL WOOD DOORSETS, DOOR LEAVES AND FRAMES | | | 4787 | 1 | | Part 1: Dimensional requirements |
| 899.5 | HOT-ROLLED STRUCTURAL STEEL SECTIONS | | | 4848 | 2 & 4 | | Part 2: Hot-finished hollow sections<br>Part 4: Equal and unequal angles |
| 899.6 | URINALS | | | 4880 | 1 | | Part 1: Stainless steel slab urinals |
| 899.7 | MORTAR ADMIXTURES | | | 4887 | 1 & 2 | | Part 1: Air-entraining (plasticizing) |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | admixtures<br>Part 2: Set retarding admixtures |
| 899.8 | SOFTWOOD GRADES FOR STRUCTURAL USE | | | 4978 | | | |
| 899.9 | COATED MACADAM FOR ROADS AND OTHER PAVED AREAS | | | 4987 | 1 & 2 | | Part 1: Constituent materials and mixtures<br>Part 2: Transport, laying and compaction |
| 899.10 | WATER-BORNE PRIMING PAINTS FOR WOODWORK | | | 5082 | | | |
| 899.11 | MASONRY CEMENT | | | 5224 | | | |
| 899.12 | EXTERNAL RENDERINGS | | | 5262 | | | |
| 899.13 | SOLVENT-BORNE PRIMING PAINTS FOR WOODWORK | | | 5358 | | | |
| 899.14 | WALL AND FLOOR TILING | | | 5385 | 1, 2, 3, 4 & 5 | | Part 1: Design and installation of internal ceramic wall tiling and mosaics in normal conditions Part 2: Design and installation of external ceramic wall tiling and mosaics (including terra cotta and faience tiles)<br>Part 3: Design and installation of ceramic floor tiles and mosaics<br>Part 4: Tiling and mosaics in specific conditions<br>Part 5: Design and installation of |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | terrazzo tile and slab, natural stone and composition block floorings |
| 899.15 | STONE MASONRY | | | 5390 | | | |
| 899.16 | SPECIFICATION FOR LOW-RESISTANCE SINGLE TAPS AND COMBINATION TAP ASSEMBLIES (NOMINAL SIZE ½ AND 3/4) | | | 5412 | | | |
| | SUITABLE FOR OPERATION AT PN 10<br><br>MAX. AND A MINIMUM FLOW PRESSURE OF 0.01 MPa (0.1 BAR) | | | | | | |
| 899.17 | VITREOUS CHINA WASHDOWN WC PANS WITH HORIZONTAL OUTLET | | | 5503 | 1 & 2 | | Part 1: Connecting dimensions<br>Part 2: Materials, quality, performance and dimensions other than connecting dimensions |
| 899.18 | VITREOUS CHINA BOWL URINALS (RIMLESS TYPE) | | | 5520 | | | |
| 899.19 | PRESERVATION OF TIMBER | | | 5589 | | | |
| 899.20 | PLASTIC CONNECTORS FOR USE WITH HORIZONTAL OUTLET VITREOUS CHINA WC PANS | | | 5627 | | | |
| 899.21 | STILES, BRIDLE GATES AND KISSING GATES | | | 5709 | | | |
| 899.22 | GLAZING FOR BUILDINGS | | | 6262 | | | |
| 899.23 | MANUFACTURE OF GLUED STRUCTURAL COMPONENTS FOR TIMBER AND WOOD BASED PANEL PRODUCTS | | | 6446 | | | |
| 899.2 | POLYETHYLENE DAMP-PROOF | | | 6515 | | | |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 4 | COURSES FOR MASONRY | | | | | | |
| 899.25 | INSTALLATION OF CHMICAL DAMP- PROOF COURSES | | | 6576 | | | |
| 899.26 | PORTLAND PULVERIZED-FUEL ASH CEMENTS | | | 6588 | | | |
| 899.27 | PRECAST CONCRETE PAVING BLOCKS | | | 6717 | 1 | | Part 1: Paving blocks |
| 899.28 | EXTERIOR WOOD COATING SYSTEMS | | | 6952 | 1 | | Part 1: Guide to classification and selection |
| 899.29 | PRECAST CONCRETE FLAGS, KERBS, CHANNELS, EDGINGS AND QUADRANTS | | | 7263 | 1 & 2 | | Part 1: Specification<br><br>Part 2: Code of practice for laying |
| 899.30 | IN-SITU FLOORINGS | | | 8204 | 2 | | Part 2: Concrete wearing surfaces |

## 3.10 ELECTRICAL / MECHANICAL

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 001 | FRACTIONAL HORSE-POWER MOTORS (DIMENSIONS) | 42021 | | 2048 | 1 | | |
| 002 | CURRENT FRANSFORMERS | | | 7626 | | IEC 60185 | |
| 003 | VOLTAGE TRANSFORMERS | | | 7625 | | IEC 60186/186A | |
| 004 | CIRCUIT BREAKERS 1 kV A.C. | | | 5311 | | IEC 60056/267 | |
| 005 | CIRCUIT BREAKERS A.C. VOLT. OPERATED | | | 842 | | BS EN 61008-1 | |
| 006 | CIRCUIT A.C. CURRENT OPERATED | | | 4293 | | BS IEC 1008-2-2 | BS 4293 Partially Replaced by<br><br>BS EN 61008-1 and BS IEC 1008-2-2 |
| 007 | FUSE SWITCHES (AIR BREAK) | | | 5419 | | IEC 408 | BS 5419 Withdrawn<br><br>Replaced by BS EN 60947-3 |
| 008 | MOTOR STARTERS AND CONTROLLERS | 46062 | | 587 | | | BS 587 Withdrawn<br><br>Replaced by BS EN 60947-4-1 and<br>BS 5856-1 |
| 009 | MOTOR STARTERS ABOVE 1000 V.A.C. | | | 5856 | 1 | IEC 60632-1 | |
| 010 | ELECTRIC MOTOR DIMENSIONS | 42673 | BL. 1-4 | 4999 | 10 | IEC 60072, 72A | |
| 011 | INDUCTION MOTORS FOR GENERAL PURPOSE | 42673 | BL. 1-4 | 5000 | 10 | IEC 60072 | |
| 012 | ENCLOSURE PROTECTION SWITCH / CONTROL GEAR | 40050 | BL. 2, 6, 9, 10 | 5420 | | IEC 60144 (IP32) | BS 5420 Withdrawn<br><br>Replaced by BS EN 60947-1 |
| 013 | MOTOR STARTERS NOT EXC. 1000 V.A.C. | 46062 | | 4941 | 1, 3, 4 | IEC 292, 1, 2, 3, 4 | BS 4941 Withdrawn<br><br>Replaced by BS EN 60947-4-1 |
| 014 | ELECTRICITY METERS | | | 37 | 1, 5, 8 | | BS 37 Withdrawn<br><br>Replaced by Parts 1-4 of BS 5685 |

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|---|---|---|---|---|---|---|---|
| 015 | WATT-HOUR METERS | | | 5685 | | IEC 521 | BS 5685 Part 1 (1979) and Parts 2, 3<br><br>& 4 (1986) all Obsolescent |
| 016 | ACCEPTANCE TESTS FOR PUMPS (CLASS C) | 4325 | | 5316 | 1 | ISO 2548<br><br>IEC 198 | |
| 017 | ACCEPTANCE TESTS FOR PUMPS (CLASS B) | 4325 | | 5316 | 2 | ISO 3555<br><br>IEC 198 | |
| 018 | CODE OF PRACTICE, ELECTRICAL WIRING | | | | | IEE W. REGS (15TH ED) | |
| 019 | ELECTRICAL PROTECTIVE RELAYS | | | 142 | | | BS 142 Part 1 Section 1.5 Sub- Section 1.5.1 - 1.5.3 all renumbered as BS 60255-21-1, 2, 3 respectively |
| 020 | FACTORY BUILT SWITCHGEAR ASSEMBLIES | 57670 | TL. 6 | 5486 | 1, 2, 3, 13 | IEC 439-2 | BS 5486 Part 1 Withdrawn<br><br>Replaced by BS EN 60439-1 |
| 021 | RECIPROCATING INT/COMB. ENGINES | | | 5514 | 1, 2 | ISO 3046, PT. 1, 2 | BS 5541 Part 2 (1988) 'Test Methods' Withdrawn - Replaced by BS 5514<br><br>Part 1 (1996) |
| 022 | MACHINES FOR MISCELLANEOUS APPLICATIONS | | | 5000 | 99 | | |
| 023 | INSULATING MATERIALS FOR ELECTRICAL MACHINES | | | 2757 | | IEC 85 | |
| 024 | PCV INSULATED CABLES NOT EXCEEDING 1900 V.A.C. | 57207 | 4, 5 | 6346 | | | |
| 025 | ROTATING ELECTRICAL MACHINES - GENERAL | | | 4999 | 1, 2, 3 | IEC 34-1, 34-8, 72,<br><br>72A | Renumbered as EN 60034-4 |
| 026 | CONCRETE CABLE COVERS | | | 2484 | | | BS 2484 Obsolescent |

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|---|---|---|---|---|---|---|---|
| 027 | ELECTRIC POWER SWITCHGEAR (LOW VOL. N.E. 1kV) | 57660 | | 5486<br>5727<br>7354 | | | |
| 028 | SAFETY ISOLATING TRANSFORMERS | | | 3535 | | | |
| 029 | ROTATING ELECTRICAL MACHINES - RATING PLATES | 42961 | | 4999 | 4 | IEC 60034-1 | |
| 030 | ROTATING ELECTRICAL MACHINES - ENCLOSURES | 40050 | | 4999 | 20 | IEC 60035-5 | |
| 031 | ROTATING ELECTRICAL MACHINES - CONDITIONS | | | 4999 | 31 | IEC 60034-1 | |
| 032 | ROTATING ELECTRICAL MACHINES - TEMPERATURE LIMITS | See<br>E DIN | | 4999 | 32 | IEC 60034-1<br>E DIN | |
| 033 | ROTATING ELECTRICAL MACHINES - VIBRATION | See DIN ISO | | 4999 | 50 | ISO 2373 | |
| 034 | ROTATING ELECTRICAL MACHINES - TESTS | | | 4999 | 60 | IEC 60034-1 | |
| 035 | GENERATORS DRIVEN BY I/C ENGINES | See<br>VDMA | | 5000 | 3 | VDMA 6280 | |
| 036 | MACHINES WITH FLAMEPROOF ENCLOSURES | 22418 | | 5000 | 17 | | |
| 037 | MAINTENANCE OF ELECTRICAL SWITCHGEAR (V.N.E. 14 kV) | | | 6626 | | | |
| 038 | PROTECTION PROVIDED BY ENCLOSURES (CLASS N OF DEG.) | | | 5490 | | IEC 600529, BS EN 60529 | BS 5490 Withdrawn<br>Replaced by BS EN 60529 |
| 039 | ELECTRICAL EQUIPMENT OF INDUSTRIAL MACHINES | | | 2771 | | EN 60204, Part 1 | BS 2771 Part 1 Replaced by EN<br>60204-1 (1993) but remains current for use as a reference standard for<br>BS EN 60204-3-1: 1992 |
| 040 | SWITCHGEAR AND CONTROL GEAR UPTO 1000V | | | 4752 | | IEC 600157-1, | BS 4752 Withdrawn<br>Replaced by BS EN |

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| | | | | | | 600157-1A | 60947-2 |
| **SRN** | **SUBJECT** | **DIN** | **PART** | **BSS** | **PART** | **OTHER** | **REMARKS** |
| | | | | | | | |
| 041 | PVC INSULATED CABLES FOR SWITCHES AND CONTROL GEAR | | | 6231 | | | |
| 042 | BASIC ENVIRONMENTAL TESTING PROCEDURES | | | 2011 | 1.1 | IEC 60068-1 | BS 2011 Parts Withdrawn and<br><br>Replaced by Parts of BS EN 60068 |
| 043 | DEFINITIONS AND GENERAL REQUIREMENTS | | | | | IEC 60051-1 | |
| 044 | PANEL MOUNTED INSTRUMENTS - DIMENSIONS | | | | | IEC 600473 | |
| 045 | CELLULOSIC PAPERS FOR ELECTRICAL PURPOSES | | | 5626 | 1, 2, 3 | IEC 600554 | |
| 046 | COMMISSIONIING, OPERATION AND MAINTENANCE OF STORAGE PUMPS | | | | | IEC 600805 | |
| 047 | RUBBER INSULATED CABLES | | | | | IEC 600245 | |
| 048 | VOLTAGE FLUCTUATION LIMITS - GUIDE | | | | | IEC 600827 | |
| 049 | ELECTRIC CABLES - ARMOURING - WIRE FOR | | | | | KS 04-290 | |
| 050 | ROTATING ELECTRICAL MACHINES FOR HARZARDOUS AREAS (“N”) | | | 5000 | 16 | | |
| 051 | POWER TRANSFORMERS - GENERAL | | | | | BS EN 60076-1 | |
| 052 | ELECTRIC CONDUIT - STEEL | | | 4568 | 2 | | |
| 053 | BUS BARS | | | 159 | | | |
| 054 | NON-METALLIC CONDUITS | | | 4607 (6099) | 2 | | Partially Replaced by BS 6099 Part 1 and BS 6099 Section 2.2 |
| 055 | PVC CABLES IN CONDUITS | | | 6004 | | | |
| 056 | INSULATED FLEXIBLE CORD | | | 6500 | | | |
| 057 | M.I.C.C. CABLES | | | 4782 | 1 | | |
| 058 | FLUSH SWITCHES | | | 3676 | | | |

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|---|---|---|---|---|---|---|---|
| 059 | ELECTRIC SOCKETS | | | 1363 | | | Part 3: 1989 Replaced by BS 1363<br><br>Part 3 (1995) but remains current |
| 060 | FUSED SPUR BOXES | | | 1362 | | | |
| 061 | CONTACTORS | | | 775 | | | Part 1 (1969) Withdrawn<br><br>Replaced by BS 5424: Part 1 1977 |
| 062 | SECURITY LIGHTING INSTALLATION | | | | | CP 1004 | Renumbered as BS 5498 |
| 063 | ALUMINIUM SOLID CONDUCTORS | | | 3988 | | | |

### 3.11 MISCELLLANEOUS

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
|---|---|---|---|---|---|---|---|
| 900 | ZINC SPRAY PROTECTION | 55928 | 1-9 | 2569 | 1 | ISO 2063<br>BS EN 22063 | BS 2569 Withdrawn<br>Replaced by BS EN 22063 |
| 900 | ZINC SPRAY PROTECTION (CONT.) | | | 5493 | | BS EN ISO 12944 | BS 5493 Proposed for Obsolescence<br>Partially Replaced by Parts 1-8 of<br>BS EN ISO 12944 |
| 901 | METALLIC ZINC RICH PRIMER | | | 4652 | | | |
| 902 | COLOUR OF FINISH (BUILDING MATERIALS) | See VOB | | 4800 | | VOB pt. C | |
| 903 | HOT DIP GALVANIZING ON IRON & STEEL | | | 729 | | ISO 1459 | |
| 903 | HOT DIP GALVANIZING ON IRON & STEEL (CONT.) | | | 5493 | | ISO 1461<br>BS EN ISO 12944 | BS 5493 Proposed for Obsolescence<br>Partially Replaced by Parts 1-8 of<br>BS EN ISO 12944 |
| 904 | BLACK BITUMEN SOLUTION (COLD APP.) FOR WATER TANKS | | See DVGW | 3416 | TYPE II | DVGW-GWS | |
| 905 | WELDABLE STRUCTURAL STEELS | 1025 | 1-5 | 4360 | | ISO 630 | BS 4360 Withdrawn -<br>Replaced by BS 7613, BS 7668, BS EN 10113, BS EN 10155 & BS EN 10210 |
| 906 | CLASSIFICATION OF GREY CAST IRON | | | 1452 | | ISO 185 | BS 1452 Withdrawn<br>Replaced by BS EN 1561 |
| 907 | BEARING DESIGN LIFE | | | | | | |
| 908 | BITUMEN - HOT APPLIED - COATINGS FOR IRON AND STEEL | 30673 | | 4147 | | | |
| 908 | BITUMEN - HOT APPLIED - COATINGS FOR IRON AND STEEL (CONT.) | | | 5493 | | | |

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|---|---|---|---|---|---|---|---|
| 909 | PRESSED STEEL RECTANGULAR TANKS | | | 1564 | | | |
| 910 | GREY IRON CASTINGS FOR MANHOLE COVERS | | | 1452 | GRADE 10 | | |
| 911 | MALLEABLE CAST IRON | | | 6681 | | ISO 5922 | BS 6681 Withdrawn - Replaced by BS EN 1562 |
| 911 | MALLEABLE CAST IRON (CONT.) | | | | | ASTM A 47-77 | |
| 912 | ROLLED STEEL | | | 4360 | | ISO 630 | BS 4360 Withdrawn - Replaced by BS 7613, BS 7668, BS EN 10113, BS EN 10155 & BS EN 10210 |
| 912 | ROLLED STEEL (CONT.) | | | | | | |
| 913 | STRUCTURAL STEEL SECTIONS | 1025 | 1-5 | 4 | 1 | | BS 4 Part 2 (1969) Withdrawn Replaced by BS 4848 Part 2 |
| 914 | ISO METRIC BLACK HEXAGONAL BOLTS, SCREWS AND NUTS | 267 | 1, 2 | 4190 | | ISO 272, 4759-1, 3 | BS 4160 Obsolescent |
| 914 | ISO METRIC BLACK HEXAGONAL BOLTS, SCREWS AND NUTS (CONT 1) | | | | | ISO 885, 888 | |
| 914 | ISO METRIC BLACK HEXAGONAL BOLTS, SCREWS AND NUTS (CONT 2) | | | | | ISO 898/2, 898/1 | |
| 915 | SIZES FOR FERROUS & NON-FERROUS BARS | | | 6722 | | | |
| 916 | MECHANITE IRON, GRADE E | | | | | ASTM A48, No. 308 | |
| 917 | CORROSION PROTECTION OF STEEL STRUCTURES - GENERAL | 55928 | 1-9 | 5493 | | BS EN ISO 12944 | BS 5493 Proposed for Obsolescence Partially Replaced by Parts 1-8 of BS EN ISO 12944 |
| 918 | INGOT ZINC | | | 3436 | | ISO 752 BS EN 1179 | BS 3436 Withdrawn Replaced by BS EN 1179 (1996) |

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| | | | | | | (1996) | |
| 919 | WELDING OF STEELS (METAL ARC) | 8528 | 1-2 | 5135 | 1 | | BS 5135 Partially Replaced by BS EN 1011-1 (1998) |
| 919 | WELDING OF STEELS (METAL ARC) (CONT 1) | 8553 | | 499 | 1 | | BS 499 Part Obsolescent / Withdrawn |
| 919 | WELDING OF STEELS (METAL ARC) (CONT 2) | 8558 | 1 | | | | |
| 919 | WELDING OF STELLS (METAL ARC) (CONT 3) | 50120 | 1 | | | | |
| 920 | STEEL PLATE, SHEET AND STRIP | | | 1449 | 1 (Withdrawn) | ISO 3573 | BS 1499 Parts Withdrawn Replaced by BS EN 10111, 10209, BS EN 10149-2 & 3, 10051, 10131, 10139, 10149-2 & 3, 10048, 10140, 10029, 10258 & 10259 |
| 920 | STEEL PLATE, SHEET AND STRIP (CONT 1) | | | | | ISO 3574 | |
| 920 | STEEL PLATE, SHEET AND STRIP (CONT 2) | | | | | | |
| 920 | STEEL PLATE, SHEET AND STRIP (CONT 3) | | | | | | |
| 920 | STEEL PLATE, SHEET AND STRIP (CONT 4) | | | | | | |
| 920 | STEEL PLATE, SHEET AND STRIP (CONT 5) | | | | | | |
| 920 | STEEL PLATE, SHEET AND STRIP (CONT 6) | 1614 | | | | | |
| 920 | STEEL PLATE, SHEET AND STRIP | 1632 | 2 | | | | |

| SRN | SUBJECT | DIN | PART | BSS | PART | OTHER | REMARKS |
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| | (CONT 7) | | | | | | |
| 920 | STEEL PLATE, SHEET AND STRIP (CONT 8) | 1624 | | | | | |
| 921 | ELECTROPLATED COATINGS ON THREADS - STANDARD | | | 3382 | 1-6 | | |
| 922 | ELECTROPLATED COATINGS ON THREADS - THICKENED | | | 3382 | 7 | ISO-DIS 4042 | |

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|---|---|---|---|---|---|---|---|
| 923 | ISO METRIC SCREW THREADS | | | 3643 | 1-2 | ISO 68, 261, 724,<br>965/1, 965/3, 262 | |
| 923 | ISO METRIC SCREW THREADS (CONT) | | | | | ISO 1106-3, 7438 | |
| 924 | ISO METRIC PRECISION HEXAGON BOLTS, SCREWS AND NUTS | | | 3692 | | ISO 887 | BS 3692 Obsolescent |
| 925 | METAL WASHERS FOR GENERAL ENGINEERING | | | 4320 | | ASS 2602: 83<br>2603: 83 - ISO/12<br>887 | |
| 926 | STEEL STRUCTURES - PAINTS FOR POLYURETHANE | | | | | | |
| 927 | SHEAR TEST FOR METALS | 50141 | | | | | |
| 928 | WELDED STEEL TANKS FOR OIL STORAGE | | | | | APS 650 | |
| 929 | LIFTING APPLIANCES - OVERHEAD TRAVELLING CRANES | | | | | ISO 7752/5 | |
| 930 | HIGH STRENGTH FRICTION GRIP BOLTS | | | 4325 | | | |
| 931 | ELECTRODES FOR MANUAL ARC WELDING | | | 639 | | BS EN 499 | BS 639 Withdrawn<br>Replaced by BS EN 499 |
| 932 | BLACK CUP COUNTERSUNK BOLTS, SCREWS WITH NUTS | | | 4933 | | | BS 4933 Obsolescent |
| 933 | METAL LATHING | | | 1369 | | | |
| 934 | ROLLED ASPHALT HOT PROCESS FOR ROADS | | | 594 | | | |
| 935 | BINDER DIST. FOR ROAD SURFACE DRESSING | | | 1707 | | | |
| 936 | BITUMINOUS ROOFING FELT | | | 747 | | CP 114: 3 | CP 114:3 Withdrawn |
| 937 | GAS WELDING | | | 2640 | | | |
| 938 | METALLIC COATINGS. HOT DIP GALVANISED COATINGS ON FERROUS MATERIALS | | | | | BS EN 1460 | |
| 939 | METHOD FOR SPECIFYING ELECTROPLATED COATINGS OF ZINC AND | | | 1706 | | | |

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|---|---|---|---|---|---|---|---|
| | CADMIUM ON IRON AND STEEL | | | | | | |
| 940 | DIMENSIONS OF GASKETS FOR PIPE FLANGES TO BS 4504 | | | 4865 | 1 | | Part 1: Non-metallic flat gaskets<br><br>(including gaskets for flanges to BS<br>4722) |
| 941 | BONDING AGENTS FOR USE WITH GYPSUM PLASTERS AND CEMENT | | | 5270 | 1 | | Part 1: Polyvinyl acetate (PVAC) emulsion bonding agents for indoor use with gypsum building plasters |
| 942 | FALSEWORK | | | 5975 | | | |
| 943 | TUBULAR POLYETHYLENE FILM FOR USE AS A PROTECTIVE SLEEVING FOR BURIED IRON PIPES AND FITTINGS | | | 6076 | | | |
| 944 | FLEXIBLE JOINTS FOR GREY OR DUCTILE CAST IRON DRAINPIPES AND FITTINGS (BS 437) AND FOR DISCHARGE AND VIENTILATING PIPES AND FITTINGS (BS 416) | | | 6087 | | | |
| 945 | HOT ROLLED PRODUCTS OF NON-ALLOY STRUCTURAL STEELS | | | 10025 | | | |
| 946 | STAINLESS STEELS | | | 10088 | 2 | | Part 2: Technical delivery conditions for sheet/plate and strip for general purposes |

## 4.1 DIN

| DIN | SRN | DIN | SRN | DIN | SRN | DIN | SRN | DIN | SRN |
|---|---|---|---|---|---|---|---|---|---|
| 105 | 806 | 2000 | 651 | 2988 | 204 | 4279 | 405 | 19630 | 651 |
| 106 | 806 | 2403 | 700 | 2990 | 204 | 4279 | 602 | 19648 | 510 |
| 267 | 914 | 2406 | 701 | 2991 | 204 | 4281 | 845 | 19800 | 401 |
| 278 | 805 | 2410 | 213 | 2993 | 204 | 4325 | 017 | 19850 | 402 |
| 459 | 119 | 2413 | 210 | 2999 | 203 | 4325 | 016 | 19850 | 839 |
| 483 | 855 | 2413 | 228 | 2999 | 823 | 7572 | 832 | 19850 | 860 |
| 488 | 128 | 2425 | 708 | 3202 | 502 | 7865 | 138 | 22418 | 036 |
| 488 | 127 | 2425 | 651 | 3202 | 505 | 8061 | 305 | 28500 | 201 |
| 488 | 126 | 2429 | 701 | 3202 | 501 | 8061 | 314 | 28500 | 200 |
| 488 | 125 | 2440 | 203 | 3221 | 509 | 8061 | 313 | 28601 | 217 |
| 1025 | 905 | 2440 | 823 | 3230 | 501 | 8062 | 300 | 28602 | 218 |
| 1025 | 913 | 2441 | 203 | 3352 | 501 | 8062 | 305 | 28603 | 219 |
| 1045 | 108 | 2441 | 823 | 3352 | 502 | 8063 | 301 | 30670 | 227 |
| 1045 | 107 | 2442 | 203 | 3352 | 511 | 8072 | 825 | 30671 | 215 |
| 1045 | 110 | 2442 | 823 | 3354 | 506 | 8073 | 825 | 30672 | 221 |
| 1045 | 120 | 2444 | 225 | 3356 | 504 | 8074 | 825 | 30673 | 214 |
| 1045 | 111 | 2448 | 213 | 3357 | 514 | 8075 | 825 | 30673 | 908 |
| 1045 | 113 | 2458 | 213 | 3441 | 515 | 8528 | 919 | 30674 | 220 |
| 1045 | 112 | 2460 | 210 | 3620 | 847 | 8553 | 919 | 40050 | 012 |
| 1048 | 116 | 2460 | 213 | 4030 | 114 | 855 | 919 | 40050 | 030 |
| 1048 | 117 | 2460 | 824 | 4032 | 407 | 8564 | 600 | 42021 | 001 |
| 1060 | 801 | 2500 | 207 | 4032 | 409 | 8565 | 220 | 42673 | 010 |
| 1084 | 115 | 2501 | 207 | 4033 | 655 | 1045 | 100 | 42673 | 011 |
| 1084 | 121 | 2505 | 216 | 4034 | 854 | 16450 | 301 | 42961 | 029 |

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| 1084 | 133 | 2519 | 207 | 4035 | 409 | 16451 | 301 | 46062 | 008 |
| 1101 | 815 | 2526 | 207 | 4035 | 408 | 16922 | 814 | 46062 | 013 |
| 1102 | 815 | 2559 | 210 | 4046 | 651 | 16928 | 302 | 50019 | 709 |
| 1164 | 103 | 2566 | 207 | 4060 | 222 | 16963 | 307 | 50120 | 600 |
| 1164 | 106 | 2605 | 226 | 4078 | 811 | 16970 | 304 | 50120 | 919 |
| 1164 | 105 | 2615 | 226 | 4085 | 667 | 18101 | 817 | 50141 | 927 |
| 1164 | 104 | 2615 | 216 | 4124 | 654 | 18195 | 668 | 50976 | 903 |
| 1187 | 862 | 2616 | 226 | 4126 | 145 | 18196 | 601 | 52128 | 856 |
| 1199 | 849 | 2616 | 216 | 4226 | 109 | 18196 | 650 | 52129 | 856 |
| 1211 | 845 | 2617 | 216 | 4226 | 110 | 18203 | 657 | 52130 | 856 |
| 1212 | 845 | 2617 | 226 | 4226 | 108 | 18301 | 822 | 53255 | 818 |
| 1229 | 846 | 2632 | 207 | 4226 | 107 | 18307 | 650 | 55928 | 900 |
| 1230 | 414 | 2633 | 207 | 4226 | 130 | 18330 | 656 | 55928 | 917 |
| 1249 | 822 | 2673 | 207 | 4226 | 111 | 18540 | 812 | 57207 | 024 |
| 1381 | 833 | 2693 | 208 | 4226 | 136 | 19522 | 829 | 57660 | 027 |
| 1387 | 833 | 2695 | 208 | 4226 | 114 | 19532 | 300 | 57670 | 020 |
| 1614 | 920 | 2696 | 208 | 4226 | 113 | 19532 | 305 | 68705 | 811 |
| 1623 | 920 | 2697 | 208 | 4226 | 112 | 19533 | 825 | 68706 | 817 |
| 1624 | 920 | 2873 | 221 | 4226 | 135 | 19593 | 846 | 68761 | 813 |
| 1626 | 213 | 2950 | 209 | 4235 | 132 | 19594 | 846 | 68763 | 813 |
| 1629 | 213 | 2980 | 204 | 4271 | 846 | 19596 | 846 | 68764 | 813 |
| 1754 | 205 | 2986 | 203 | 4279 | 202 | 19597 | 846 | 68791 | 131 |
| 1986 | 652 | 2987 | 204 | 4279 | 303 | 19630 | 653 | 68792 | 131 |
| | | | | | | | | | |

## 4.2 BSS

| BSS | SRN | BSS | SRN | BSS | SRN | BSS | SRN | BSS | SRN |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 913 | 1188 | 835 | 2494 | 308 | 4466 | 129 | 5486 | 020 |
| 12 | 103 | 1189 | 831 | 2499 | 137 | 4483 | 128 | 5493 | 900 |
| 12 | 106 | 1192 | 703 | 2439 | 122 | 4504 | 207 | 5493 | 908 |
| 12 | 105 | 1192 | 704 | 2569 | 900 | 4514 | 862 | 5493 | 917 |
| 21 | 203 | 5911 | 410 | 2640 | 937 | 6811 | 012 | 5506 | 835 |
| 21 | 223 | 1199 | 130 | 2757 | 023 | 4550 | 603 | 5514 | 021 |
| 21 | 823 | 1199 | 136 | 2871 | 206 | 4568 | 052 | 5626 | 045 |
| 5685 | 014 | 1200 | 135 | 2871 | 205 | 4592 | 850 | 5642 | 142 |
| 65 | 414 | 1203 | 818 | 3148 | 114 | 4607 | 054 | 5669 | 813 |
| 78 (4772) | 224 | 1211 (4772) | 200 | 3284 (6811) | 307 | 4622 | 200 | 5685 | 015 |
| 143 | 824 | 1212 | 508 | 3382 | 921 | 4624 | 401 | 5728 | 510 |
| 144 | 872 | 1212 | 827 | 3382 | 922 | 4624 | 858 | 5834 | 513 |
| 159 | 053 | 1217 | 871 | 3402 | 875 | 4625 | 408 | 5856 | 009 |
| 308 | 705 | 1243 | 857 | 3416 | 904 | 4652 | 901 | 5886 | 405 |
| 336 | 512 | 1244 | 836 | 3444 | 810 | 4660 | 309 | 5911 | 407 |
| 368 | 859 | 1247 | 845 | 3505 | 311 | 4670 | 938 | 5911 | 409 |
| 410 | 146 | 1254 | 834 | 3505 | 310 | 4800 | 902 | 5911 | 413 |
| 416 | 829 | 1256 | 824 | 3505 | 300 | 4870 | 670 | 5911 | 854 |
| 417 | 830 | 1363 | 059 | 3505 | 305 | 4871 | 671 | 5927 | 404 |
| 437 | 844 | 1369 | 933 | 3505 | 312 | 4999 | 030 | 5930 | 650 |
| 437 | 842 | 1377 | 601 | 3506 | 305 | 4999 | 033 | 5977 | 861 |
| 459 | 817 | 1387 | 203 | 3535 | 028 | 4999 | 034 | 6004 | 055 |
| 499 | 919 | 1362 | 060 | 3600 | 213 | 4999 | 031 | 6072 | 600 |
| 534 | 210 | 1387 | 823 | 3600 | 228 | 4999 | 010 | 6073 | 804 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 534 | 212 | 1438 | 870 | 3601 | 213 | 4999 | 029 | 6100 | 707 |
| 569 | 860 | 1449 | 920 | 3643 | 923 | 4999 | 025 | 6100 | 750 |
| 594 | 934 | 1521 | 124 | 3656 | 839 | 5000 | 011 | 6180 | 864 |
| 604 | 150 | 1521 | 856 | 3676 | 058 | 5000 | 022 | 6231 | 041 |
| 690 | 807 | 1553 | 701 | 3680 | 661 | 5000 | 036 | 6263 | 868 |
| 729 | 903 | 1554 | 229 | 3690 | 866 | 5000 | 035 | 6282 | 505 |
| 743 | 803 | 1564 | 909 | 3692 | 924 | 5000 | 050 | 6297 | 659 |
| 747 | 936 | 1579 | 820 | 3889 | 600 | 5041 | 517 | 6316 | 660 |
| 750 | 509 | 1707 | 935 | 3921 | 805 | 5070 | 706 | 6346 | 024 |
| 775 | 061 | 1722 | 849 | 3921 | 806 | 5075 | 149 | 6367 | 664 |
| 812 | 107 | 1740 | 204 | 3941 | 003 | 5135 | 919 | 6398 | 804 |
| 812 | 112 | 1740 | 824 | 3943 | 873 | 5150 | 502 | 6431 | 802 |
| 812 | 113 | 1881 | 139 | 3988 | 063 | 5151 | 503 | 6464 | 317 |
| 842 | 005 | 1881 | 140 | 3974 | 406 | 5152 | 504 | 6500 | 056 |
| 882 | 108 | 1881 | 141 | 4027 | 104 | 5153 | 505 | 6510 | 821 |
| 882 | 109 | 1881 | 116 | 4147 | 214 | 5154 | 511 | 6626 | 037 |
| 882 | 110 | 1881 | 117 | 4147 | 908 | 5163 | 501 | 6722 | 915 |
| 882 | 111 | 1924 | 673 | 4211 | 847 | 5212 | 879 | 6746 | 024 |
| 890 | 801 | 1968 | 874 | 4248 | 148 | 5311 | 004 | 6925 | 851 |
| 952 | 822 | 2011 | 042 | 4293 | 006 | 5316 | 016 | 8007 | 102 |
| 1010 | 826 | 2048 | 001 | 4320 | 925 | 5316 | 017 | 8010 | 316 |
| 1010 | 832 | 2494 | 318 | 4335 | 702 | 5328 | 100 | 8110 | 101 |
| 1105 | 815 | 2521 | 877 | 4346 | 301 | 5328 | 115 | 8110 | 143 |
| 1142 | 809 | 2456 | 828 | 4395 | 930 | 8007 | 138 | | |
| 1186 | 816 | 2494 | 222 | 4449 | 126 | 5419 | 007 | | |
| | | | | | | | | | |

## 4.3 OTHER STANDARDS

| OTHER STANDARDS | SRN | OTHER STANDARDS | SRN |
|---|---|---|---|
| AAS 2602:83, 2603:03 | 926 | ISO 2035, 2044 | 301 |
| AGMA 5T 510 | 907 | ISO 2045, 2048, 2536 | 301 |
| ANSI A10 9-1983 | 663 | ISO 2063 | 900 |
| AP15LS | 234 | ISO 2505, 3114, 3472, 3473, 3474 | 315 |
| APS 650 | 928 | ISO 2531 | 202 |
| AS 2813-85 | 867 | ISO 2531 | 207 |
| ASTM A 47-77 | 911 | ISO 2548 ICE 198 | 016 |
| ASTM A 48, No. 308 | 916 | ISO 272, 4759-1, 3 | 914 |
| AWWA C. 508-82 | 505 | ISO 3046, PARTS 1, 2 | 021 |
| AWWA C.104A, C602-76 | 211 | ISO 3114, 3606 | 300 |
| AWWA C.200-75 | 210 | ISO 3127 | 310 |
| AWWA C.200-75 | 230 | ISO 4042 | 922 |
| AWWA C.203-78 | 221 | ISO 4179, 6600, DVGW W342 | 211 |
| AWWA C.205 DVGW-W-342-71 | 212 | ISO 4200 | 228 |
| AWWA C.214-83 | 232 | ISO 4633 | 222 |
| AWWA C.602-83 | 212 | ISO 49 | 209 |
| AWWA C.602-89 | 413 | ISO 7/2 | 203 |
| CP 1004 | 062 | ISO 7005/2, 3 | 207 |
| CP 112, 2 | 666 | ISO 7-1/2 | 223 |
| CP 2004 | 665 | ISO 7186 | 411 |
| CP 2005 | 658 | ISO 7194 | 662 |
| CP 301 | 652 | ISO 7268 | 231 |
| CP 310 | 651 | ISO 752 | 918 |
| CP 312 | 302 | ISO 7751 | 412 |

| | | | |
|---|---|---|---|
| CP 499 | 848 | ISO 7752/5 | 929 |
| IEC 60072 | 011 | ISO 8493 | 205 |
| IEC 60072, 72A | 010 | ISO 881 | 402 |
| IEC 600805 | 046 | ISO 885, 888 | 914 |
| IEC 600827 | 048 | ISO 887 | 925 |
| IEC 60085 | 023 | ISO 898/2, 898/1 | 914 |
| IEE W. REGS ($15^{TH}$ EDITION) | 018 | ISO 965/3, 262 | 923 |
| ISO 1106-3, 7438 | 924 | ISO DIS 4042 | 921 |
| ISO 1167 | 306 | KENYA M.O.W. STANDARD SPEC. | 804 |
| ISO 128, 2162, 2203, 5455, 5457 | 705 | KS 04-290 | 049 |
| ISO 13 | 200 | KS 05-459:5 | 606 |
| ISO 160 | 401 | KS 06-149:2 | 300 |
| ISO 161/1 | 300 | KS 06-248 1, 2 | 510 |
| ISO 161-1 | 825 | VDB 2 | 101 |
| ISO 185 | 906 | VDB PART C | 902 |
| ISO 1920, 4012, 4108, 4013 | 117 | VDMA 6280 | 035 |
| ISO 196 (TESTS) | 206 | | |
| | | | |

# REPUBLIC OF KENYA

**MURANGA SOUTH WATER AND SANITATION COMPANY LTD**

MURANG'A SOUTH WATER AND SANITATION LTD.
Quality Water Through Quality Services

**TENDER No. : MUSWASCO/KWASH/26-27/01**

# CONSTRUCTION WORKS FOR MURANGA SOUTH WATER SUPPLY PROJECT

## ANNEXURE NO. 2: BOOKS OF DRAWINGS

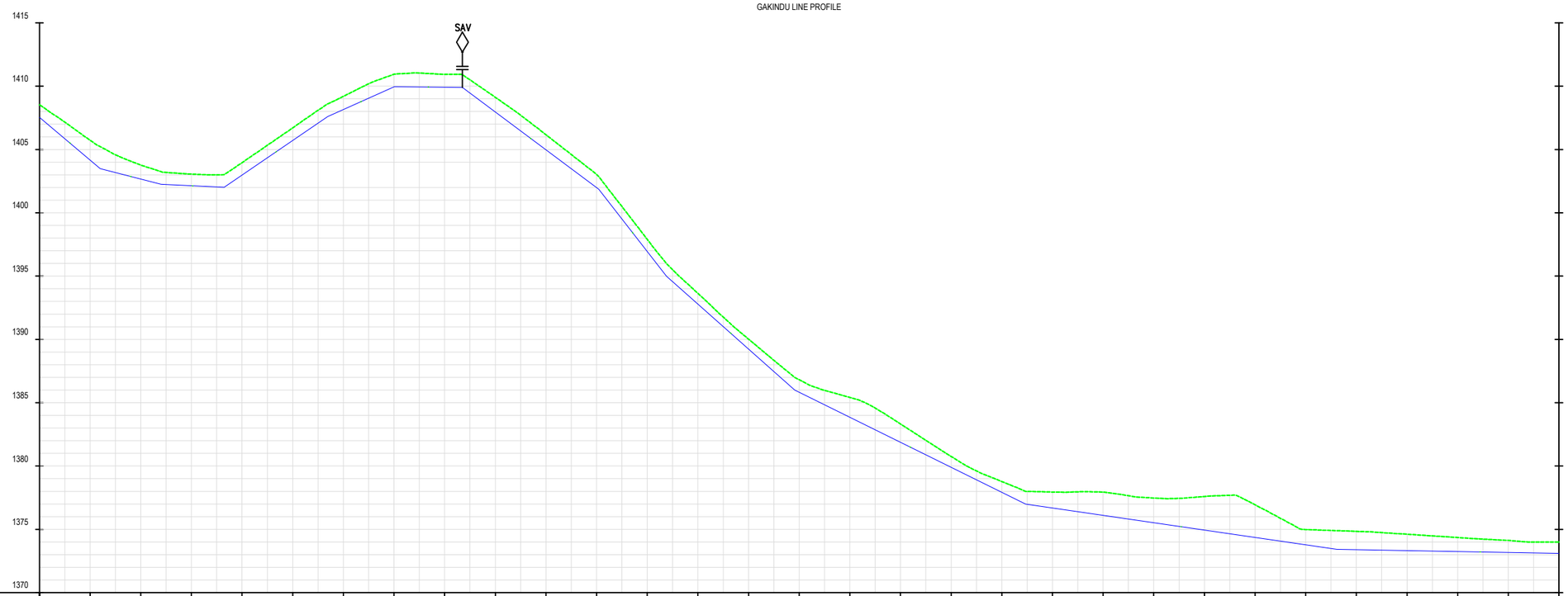
| Sn. | DRAWING NO. | DESCRIPTION | REMARKS |
|---|---|---|---|
| 1 | PLANS & PROFILES | | |
| | | **MURANGA SOUTH WATER PIPELINES** | |
| | | MURANGA DL DRAWING-MURANGA PHASE TWO LAYOUT | |
| | | MURANGA DL DRAWING-MURANGA PHASE TWO LAYOUT | |
| | | MURANGA DL DRAWING-MURANGA PHASE TWO LAYOUT | |
| | | MURANGA DL DRAWING-MURANGA PHASE TWO LAYOUT | |
| | | MURANGA DL DRAWING-MURANGA PHASE TWO LAYOUT | |
| 1 | MURANGA SOUTH/PLAN &PROFILE/01 | MURANGA SOUTH DRAWING- GAKINDU LINE (1) | SHEET 1 OF 53 |
| 2 | MURANGA SOUTH/PLAN &PROFILE/02 | MURANGA SOUTH DRAWING- GAKINDU LINE (2) | SHEET 2 OF 53 |
| 3 | MURANGA SOUTH/PLAN &PROFILE/03 | MURANGA SOUTH DRAWING- GAKINDU 1 LINE | SHEET 3 OF 53 |
| 4 | MURANGA SOUTH/PLAN &PROFILE/04 | MURANGA SOUTH DRAWING- GITHUTHU- INI A (1) | SHEET 4 OF 53 |
| 5 | MURANGA SOUTH/PLAN &PROFILE/05 | MURANGA SOUTH DRAWING- GITHUTHU- INI A (2) | SHEET 5 OF 53 |
| 6 | MURANGA SOUTH/PLAN &PROFILE/06 | MURANGA SOUTH DRAWING- GITHUTHU- INI B (1) | SHEET 6 OF 53 |
| 7 | MURANGA SOUTH/PLAN &PROFILE/07 | MURANGA SOUTH DRAWING- GITHUTHU- INI B (2) | SHEET 7 OF 53 |
| 8 | MURANGA SOUTH/PLAN &PROFILE/08 | MURANGA SOUTH DRAWING- GITIRI KAWENDO OD 90MM (1) | SHEET 8 OF 53 |
| 9 | MURANGA SOUTH/PLAN &PROFILE/09 | MURANGA SOUTH DRAWING- GITIRI KAWENDO OD 90MM (2) | SHEET 9 OF 53 |
| 10 | MURANGA SOUTH/PLAN &PROFILE/10 | MURANGA SOUTH DRAWING- GITIRI KAWENDO OD 90MM (3) | SHEET 10 OF 53 |
| 11 | MURANGA SOUTH/PLAN &PROFILE/11 | MURANGA SOUTH DRAWING- GITIRI KAWENDO OD 90MM (4) | SHEET 11 OF 53 |
| 12 | MURANGA SOUTH/PLAN &PROFILE/12 | MURANGA SOUTH DRAWING- GITIRI KAWENDO OD 90MM (5) | SHEET 12 OF 53 |
| 13 | MURANGA SOUTH/PLAN &PROFILE/13 | MURANGA SOUTH DRAWING- GITIRI KAWENDO OD 90MM (6) | SHEET 13 OF 53 |
| 14 | MURANGA SOUTH/PLAN &PROFILE/14 | MURANGA SOUTH DRAWING- GITIRI KAWENDO OD 90MM (7) | SHEET 14 OF 53 |
| 15 | MURANGA SOUTH/PLAN &PROFILE/15 | MURANGA SOUTH DRAWING- GOLDEN A OD 63MM | SHEET 15 OF 53 |
| 16 | MURANGA SOUTH/PLAN &PROFILE/16 | MURANGA SOUTH DRAWING- KAHUHO BAPTIST (1) | SHEET 16 OF 53 |
| 17 | MURANGA SOUTH/PLAN &PROFILE/17 | MURANGA SOUTH DRAWING- KAHUHO BAPTIST (2) | SHEET 17 OF 53 |
| 18 | MURANGA SOUTH/PLAN &PROFILE/18 | MURANGA SOUTH DRAWING- KAHUHO BAPTIST (3) | SHEET 18 OF 53 |
| 19 | MURANGA SOUTH/PLAN &PROFILE/19 | MURANGA SOUTH DRAWING- KAHUHO BAPTIST B | SHEET 19 OF 53 |
| 20 | MURANGA SOUTH/PLAN &PROFILE/20 | MURANGA SOUTH DRAWING- KAHUHO LINE | SHEET 20 OF 53 |
| 21 | MURANGA SOUTH/PLAN &PROFILE/21 | MURANGA SOUTH DRAWING- KAMUNGU LINE (1) | SHEET 21 OF 53 |
| 22 | MURANGA SOUTH/PLAN &PROFILE/22 | MURANGA SOUTH DRAWING- KAMUNGU LINE (2) | SHEET 22 OF 53 |
| 23 | MURANGA SOUTH/PLAN &PROFILE/23 | MURANGA SOUTH DRAWING- KAMUNGU LINE (3) | SHEET 23 OF 53 |
| 24 | MURANGA SOUTH/PLAN &PROFILE/24 | MURANGA SOUTH DRAWING- KAMUNGU LINE (4) | SHEET 24 OF 53 |
| 25 | MURANGA SOUTH/PLAN &PROFILE/25 | MURANGA SOUTH DRAWING- KANDANI (1) | SHEET 25 OF 53 |
| 26 | MURANGA SOUTH/PLAN &PROFILE/26 | MURANGA SOUTH DRAWING- KANDANI (2) | SHEET 26 OF 53 |
| 27 | MURANGA SOUTH/PLAN &PROFILE/27 | MURANGA SOUTH DRAWING-KANDANI DIST 1 | SHEET 27 OF 53 |
| 28 | MURANGA SOUTH/PLAN &PROFILE/28 | MURANGA SOUTH DRAWING- KANDANI DIST 2 | SHEET 28 OF 53 |

| | | | |
|---|---|---|---|
| 29 | MURANGA SOUTH/PLAN &PROFILE/29 | MURANGA SOUTH DRAWING-KANDIRI- NGURW…I OD 110MM (1) | SHEET 29 OF 53 |
| 30 | MURANGA SOUTH/PLAN &PROFILE/30 | MURANGA SOUTH DRAWING- KANDIRI- NGURW…I OD 110MM (2) | SHEET 30 OF 53 |
| 31 | MURANGA SOUTH/PLAN &PROFILE/31 | MURANGA SOUTH DRAWING- KANDIRI- NGURW…I OD 110MM (3) | SHEET 31 OF 53 |
| 32 | MURANGA SOUTH/PLAN &PROFILE/32 | MURANGA SOUTH DRAWING- KANDIRI- NGURW…I OD 110MM (4) | SHEET 32 OF 53 |
| 33 | MURANGA SOUTH/PLAN &PROFILE/33 | MURANGA SOUTH DRAWING- KANDIRI- NGURW…I OD 110MM (5) | SHEET 33 OF 53 |
| 34 | MURANGA SOUTH/PLAN &PROFILE/34 | MURANGA SOUTH DRAWING- KANDIRI- NGURW…I OD 110MM (6) | SHEET 34 OF 53 |
| 35 | MURANGA SOUTH/PLAN &PROFILE/35 | MURANGA SOUTH DRAWING- KANDIRI- NGURW…I OD 110MM (7) | SHEET 35 OF 53 |
| 36 | MURANGA SOUTH/PLAN &PROFILE/36 | MURANGA SOUTH DRAWING- KANDIRI- NGURW…I OD 110MM (8) | SHEET 36 OF 53 |
| 37 | MURANGA SOUTH/PLAN &PROFILE/37 | MURANGA SOUTH DRAWING-KARIGUINI OD 90MM (1) | SHEET 37 OF 53 |
| 38 | MURANGA SOUTH/PLAN &PROFILE/38 | MURANGA SOUTH DRAWING- KARIGUINI OD 90MM (2) | SHEET 38 OF 53 |
| 39 | MURANGA SOUTH/PLAN &PROFILE/39 | MURANGA SOUTH DRAWING- KAWAIRITI LINE (1) | SHEET 39 OF 53 |
| 40 | MURANGA SOUTH/PLAN &PROFILE/40 | MURANGA SOUTH DRAWING- KAWAIRITI LINE (2) | SHEET 40 OF 53 |
| 41 | MURANGA SOUTH/PLAN &PROFILE/41 | MURANGA SOUTH DRAWING- KIANDUBI NJIRI OD 63MM (1) | SHEET 41 OF 53 |
| 42 | MURANGA SOUTH/PLAN &PROFILE/42 | MURANGA SOUTH DRAWING- KIANDUBI NJIRI OD 63 (2) | SHEET 42 OF 53 |
| 43 | MURANGA SOUTH/PLAN &PROFILE/43 | MURANGA SOUTH DRAWING- KIHORWE (1) | SHEET 43 OF 53 |
| 44 | MURANGA SOUTH/PLAN &PROFILE/44 | MURANGA SOUTH DRAWING- KIHORWE (2) | SHEET 44 OF 53 |
| 45 | MURANGA SOUTH/PLAN &PROFILE/45 | MURANGA SOUTH DRAWING- MWEMA LINE (1) | SHEET 45 OF 53 |
| 46 | MURANGA SOUTH/PLAN &PROFILE/46 | MURANGA SOUTH DRAWING- MWEMA LINE (2) | SHEET 46 OF 53 |
| 47 | MURANGA SOUTH/PLAN &PROFILE/47 | MURANGA SOUTH DRAWING- MWEMA LINE (3) | SHEET 47 OF 53 |
| 48 | MURANGA SOUTH/PLAN &PROFILE/48 | MURANGA SOUTH DRAWING- MWEMA LINE (4) | SHEET 48 OF 53 |
| 49 | MURANGA SOUTH/PLAN &PROFILE/49 | MURANGA SOUTH DRAWING- MWEMA LINE (5) | SHEET 49 OF 53 |
| 50 | MURANGA SOUTH/PLAN &PROFILE/50 | MURANGA SOUTH DRAWING- MWEMA LINE (6) | SHEET 50 OF 53 |
| 51 | MURANGA SOUTH/PLAN &PROFILE/51 | MURANGA SOUTH DRAWING- NJIRIS KIANDUBI OD 50MM | SHEET 51 OF 53 |
| 52 | MURANGA SOUTH/PLAN &PROFILE/52 | MURANGA SOUTH DRAWING- PENKA LINE (1) | SHEET 52 OF 53 |
| 53 | MURANGA SOUTH/PLAN &PROFILE/53 | MURANGA SOUTH DRAWING- PENKA LINE (1) | SHEET 53 OF 53 |




## PLAN
SCALE 1:1000

GAKINDU LINE PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1408.54 | 1405.73 | 1403.77 | 1403.06 | 1403.96 | 1406.71 | 1409.19 | 1410.94 | 1410.93 | 1409.12 | 1406.17 | 1403.04 | 1397.90 | 1393.64 | 1390.03 | 1386.82 | 1385.42 | 1383.33 | 1380.75 | 1378.77 | 1377.94 | 1377.94 | 1377.47 | 1377.59 | 1376.94 | 1374.98 | 1374.84 | 1374.61 | 1374.35 | 1374.13 | 1374.00 |
| INVERT LEVELS (mASL) | | 1404.17 | 1402.66 | 1402.13 | 1402.98 | 1405.71 | 1408.16 | 1409.94 | 1409.91 | 1407.96 | 1404.97 | 1401.98 | 1396.94 | 1392.79 | 1389.24 | 1385.83 | 1383.85 | 1381.88 | 1379.90 | 1377.93 | 1376.69 | 1376.11 | 1375.53 | 1374.94 | 1374.36 | 1373.78 | 1373.39 | 1373.32 | 1373.25 | 1373.18 | 1373.10 |
| EXCAVATION DEPTH (m) | | 1.57 | 1.11 | 0.93 | 0.98 | 0.99 | 1.04 | 1.00 | 1.02 | 1.17 | 1.19 | 1.05 | 0.96 | 0.85 | 0.79 | 0.99 | 1.57 | 1.45 | 0.85 | 0.84 | 1.25 | 1.83 | 1.95 | 2.65 | 2.58 | 1.21 | 1.45 | 1.30 | 1.11 | 0.95 | 0.90 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -16.87% | -5.18% | -0.95% | 13.68% | 8.93% | -0.18% | -14.94% | -25.68% | -17.75% | -9.87% | -2.92% | -0.36% | | | | | | | | | | | | | | | | | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

GAKINDU WATER PIPELINE

PLAN AND PROFILE

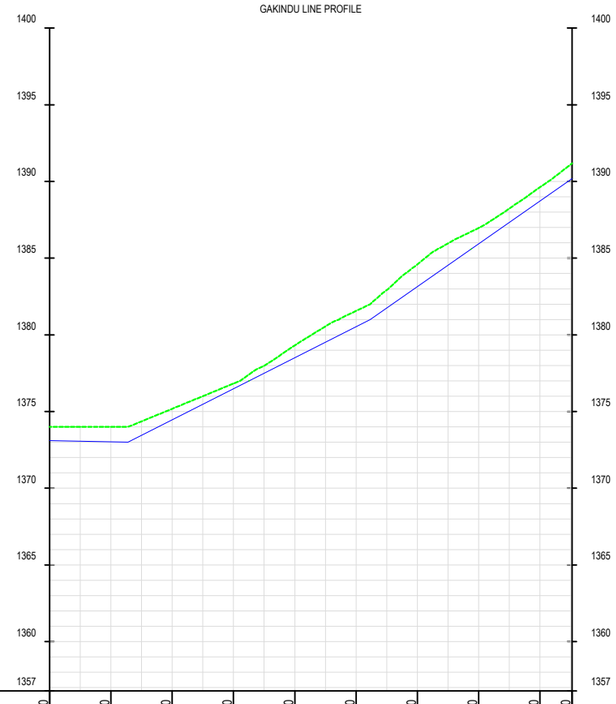
SHEET 1 OF 53

| | | | |
|---|---|---|---|
| Designed by JMM | | Drawn by ENN | |
| Checked by JMM | | Approved by | |
| Scale AS SHOWN (AT A1) | | Date OCTOBER 2026 | |
| Job No. | TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ | |
| A STATUS | DRAWING No. TA-(WSDP)/ | | 0 REV |




## PLAN
SCALE 1:1000

GAKINDU LINE PROFILE




| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+680 | 0+700 | 0+720 | 0+740 | 0+760 | 0+770 |
|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1374.00 | 1374.00 | 1375.18 | 1376.82 | 1379.31 | 1381.56 | 1384.60 | 1386.97 | 1389.62 | 1391.18 |
| INVERT LEVELS (mASL) | 1373.10 | 1373.03 | 1374.47 | 1376.49 | 1378.51 | 1380.53 | 1383.15 | 1385.94 | 1388.73 | 1390.18 |
| EXCAVATION DEPTH (m) | 0.90 | 0.97 | 0.71 | 0.33 | 0.79 | 1.03 | 1.45 | 1.03 | 0.89 | 1.00 |
| DESIGN FLOW ($m^3$/day) | DESIGN FLOW | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50MM | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | |
| SLOPE (%) | -0.36% | | 10.11% | | | | 13.95% | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES
1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:
- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
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| D | | BY | | | |
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| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
GAKINDU WATER PIPELINE
PLAN AND PROFILE
SHEET 2 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

GAKINDU 1 LINE PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+527 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1374.96 | 1374.90 | 1374.58 | 1374.23 | 1374.00 | 1374.00 | 1374.00 | 1374.00 | 1374.00 | 1374.21 | 1374.68 | 1374.89 | 1373.98 | 1373.64 | 1373.11 | 1372.53 | 1371.89 | 1371.13 | 1370.10 | 1369.37 | 1369.21 | 1370.17 | 1371.83 | 1372.57 | 1373.50 | 1374.40 | 1373.74 | 1372.97 |
| INVERT LEVELS (mASL) | 1373.96 | 1373.68 | 1373.39 | 1373.11 | 1372.98 | 1372.94 | 1372.90 | 1372.86 | 1372.83 | 1372.79 | 1372.75 | 1372.71 | 1372.67 | 1372.64 | 1371.99 | 1371.25 | 1370.52 | 1369.78 | 1369.04 | 1368.44 | 1368.34 | 1369.14 | 1370.64 | 1371.77 | 1372.47 | 1373.16 | 1372.63 | 1371.97 |
| EXCAVATION DEPTH (m) | 1.00 | 1.23 | 1.19 | 1.12 | 1.02 | 1.06 | 1.10 | 1.14 | 1.17 | 1.42 | 1.93 | 2.17 | 1.30 | 1.01 | 1.11 | 1.27 | 1.37 | 1.35 | 1.06 | 0.93 | 0.87 | 1.02 | 1.19 | 0.80 | 1.03 | 1.24 | 1.11 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 32MM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -1.40% | | | -0.19% | | | | | | | | | | | -3.69% | | | | -0.46% | | 7.46% | | | | 3.48% | | | -8.83% |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
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CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

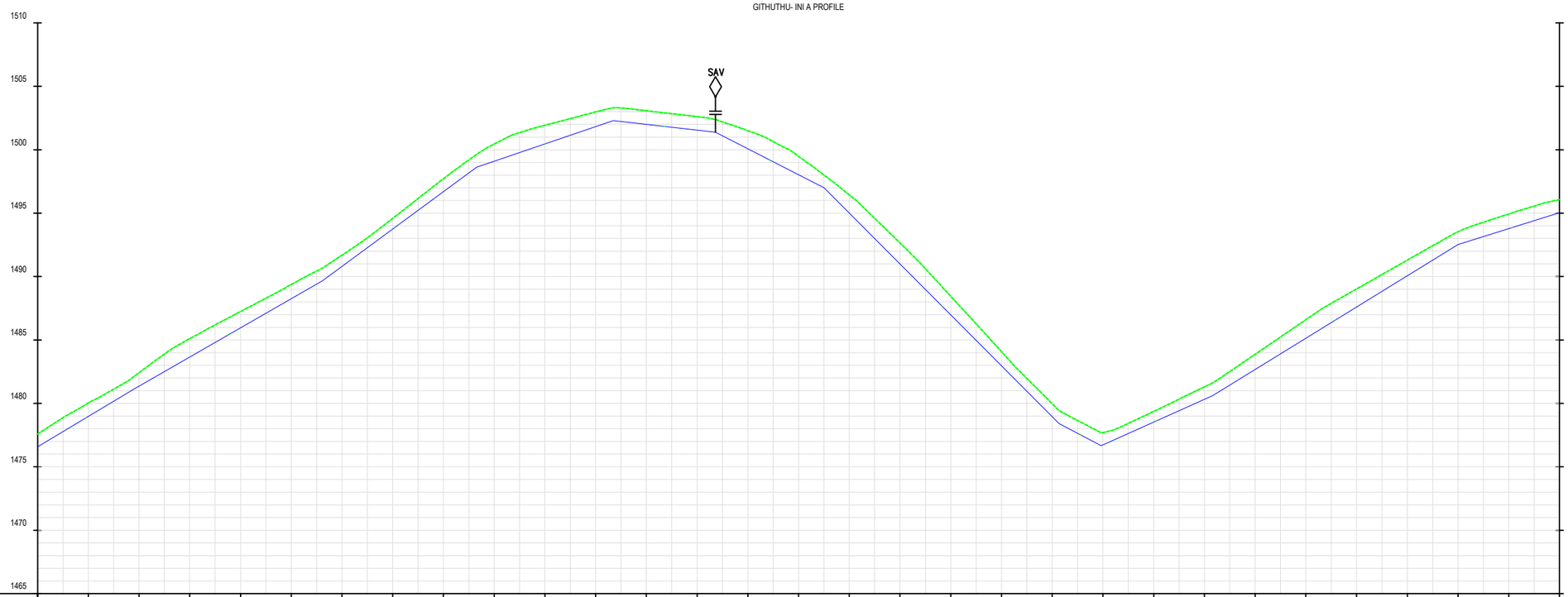
Drawing Title
GAKINDU 1 WATER PIPELINE
PLAN AND PROFILE
SHEET 3 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

GITHUTHU- INI A PROFILE




| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
| GROUND LEVELS (mASL) | 1477.57 | 1480.04 | 1482.42 | 1485.11 | 1487.24 | 1489.37 | 1491.69 | 1494.59 | 1497.72 | 1500.45 | 1501.93 | 1502.98 | 1503.07 | 1502.61 | 1501.51 | 1499.48 | 1496.44 | 1492.65 | 1488.45 | 1484.08 | 1479.98 | 1477.70 | 1479.36 | 1481.30 | 1483.87 | 1486.60 | 1489.02 | 1491.30 | 1493.53 | 1494.94 | 1496.07 |
| INVERT LEVELS (mASL) | 1476.57 | 1478.97 | 1481.36 | 1483.66 | 1485.95 | 1488.25 | 1490.80 | 1493.75 | 1496.70 | 1499.10 | 1500.46 | 1501.82 | 1502.00 | 1501.55 | 1500.08 | 1498.03 | 1495.01 | 1491.00 | 1486.99 | 1482.98 | 1478.97 | 1476.73 | 1478.52 | 1480.31 | 1482.66 | 1485.13 | 1487.60 | 1490.06 | 1492.53 | 1493.78 | 1495.03 |
| EXCAVATION DEPTH (m) | 1.00 | 1.07 | 1.07 | 1.45 | 1.29 | 1.12 | 0.89 | 0.84 | 1.02 | 1.35 | 1.47 | 1.16 | 1.08 | 1.06 | 1.43 | 1.45 | 1.44 | 1.65 | 1.46 | 1.11 | 1.02 | 0.97 | 0.84 | 0.99 | 1.21 | 1.47 | 1.43 | 1.23 | 1.00 | 1.15 | 1.04 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 32MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 11.99% | | | 11.49% | | | 14.75% | | | 6.81% | | | -2.27% | | | -10.23% | | | -20.05% | | | 10.50% | | 8.94% | | | 12.33% | | | 6.25% | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
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CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
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**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

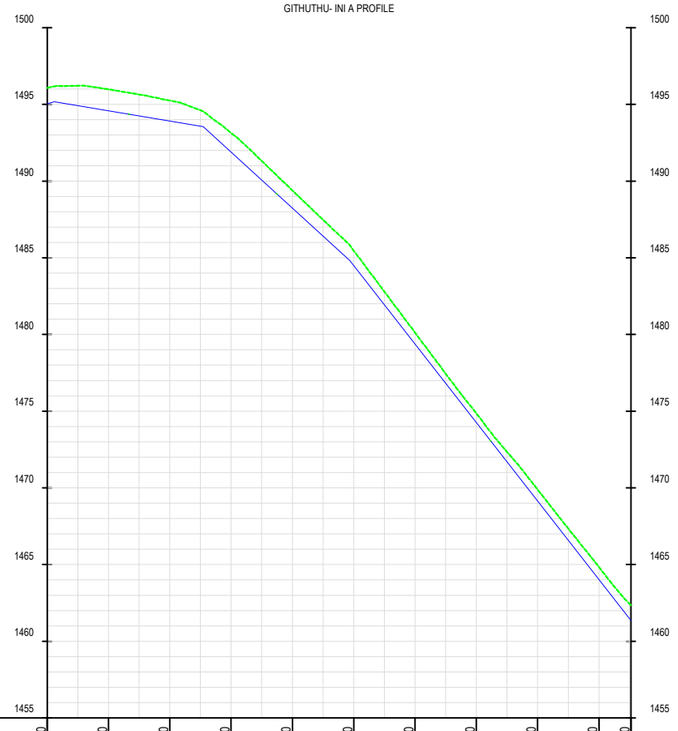
Drawing Title
GITHUTHU- INI A WATER PIPELINE
PLAN AND PROFILE
SHEET 4 OF 53

| | | | |
|---|---|---|---|
| Designed by JMM | | Drawn by ENN | |
| Checked by JMM | | Approved by | |
| Scale AS SHOWN (AT A1) | | Date OCTOBER 2026 | |
| Job No. | TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ | |
| A STATUS | DRAWING No. TA-(WSDP)/ | | 0 REV |




## PLAN
SCALE 1:1000

GITHUTHU- INI A PROFILE




| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+680 | 0+700 | 0+720 | 0+740 | 0+760 | 0+780 | 0+790 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1496.07 | 1495.98 | 1495.25 | 1493.14 | 1488.39 | 1485.47 | 1480.12 | 1474.86 | 1469.89 | 1464.84 | 1462.35 |
| INVERT LEVELS (mASL) | 1495.03 | 1494.58 | 1493.91 | 1491.89 | 1488.23 | 1484.48 | 1479.37 | 1474.25 | 1469.13 | 1464.02 | 1461.35 |
| EXCAVATION DEPTH (m) | 1.04 | 1.40 | 1.33 | 1.24 | 1.15 | 0.98 | 0.76 | 0.60 | 0.75 | 0.82 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 32MM | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | |
| SLOPE (%) | 6.25% | -3.35% | | | -18.29% | | | -25.58% | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
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CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

GITHUTHU- INI A WATER PIPELINE

PLAN AND PROFILE

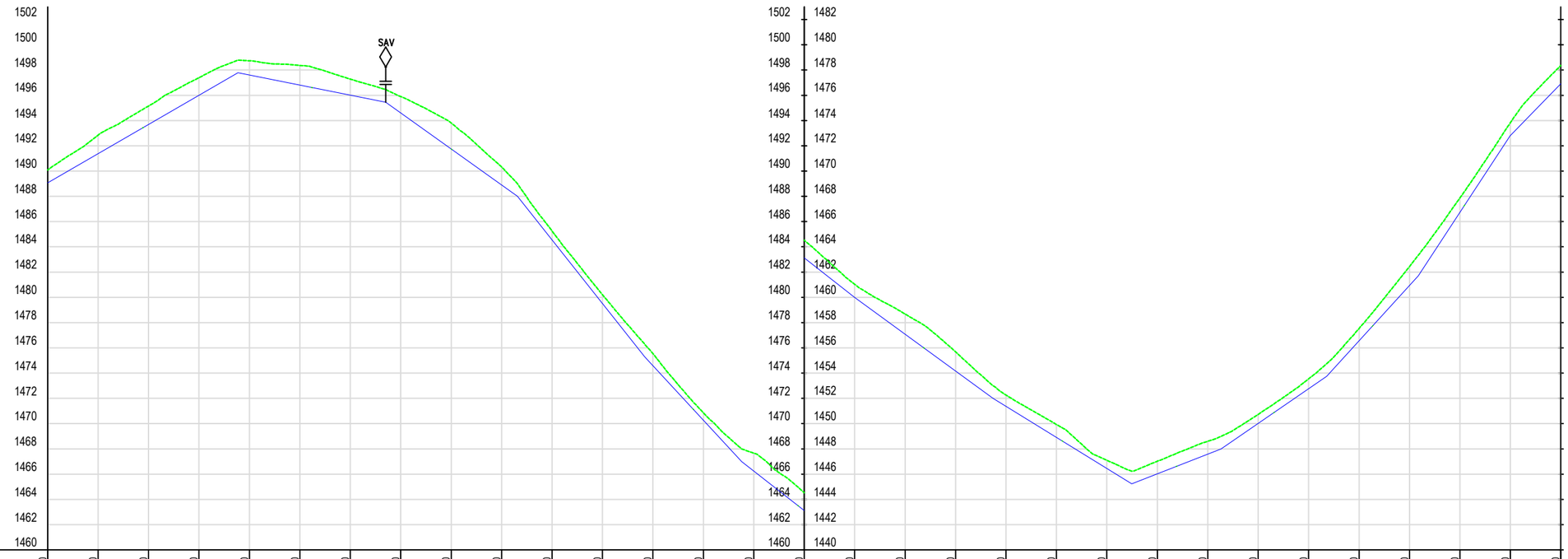
SHEET 5 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

GITHUTHU- INI B PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1490.08 | 1492.85 | 1495.15 | 1497.39 | 1498.74 | 1498.37 | 1497.28 | 1495.90 | 1493.80 | 1490.32 | 1485.26 | 1480.21 | 1475.54 | 1470.86 | 1467.66 | 1464.53 | 1461.03 | 1458.68 | 1455.68 | 1452.27 | 1449.93 | 1447.09 | 1447.02 | 1448.60 | 1450.73 | 1453.55 | 1457.53 | 1462.44 | 1467.88 | 1473.83 | 1478.36 |
| INVERT LEVELS (mASL) | 1489.08 | 1491.38 | 1493.69 | 1496.00 | 1497.60 | 1496.80 | 1496.01 | 1494.60 | 1491.75 | 1488.89 | 1484.54 | 1479.51 | 1474.59 | 1470.27 | 1466.25 | 1463.12 | 1460.00 | 1457.08 | 1454.16 | 1451.36 | 1448.91 | 1446.45 | 1446.03 | 1447.59 | 1450.02 | 1452.77 | 1456.56 | 1460.94 | 1466.74 | 1472.82 | 1476.91 |
| EXCAVATION DEPTH (m) | 1.00 | 1.46 | 1.46 | 1.40 | 1.14 | 1.56 | 1.28 | 1.30 | 2.06 | 1.43 | 0.72 | 0.71 | 0.95 | 0.58 | 1.41 | 1.40 | 1.03 | 1.59 | 1.52 | 0.90 | 1.03 | 0.64 | 1.00 | 1.01 | 0.71 | 0.78 | 0.97 | 1.51 | 1.14 | 1.01 | 1.45 |
| DESIGN FLOW ($m^3$/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 32MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 11.54% | | | -3.98% | | | -14.26% | | | -25.17% | | | -21.57% | | | -15.62% | | | -14.59% | | | -12.28% | | | 7.80% | | | 13.73% | | | 21.89% | | | 30.49% | | | 20.44% | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
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MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

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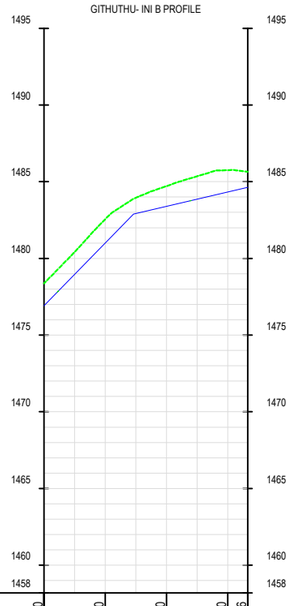
Drawing Title
GITHUTHU- INI B WATER PIPELINE
PLAN AND PROFILE
SHEET 6 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

GITHUTHU- INI B PROFILE




| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+666 |
|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1478.36 | 1482.55 | 1484.71 | 1485.75 | 1485.64 |
| INVERT LEVELS (mASL) | 1476.91 | 1481.00 | 1483.39 | 1484.34 | 1484.64 |
| EXCAVATION DEPTH (m) | 1.45 | 1.55 | 1.32 | 1.42 | 1.00 |
| DESIGN FLOW ($m^3$/day) | DESIGN FLOW | | | | |
| PIPE DETAILS | HDPE OD 32MM | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | |
| SLOPE (%) | 20.44% | 4.72% | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
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| D | | BY | | | |
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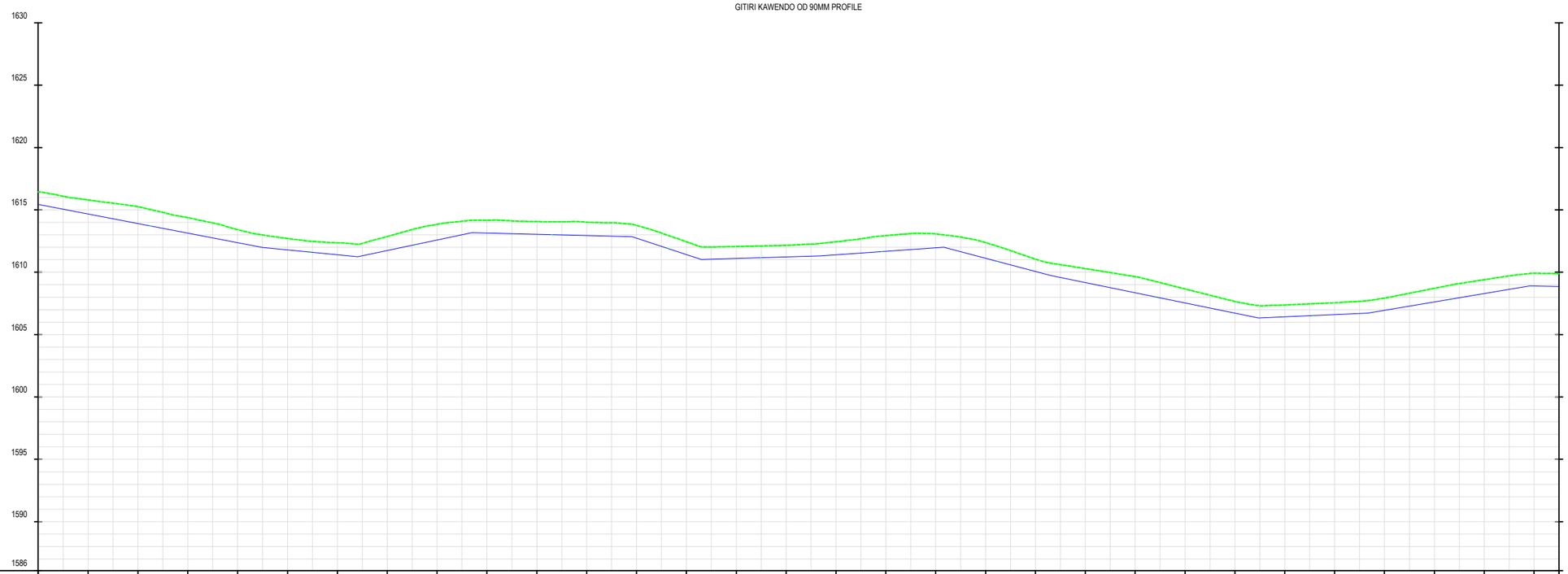
Drawing Title
GITHUTHU- INI B WATER PIPELINE
PLAN AND PROFILE
SHEET 7 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

GITIRI KAWENDO OD 90MM PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 | 0+610 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1616.43 | 1615.80 | 1615.26 | 1614.38 | 1613.41 | 1612.70 | 1612.37 | 1612.87 | 1613.84 | 1614.18 | 1614.07 | 1614.02 | 1613.75 | 1612.44 | 1612.07 | 1612.15 | 1612.44 | 1612.93 | 1613.07 | 1612.37 | 1611.05 | 1610.29 | 1609.65 | 1608.66 | 1607.65 | 1607.37 | 1607.55 | 1607.92 | 1608.71 | 1609.40 | 1609.92 | 1609.89 |
| INVERT LEVELS (mASL) | 1615.43 | 1614.67 | 1613.90 | 1613.14 | 1612.37 | 1611.79 | 1611.40 | 1611.74 | 1612.59 | 1613.15 | 1613.04 | 1612.94 | 1612.73 | 1611.42 | 1611.11 | 1611.23 | 1611.40 | 1611.68 | 1611.95 | 1611.11 | 1610.06 | 1609.16 | 1608.35 | 1607.53 | 1606.72 | 1606.42 | 1606.61 | 1606.95 | 1607.62 | 1608.29 | 1608.89 | 1608.85 |
| EXCAVATION DEPTH (m) | 1.00 | 1.13 | 1.35 | 1.24 | 1.04 | 0.91 | 0.97 | 1.13 | 1.25 | 1.03 | 1.02 | 1.08 | 1.02 | 1.02 | 0.96 | 0.93 | 1.05 | 1.26 | 1.12 | 1.26 | 1.00 | 1.13 | 1.30 | 1.13 | 0.93 | 0.95 | 0.95 | 0.97 | 1.09 | 1.12 | 1.03 | 1.04 |
| DESIGN FLOW ($m^3$/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 90MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -3.82% | | | | | -1.98% | | | 4.24% | | | -0.51% | | | -6.57% | | 0.60% | | | 1.40% | | | -5.29% | | | -4.06% | | | 0.91% | | | 3.34% | | -0.43% |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

GITIRI- KAWENDO WATER PIPELINE

PLAN AND PROFILE

SHEET 8 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

GITIRI KAWENDO OD 90MM PROFILE




| CHAINAGE (Km+m) | 0+610 | 0+620 | 0+640 | 0+660 | 0+680 | 0+700 | 0+720 | 0+740 | 0+760 | 0+780 | 0+800 | 0+820 | 0+840 | 0+860 | 0+880 | 0+900 | 0+920 | 0+940 | 0+960 | 0+980 | 1+000 | 1+020 | 1+040 | 1+060 | 1+080 | 1+100 | 1+120 | 1+140 | 1+160 | 1+180 | 1+200 | 1+220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1609.89 | 1609.86 | 1608.51 | 1606.46 | 1603.97 | 1600.96 | 1598.25 | 1596.35 | 1595.96 | 1595.99 | 1596.96 | 1598.67 | 1600.97 | 1603.35 | 1605.59 | 1607.91 | 1610.04 | 1612.16 | 1614.41 | 1615.56 | 1616.42 | 1616.14 | 1616.01 | 1615.72 | 1615.88 | 1616.55 | 1617.64 | 1618.83 | 1618.86 | 1618.77 | 1619.06 | 1619.76 |
| INVERT LEVELS (mASL) | 1608.85 | 1608.80 | 1607.14 | 1604.68 | 1602.22 | 1599.77 | 1597.40 | 1595.44 | 1595.33 | 1595.22 | 1596.13 | 1598.05 | 1599.97 | 1602.21 | 1604.46 | 1606.71 | 1608.96 | 1611.21 | 1613.38 | 1614.46 | 1615.43 | 1615.33 | 1615.23 | 1615.13 | 1615.04 | 1615.67 | 1616.73 | 1617.80 | 1618.07 | 1618.07 | 1618.07 | 1618.76 |
| EXCAVATION DEPTH (m) | 1.04 | 1.06 | 1.36 | 1.78 | 1.75 | 1.20 | 0.85 | 0.91 | 0.63 | 0.77 | 0.83 | 0.62 | 1.00 | 1.13 | 1.13 | 1.20 | 1.08 | 0.95 | 1.03 | 1.10 | 0.99 | 0.81 | 0.78 | 0.59 | 0.84 | 0.88 | 0.91 | 1.03 | 0.79 | 0.69 | 0.99 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 90MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -0.43% | -12.30% | | | -11.60% | -0.53% | | 9.59% | | | 11.24% | | | | | | | | 5.36% | -0.49% | | | | | | 5.31% | | -0.01% | | | 3.55% | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES
1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:
- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

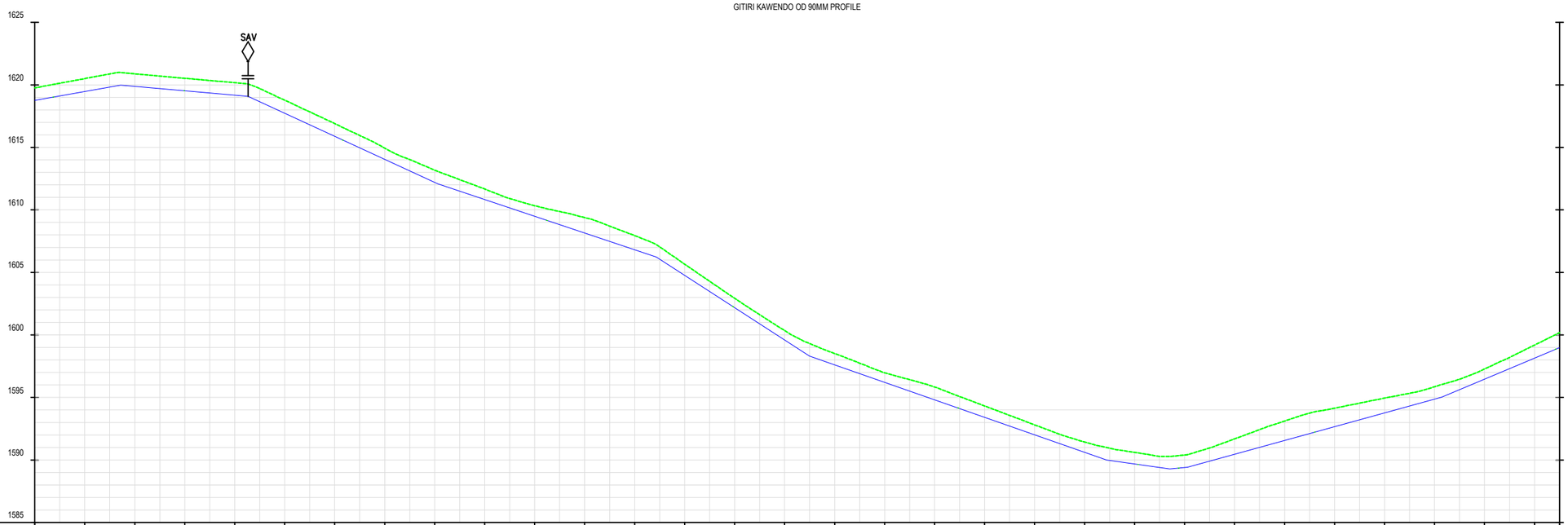
Drawing Title
GITIRI- KAWENDO WATER PIPELINE
PLAN AND PROFILE
SHEET 9 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

GITIRI KAWENDO OD 90MM PROFILE




| CHAINAGE (Km+m) | 1+220 | 1+240 | 1+260 | 1+280 | 1+300 | 1+320 | 1+340 | 1+360 | 1+380 | 1+400 | 1+420 | 1+440 | 1+460 | 1+480 | 1+500 | 1+520 | 1+540 | 1+560 | 1+580 | 1+600 | 1+620 | 1+640 | 1+660 | 1+680 | 1+700 | 1+720 | 1+740 | 1+760 | 1+780 | 1+800 | 1+820 | 1+830 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1619.76 | 1620.50 | 1620.88 | 1620.52 | 1620.17 | 1618.77 | 1616.90 | 1614.94 | 1613.18 | 1611.67 | 1610.34 | 1609.38 | 1607.94 | 1605.65 | 1602.93 | 1600.35 | 1598.52 | 1596.97 | 1595.83 | 1594.32 | 1592.81 | 1591.44 | 1590.61 | 1590.40 | 1591.69 | 1593.11 | 1594.14 | 1594.95 | 1595.86 | 1597.28 | 1599.19 | 1600.18 |
| INVERT LEVELS (mASL) | 1618.76 | 1619.47 | 1619.88 | 1619.53 | 1619.17 | 1617.72 | 1615.88 | 1614.03 | 1612.19 | 1610.82 | 1609.48 | 1608.14 | 1606.81 | 1604.76 | 1602.18 | 1599.60 | 1597.61 | 1596.21 | 1594.81 | 1593.42 | 1592.02 | 1590.62 | 1589.68 | 1589.40 | 1590.46 | 1591.57 | 1592.67 | 1593.77 | 1594.87 | 1596.47 | 1598.15 | 1598.99 |
| EXCAVATION DEPTH (m) | 1.00 | 1.03 | 1.00 | 1.00 | 1.00 | 1.05 | 1.02 | 0.91 | 0.99 | 0.85 | 0.85 | 1.24 | 1.14 | 0.89 | 0.75 | 0.75 | 0.90 | 0.76 | 1.02 | 0.91 | 0.80 | 0.82 | 0.93 | 1.00 | 1.22 | 1.55 | 1.48 | 1.18 | 0.99 | 0.81 | 1.04 | 1.19 |
| DESIGN FLOW ($m^3$/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 90MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 3.55% | | -1.78% | | -9.23% | | -6.69% | | -12.90% | | -7.00% | | -2.86% | 2.10% | | 5.51% | | | | 8.39% | | | | | | | | | | | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

CONSULTANCY NAME:
CONTRACT No.: PROJECT NAME:
IMPLEMENTING AGENCY:
ASSIGNMENT NAME:

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
GITIRI- KAWENDO WATER PIPELINE
PLAN AND PROFILE
SHEET 10 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN

SCALE 1:1000

GITIRI KAWENDO OD 90MM PROFILE




| CHAINAGE (Km+m) | 1+830 | 1+840 | 1+860 | 1+880 | 1+900 | 1+920 | 1+940 | 1+960 | 1+980 | 2+000 | 2+020 | 2+040 | 2+060 | 2+080 | 2+100 | 2+120 | 2+140 | 2+160 | 2+180 | 2+200 | 2+220 | 2+240 | 2+260 | 2+280 | 2+300 | 2+320 | 2+340 | 2+360 | 2+380 | 2+400 | 2+420 | 2+440 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1600.18 | 1601.13 | 1602.65 | 1603.94 | 1604.53 | 1604.84 | 1605.51 | 1606.79 | 1608.07 | 1609.26 | 1610.07 | 1609.85 | 1608.42 | 1606.53 | 1604.99 | 1604.13 | 1603.61 | 1603.03 | 1601.98 | 1599.24 | 1597.11 | 1595.59 | 1594.17 | 1592.70 | 1591.18 | 1589.87 | 1589.46 | 1589.56 | 1589.85 | 1590.78 | 1591.57 | 1591.14 |
| INVERT LEVELS (mASL) | 1598.99 | 1599.83 | 1601.50 | 1602.83 | 1603.35 | 1603.88 | 1604.59 | 1605.84 | 1607.10 | 1608.35 | 1609.00 | 1608.83 | 1607.15 | 1605.47 | 1604.13 | 1603.13 | 1602.42 | 1601.71 | 1600.98 | 1598.26 | 1596.19 | 1594.69 | 1593.18 | 1591.68 | 1590.17 | 1588.90 | 1588.47 | 1588.64 | 1588.85 | 1589.70 | 1590.55 | 1590.05 |
| EXCAVATION DEPTH (m) | 1.19 | 1.30 | 1.14 | 1.11 | 1.17 | 0.96 | 0.92 | 0.95 | 0.97 | 0.90 | 1.07 | 1.02 | 1.27 | 1.06 | 0.86 | 1.00 | 1.20 | 1.33 | 1.00 | 0.99 | 0.92 | 0.90 | 0.99 | 1.02 | 1.01 | 0.97 | 0.99 | 0.92 | 1.00 | 1.09 | 1.02 | 1.08 |
| DESIGN FLOW ($m^3$/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 90MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 8.39% | | 2.61% | | 6.27% | | 0.00% | | -8.41% | | -5.00% | | -3.56% | | -13.61% | | -7.52% | | | | -2.17% | | 1.05% | | 4.25% | | -2.96% | | | | | |

PROFILE

SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

SAV - SINGLE AIR VALVE

WO - WASHOUT

DAV - DOUBLE AIR VALVE

AB - ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

CONSULTANCY NAME:
CONTRACT No.: PROJECT NAME:
IMPLEMENTING AGENCY:
ASSIGNMENT NAME:

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

GITIRI- KAWENDO WATER PIPELINE

PLAN AND PROFILE

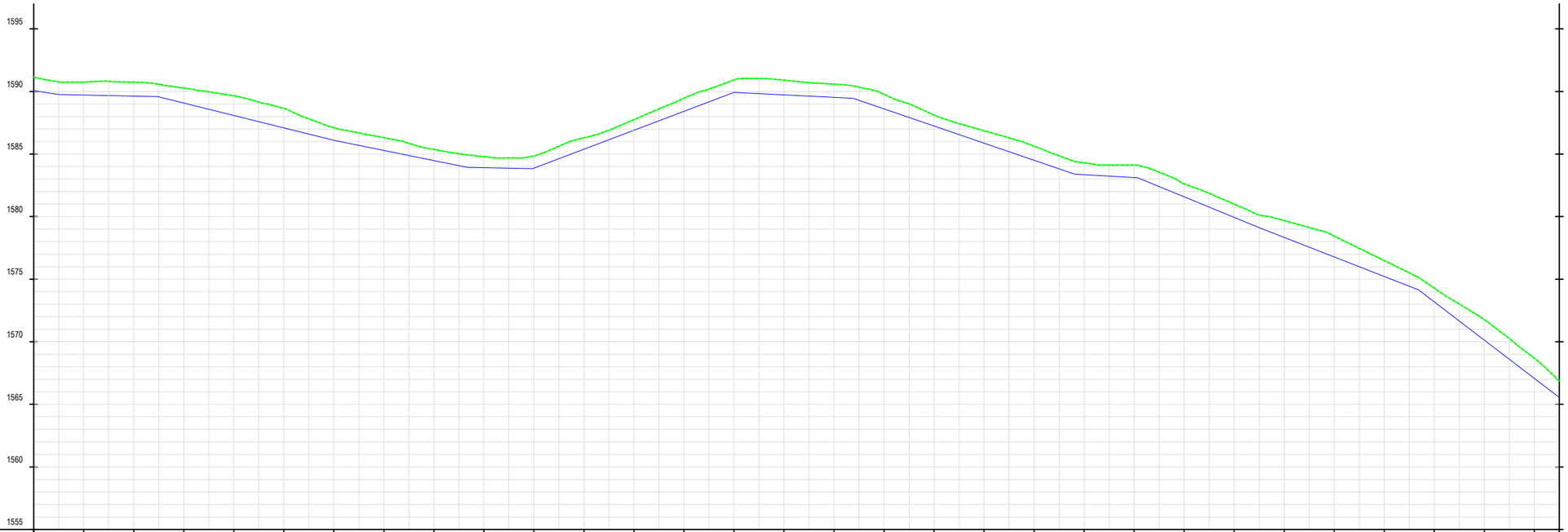
SHEET 11 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

GITIRI KAWENDO OD 90MM PROFILE

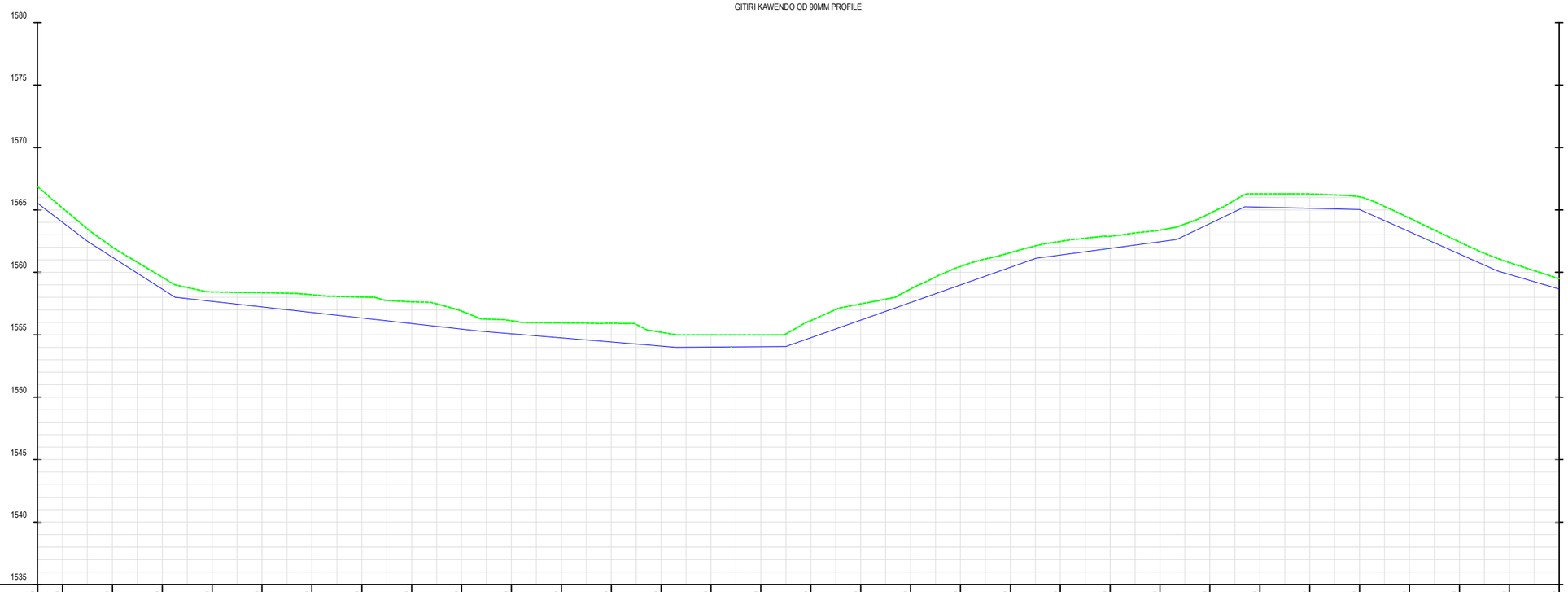



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## PLAN
SCALE 1:1000

GITIRI KAWENDO OD 90MM PROFILE




| CHAINAGE (Km+m) | 3+050 | 3+060 | 3+080 | 3+100 | 3+120 | 3+140 | 3+160 | 3+180 | 3+200 | 3+220 | 3+240 | 3+260 | 3+280 | 3+300 | 3+320 | 3+340 | 3+360 | 3+380 | 3+400 | 3+420 | 3+440 | 3+460 | 3+480 | 3+500 | 3+520 | 3+540 | 3+560 | 3+580 | 3+600 | 3+620 | 3+640 | 3+660 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1566.87 | 1565.15 | 1562.03 | 1559.61 | 1558.44 | 1558.37 | 1558.21 | 1558.03 | 1557.64 | 1556.90 | 1556.13 | 1555.95 | 1555.92 | 1555.21 | 1555.00 | 1555.00 | 1556.14 | 1557.47 | 1558.67 | 1560.47 | 1561.58 | 1562.48 | 1562.88 | 1563.38 | 1564.73 | 1566.29 | 1566.28 | 1566.04 | 1564.34 | 1562.44 | 1560.79 | 1559.49 |
| INVERT LEVELS (mASL) | 1565.54 | 1564.02 | 1561.21 | 1558.65 | 1557.67 | 1557.23 | 1556.78 | 1556.34 | 1555.89 | 1555.45 | 1555.08 | 1554.75 | 1554.42 | 1554.10 | 1554.02 | 1554.05 | 1554.77 | 1556.18 | 1557.59 | 1559.00 | 1560.41 | 1561.38 | 1561.91 | 1562.44 | 1563.90 | 1565.22 | 1565.13 | 1565.04 | 1563.26 | 1561.47 | 1559.83 | 1558.67 |
| EXCAVATION DEPTH (m) | 1.32 | 1.13 | 0.82 | 0.96 | 0.77 | 1.14 | 1.42 | 1.69 | 1.75 | 1.45 | 1.05 | 1.20 | 1.50 | 1.11 | 0.98 | 0.95 | 1.37 | 1.29 | 1.08 | 1.48 | 1.17 | 1.10 | 0.97 | 0.94 | 0.83 | 1.07 | 1.15 | 1.00 | 1.08 | 0.96 | 0.96 | 0.82 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 90MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -15.27% | | -12.78% | | -2.22% | | | | | | | -1.63% | | | 0.16% | | 7.04% | | | | | 2.65% | | 9.61% | | -0.45% | | | -8.92% | | | -5.82% |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

SAV - SINGLE AIR VALVE

WO - WASHOUT

DAV - DOUBLE AIR VALVE

AB - ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
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| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

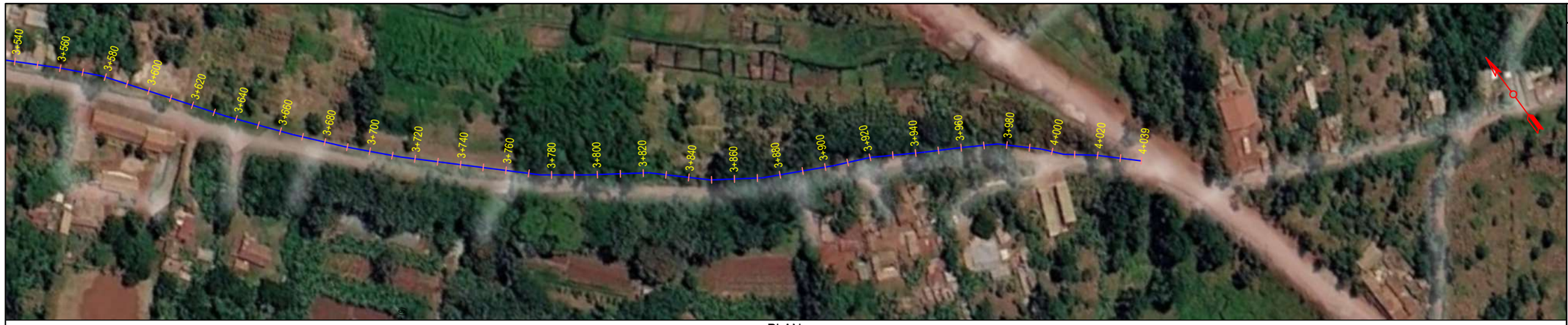
Drawing Title

GITIRI- KAWENDO WATER PIPELINE

PLAN AND PROFILE

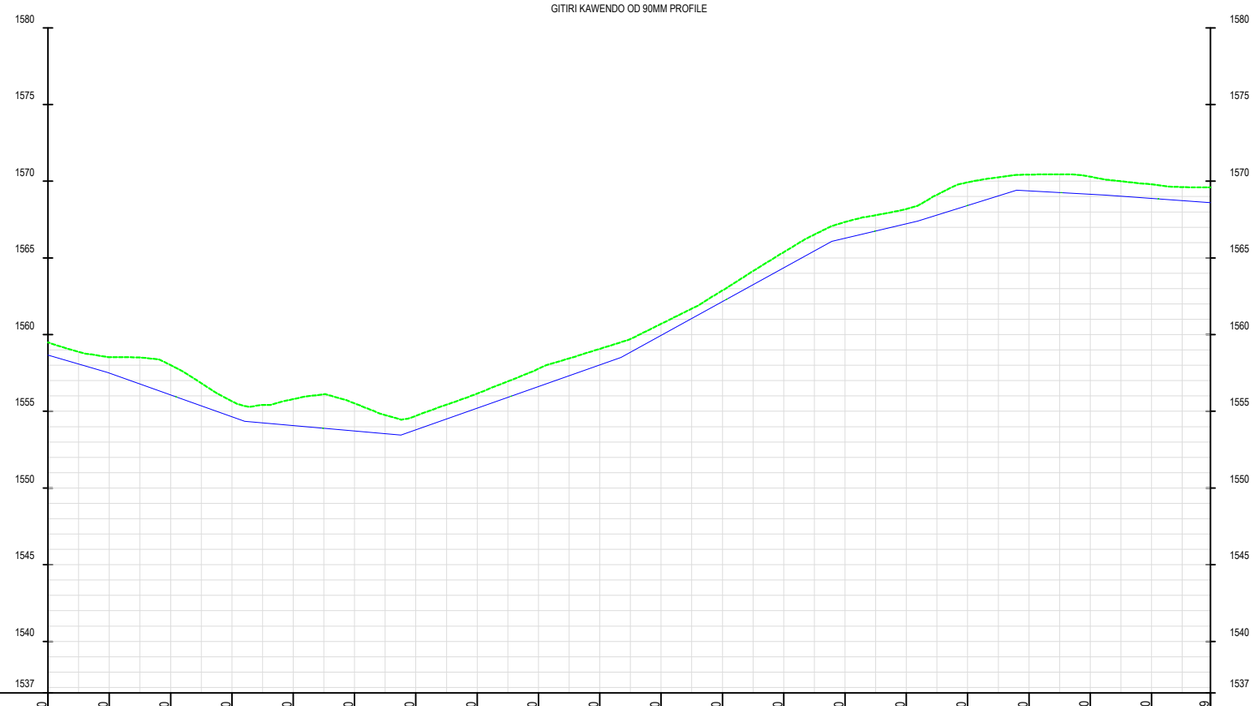
SHEET 13 OF 53

| | | | |
|---|---|---|---|
| Designed by JMM | | Drawn by ENN | |
| Checked by JMM | | Approved by | |
| Scale AS SHOWN (AT A1) | | Date OCTOBER 2026 | |
| Job No. TA-(WSDP) | | ACAD File: TA-(WSDP)/CAD/ | |
| A STATUS | DRAWING No. TA-(WSDP)/ | | 0 REV |




PLAN
SCALE 1:1000

GITIRI KAWENDO OD 90MM PROFILE




| CHAINAGE (Km+m) | 3+660 | 3+680 | 3+700 | 3+720 | 3+740 | 3+760 | 3+780 | 3+800 | 3+820 | 3+840 | 3+860 | 3+880 | 3+900 | 3+920 | 3+940 | 3+960 | 3+980 | 4+000 | 4+020 | 4+039 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1559.49 | 1558.54 | 1558.01 | 1555.66 | 1555.79 | 1555.52 | 1554.71 | 1556.16 | 1557.77 | 1559.07 | 1560.70 | 1562.88 | 1565.38 | 1567.35 | 1568.19 | 1569.93 | 1570.43 | 1570.30 | 1569.80 | 1569.61 |
| INVERT LEVELS (mASL) | 1558.67 | 1557.50 | 1556.07 | 1554.64 | 1554.07 | 1553.72 | 1553.80 | 1555.20 | 1556.61 | 1558.02 | 1559.94 | 1562.15 | 1564.35 | 1566.28 | 1567.23 | 1568.42 | 1569.37 | 1569.15 | 1568.88 | 1568.61 |
| EXCAVATION DEPTH (m) | 0.82 | 1.04 | 1.94 | 1.02 | 1.73 | 1.80 | 0.91 | 0.96 | 1.16 | 1.05 | 0.76 | 0.73 | 1.03 | 1.06 | 0.97 | 1.51 | 1.06 | 1.14 | 0.91 | 1.00 |
| DESIGN FLOW ($m^3$/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 90MM | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -5.82% | -7.14% | -1.75% | 7.04% | 11.02% | 4.74% | 6.25% | -1.10% | -1.44% | | | | | | | | | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
GITIRI- KAWENDO WATER PIPELINE
PLAN AND PROFILE
SHEET 14 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

GOLDEN A OD 63MM PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+530 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1522.97 | 1524.63 | 1525.43 | 1525.98 | 1527.42 | 1529.20 | 1531.06 | 1532.80 | 1533.95 | 1535.13 | 1536.31 | 1537.51 | 1538.43 | 1538.32 | 1538.03 | 1537.08 | 1536.00 | 1535.98 | 1535.85 | 1535.74 | 1535.63 | 1535.88 | 1535.90 | 1535.72 | 1535.80 | 1536.33 | 1536.35 | 1536.31 |
| INVERT LEVELS (mASL) | 1521.97 | 1523.60 | 1524.43 | 1524.98 | 1526.64 | 1528.33 | 1530.03 | 1531.72 | 1532.96 | 1534.11 | 1535.26 | 1536.41 | 1537.29 | 1537.20 | 1536.99 | 1535.90 | 1534.99 | 1534.94 | 1534.88 | 1534.82 | 1534.77 | 1534.71 | 1534.66 | 1534.60 | 1534.67 | 1534.92 | 1535.18 | 1535.31 |
| EXCAVATION DEPTH (m) | 1.00 | 1.03 | 1.00 | 1.00 | 0.78 | 0.87 | 1.04 | 1.08 | 0.99 | 1.02 | 1.05 | 1.10 | 1.15 | 1.11 | 1.04 | 1.18 | 1.01 | 1.04 | 0.97 | 0.91 | 0.86 | 1.17 | 1.24 | 1.11 | 1.13 | 1.40 | 1.17 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 63MM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 8.16% | | 2.76% | | 8.48% | | | | 5.74% | | | | -0.42% | | -5.43% | | | | -0.28% | | | | | | | 1.29% | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
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| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

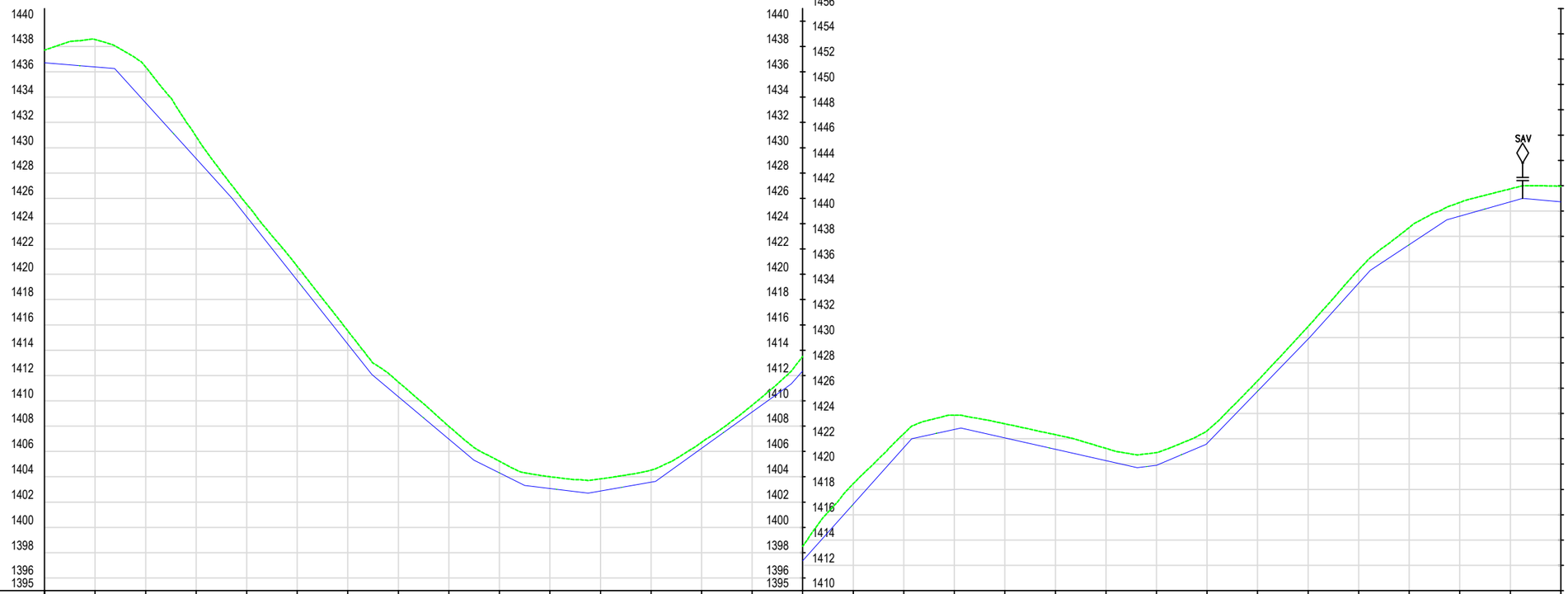
Drawing Title
GOLDEN A WATER PIPELINE
PLAN AND PROFILE
SHEET 15 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KAHUHO BAPTIST PROFILE




| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
| GROUND LEVELS (mASL) | 1437.72 | 1438.55 | 1436.39 | 1430.89 | 1425.54 | 1420.63 | 1415.54 | 1411.49 | 1407.98 | 1405.23 | 1404.00 | 1403.84 | 1404.53 | 1406.72 | 1409.65 | 1413.51 | 1418.45 | 1422.41 | 1423.86 | 1423.19 | 1422.33 | 1421.24 | 1420.90 | 1422.63 | 1426.58 | 1430.88 | 1435.35 | 1438.70 | 1440.68 | 1441.75 | 1441.94 |
| INVERT LEVELS (mASL) | 1436.72 | 1436.38 | 1433.55 | 1429.14 | 1424.55 | 1419.52 | 1414.49 | 1410.33 | 1406.98 | 1404.31 | 1403.07 | 1402.88 | 1403.57 | 1406.25 | 1409.12 | 1412.35 | 1416.83 | 1421.30 | 1422.74 | 1422.08 | 1421.18 | 1420.28 | 1419.91 | 1421.64 | 1425.76 | 1429.88 | 1434.29 | 1437.34 | 1439.59 | 1440.72 | 1440.73 |
| EXCAVATION DEPTH (m) | 1.00 | 2.17 | 2.84 | 1.75 | 0.99 | 1.11 | 1.05 | 1.16 | 1.01 | 0.92 | 0.93 | 0.96 | 0.96 | 0.48 | 0.54 | 1.16 | 1.63 | 1.10 | 1.12 | 1.11 | 1.15 | 0.97 | 1.00 | 0.99 | 0.82 | 0.99 | 1.06 | 1.36 | 1.08 | 1.03 | 1.21 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50 MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -1.68% | | -22.06% | | -25.15% | | -16.77% | | -9.94% | -2.42% | 3.46% | | 14.36% | | 22.38% | 4.40% | | -4.50% | | 2.40% | 8.45% | | 20.61% | | 22.09% | 13.19% | | 5.65% | | 1.76% |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES
1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:
- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
KAHUHO BAPTIST WATER PIPELINE
PLAN AND PROFILE
SHEET 16 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KAHUHO BAPTIST PROFILE




| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+680 | 0+700 | 0+720 | 0+740 | 0+760 | 0+780 | 0+800 | 0+820 | 0+840 | 0+860 | 0+880 | 0+900 | 0+920 | 0+940 | 0+960 | 0+980 | 1+000 | 1+020 | 1+040 | 1+060 | 1+080 | 1+100 | 1+120 | 1+140 | 1+160 | 1+180 | 1+200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1441.94 | 1441.55 | 1441.04 | 1440.07 | 1439.05 | 1437.98 | 1436.99 | 1436.47 | 1436.04 | 1435.78 | 1435.44 | 1435.54 | 1435.37 | 1435.15 | 1433.95 | 1432.43 | 1430.62 | 1427.51 | 1424.49 | 1421.15 | 1417.29 | 1414.55 | 1412.55 | 1410.62 | 1408.39 | 1406.17 | 1404.04 | 1402.80 | 1402.53 | 1403.72 | 1405.14 |
| INVERT LEVELS (mASL) | 1440.73 | 1440.38 | 1440.03 | 1439.06 | 1438.04 | 1437.01 | 1435.99 | 1435.60 | 1435.22 | 1434.83 | 1434.59 | 1434.48 | 1434.37 | 1434.07 | 1432.66 | 1431.24 | 1429.58 | 1426.26 | 1422.93 | 1419.60 | 1416.27 | 1413.58 | 1411.26 | 1409.29 | 1407.32 | 1405.36 | 1403.39 | 1401.99 | 1401.54 | 1402.69 | 1403.85 |
| EXCAVATION DEPTH (m) | 1.21 | 1.17 | 1.01 | 1.01 | 1.02 | 0.97 | 1.00 | 0.87 | 0.82 | 0.95 | 0.85 | 1.06 | 0.99 | 1.08 | 1.29 | 1.19 | 1.04 | 1.25 | 1.56 | 1.55 | 1.02 | 0.96 | 1.30 | 1.32 | 1.07 | 0.81 | 0.65 | 0.81 | 0.99 | 1.03 | 1.29 |
| DESIGN FLOW ($m^3$/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50 MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -1.76% | | | -5.12% | | | -1.94% | | | -0.53% | | | -7.08% | | | -16.64% | | | -13.25% | | | -9.83% | | | | | | -2.26% | | 5.81% | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

KAHUHO BAPTIST WATER PIPELINE

PLAN AND PROFILE

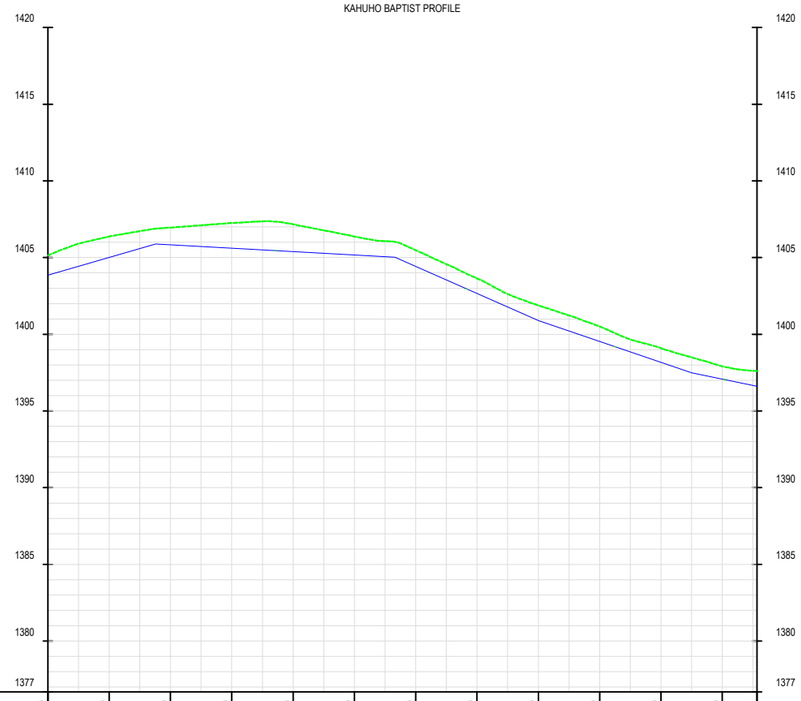
SHEET 17 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KAHUHO BAPTIST PROFILE




| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CHAINAGE (Km+m) | 1+200 | 1+220 | 1+240 | 1+260 | 1+280 | 1+300 | 1+320 | 1+340 | 1+360 | 1+380 | 1+400 | 1+420 | 1+431 |
| GROUND LEVELS (mASL) | 1405.14 | 1406.38 | 1406.96 | 1407.25 | 1407.17 | 1406.37 | 1405.48 | 1403.64 | 1401.89 | 1400.51 | 1399.09 | 1397.92 | 1397.62 |
| INVERT LEVELS (mASL) | 1403.85 | 1405.01 | 1405.84 | 1405.61 | 1405.39 | 1405.17 | 1404.43 | 1402.66 | 1400.89 | 1399.53 | 1398.17 | 1397.08 | 1396.62 |
| EXCAVATION DEPTH (m) | 1.29 | 1.36 | 1.12 | 1.64 | 1.77 | 1.20 | 1.06 | 0.98 | 1.00 | 0.98 | 0.92 | 0.83 | 1.00 |
| DESIGN FLOW (m³/day) | | DESIGN FLOW | | | | | | | | | | | |
| PIPE DETAILS | | HDPE OD 50 MM | | | | | | | | | | | |
| BEDDING DETAILS | | TO BE DETERMINED ON SITE | | | | | | | | | | | |
| SLOPE (%) | | 5.81% | | -1.11% | | -8.85% | | -6.79% | | -4.12% | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
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| C | | BY | | | |
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| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
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**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

KAHUHO BAPTIST WATER PIPELINE

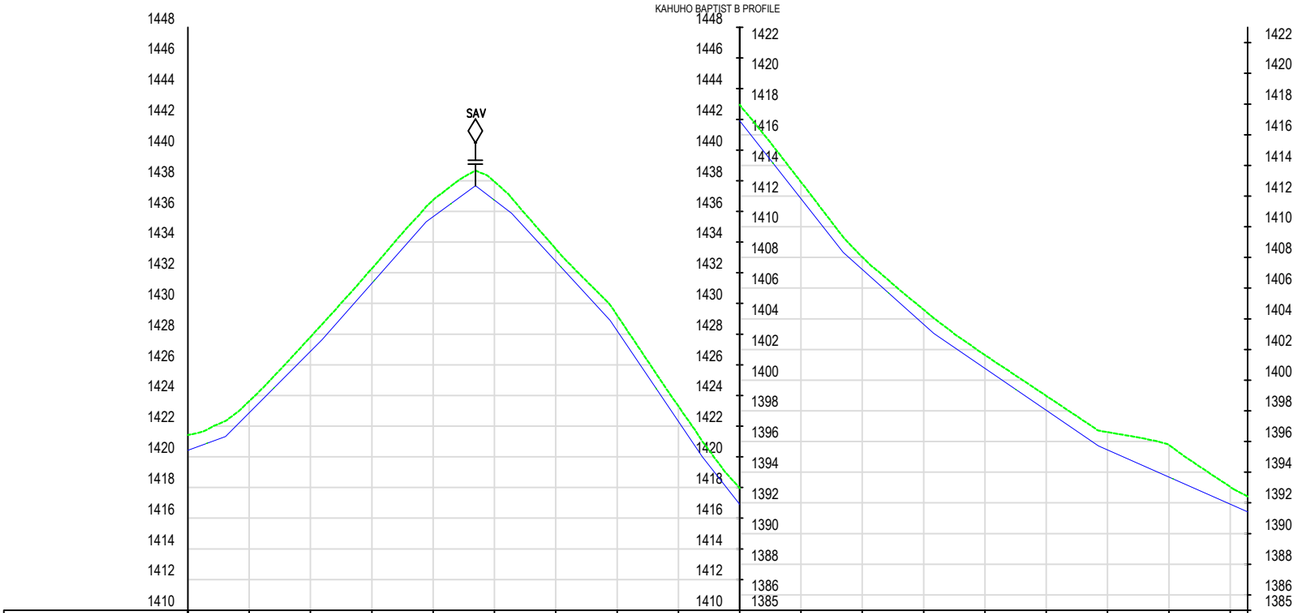
PLAN AND PROFILE

SHEET 18 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+346 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1421.43 | 1423.63 | 1427.81 | 1432.28 | 1436.74 | 1437.94 | 1433.55 | 1429.24 | 1423.31 | 1417.95 | 1412.92 | 1408.02 | 1404.59 | 1401.64 | 1398.98 | 1396.61 | 1395.77 | 1393.05 | 1392.42 |
| INVERT LEVELS (mASL) | 1420.43 | 1422.88 | 1426.88 | 1431.31 | 1435.65 | 1436.73 | 1432.75 | 1428.23 | 1422.31 | 1416.90 | 1411.82 | 1407.21 | 1403.64 | 1400.76 | 1398.03 | 1395.45 | 1393.68 | 1391.92 | 1391.42 |
| EXCAVATION DEPTH (m) | 1.00 | 0.75 | 0.93 | 0.97 | 1.09 | 1.21 | 0.80 | 1.00 | 1.00 | 1.05 | 1.09 | 0.81 | 0.96 | 0.87 | 0.95 | 1.16 | 2.09 | 1.13 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 25MM | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 7.35% | 20.02% | 22.59% | 14.66% | 15.16% | -21.71% | -29.61% | -25.40% | -17.87% | -13.66% | -8.82% | | | | | | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

CONSULTANCY NAME:
CONTRACT No.: PROJECT NAME:
IMPLEMENTING AGENCY:
ASSIGNMENT NAME:

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

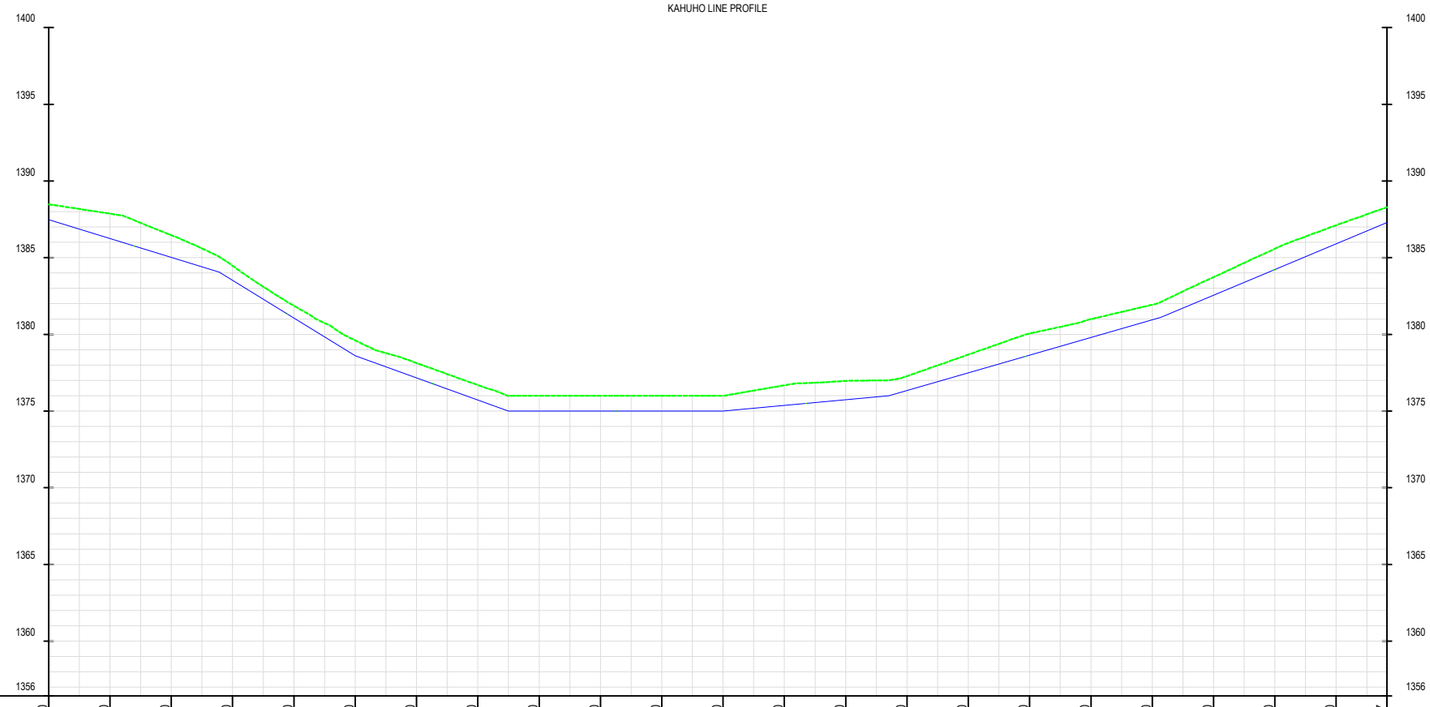
Drawing Title
KAHUHO BAPTIST B WATER PIPELINE
PLAN AND PROFILE
SHEET 19 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-IWSDPI | ACAD File: TA-IWSDPI/CAD/ |
| A STATUS | DRAWING No. TA-IWSDPI/ 0 REV |




PLAN
SCALE 1:1000

KAHUHO LINE PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+437 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1388.48 | 1387.87 | 1386.47 | 1384.47 | 1381.86 | 1379.61 | 1378.13 | 1376.70 | 1376.00 | 1376.00 | 1376.00 | 1376.00 | 1376.68 | 1376.96 | 1377.28 | 1378.68 | 1380.05 | 1380.99 | 1381.93 | 1383.73 | 1385.58 | 1387.11 | 1388.29 |
| INVERT LEVELS (mASL) | 1387.48 | 1386.25 | 1385.02 | 1383.52 | 1381.06 | 1378.61 | 1377.16 | 1375.72 | 1375.00 | 1375.00 | 1375.00 | 1375.00 | 1375.37 | 1375.74 | 1376.34 | 1377.49 | 1378.65 | 1379.80 | 1380.95 | 1382.55 | 1384.22 | 1385.90 | 1387.29 |
| EXCAVATION DEPTH (m) | 1.00 | 1.62 | 1.45 | 0.95 | 0.80 | 1.00 | 0.97 | 0.97 | 1.00 | 1.00 | 1.00 | 1.00 | 1.31 | 1.22 | 0.93 | 1.19 | 1.41 | 1.19 | 0.98 | 1.18 | 1.35 | 1.21 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50MM | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -6.16% | | -12.28% | | -7.21% | | 0.00% | | | | | 1.85% | | 5.76% | | | | 8.37% | | | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

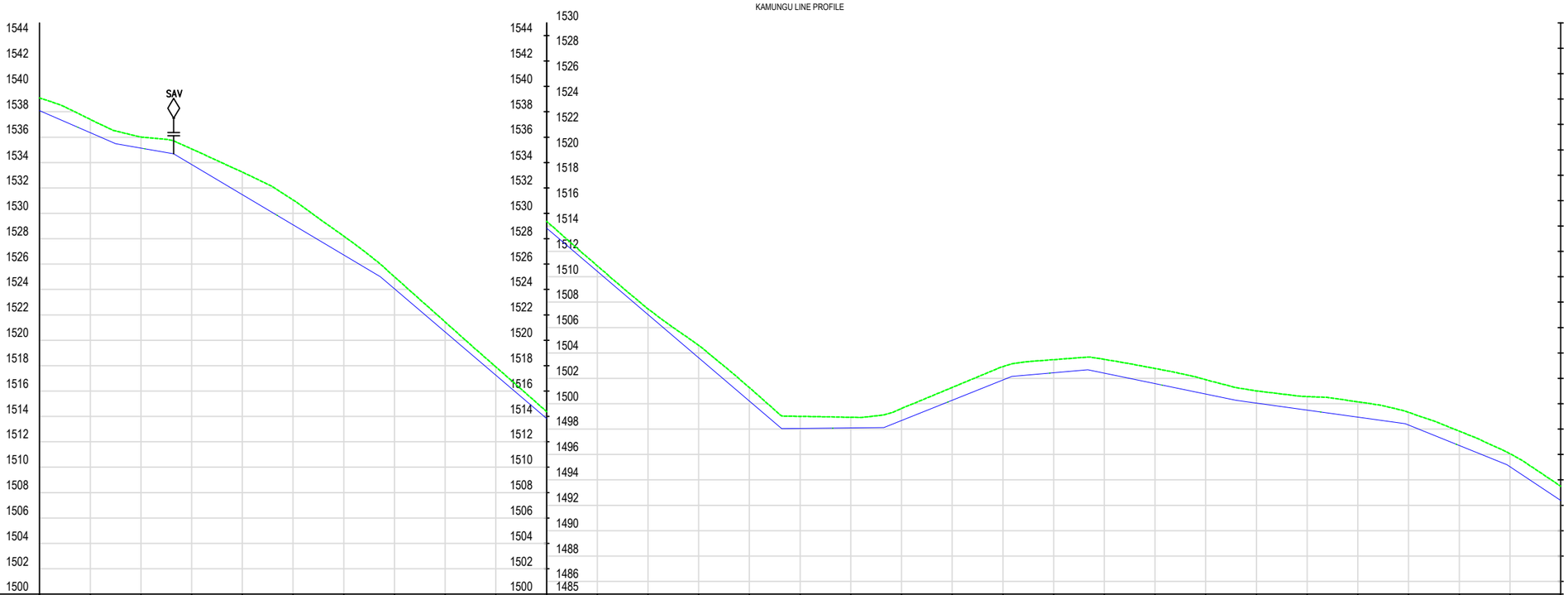
Drawing Title
KAHUHO WATER PIPELINE
PLAN AND PROFILE
SHEET 20 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KAMUNGU LINE PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1539.09 | 1537.40 | 1536.01 | 1535.08 | 1533.24 | 1531.06 | 1528.20 | 1525.00 | 1521.44 | 1517.90 | 1514.38 | 1510.86 | 1507.48 | 1504.59 | 1501.27 | 1499.01 | 1498.93 | 1499.63 | 1501.28 | 1502.92 | 1503.47 | 1503.50 | 1502.78 | 1501.89 | 1501.01 | 1500.56 | 1500.15 | 1499.33 | 1497.84 | 1496.07 | 1493.50 |
| INVERT LEVELS (mASL) | 1538.09 | 1536.36 | 1535.14 | 1533.85 | 1531.47 | 1529.10 | 1526.72 | 1524.05 | 1520.64 | 1517.24 | 1513.83 | 1510.42 | 1507.01 | 1503.61 | 1500.20 | 1498.05 | 1498.09 | 1498.67 | 1500.27 | 1501.86 | 1502.43 | 1502.40 | 1501.58 | 1500.76 | 1500.05 | 1499.49 | 1498.94 | 1498.32 | 1496.71 | 1495.04 | 1492.38 |
| EXCAVATION DEPTH (m) | 1.00 | 1.05 | 0.87 | 1.22 | 1.77 | 1.96 | 1.48 | 0.95 | 0.79 | 0.66 | 0.55 | 0.44 | 0.46 | 0.98 | 1.07 | 0.96 | 0.84 | 0.96 | 1.01 | 1.06 | 1.04 | 1.09 | 1.19 | 1.13 | 0.96 | 1.07 | 1.21 | 1.01 | 1.13 | 1.03 | 1.12 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 63MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -8.70% | | -3.45% | | -11.89% | | | | -17.04% | | | | 0.21% | | 7.98% | | 1.77% | | -4.11% | | | -2.77% | | | -8.04% | | | | -13.32% | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

KAMUNGU WATER PIPELINE

PLAN AND PROFILE

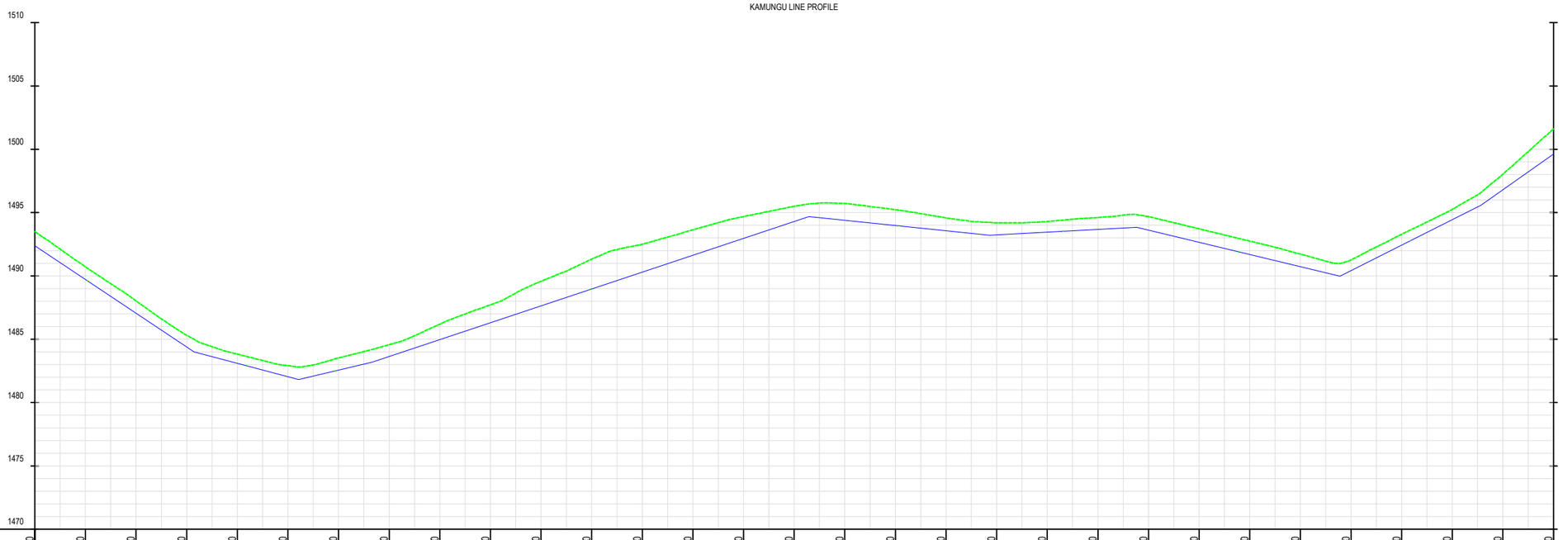
SHEET 21 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KAMUNGU LINE PROFILE




| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+680 | 0+700 | 0+720 | 0+740 | 0+760 | 0+780 | 0+800 | 0+820 | 0+840 | 0+860 | 0+880 | 0+900 | 0+920 | 0+940 | 0+960 | 0+980 | 1+000 | 1+020 | 1+040 | 1+060 | 1+080 | 1+100 | 1+120 | 1+140 | 1+160 | 1+180 | 1+200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1493.50 | 1490.72 | 1488.02 | 1485.31 | 1483.83 | 1482.91 | 1483.53 | 1484.58 | 1486.19 | 1487.72 | 1489.58 | 1491.33 | 1492.50 | 1493.64 | 1494.68 | 1495.50 | 1495.72 | 1495.23 | 1494.58 | 1494.20 | 1494.30 | 1494.61 | 1494.68 | 1493.72 | 1492.75 | 1491.72 | 1491.27 | 1493.29 | 1495.25 | 1498.04 | 1501.61 |
| INVERT LEVELS (mASL) | 1492.38 | 1489.71 | 1487.05 | 1484.38 | 1483.09 | 1482.04 | 1482.56 | 1483.64 | 1484.97 | 1486.30 | 1487.64 | 1488.97 | 1490.30 | 1491.63 | 1492.97 | 1494.30 | 1494.40 | 1493.98 | 1493.57 | 1493.25 | 1493.46 | 1493.68 | 1493.61 | 1492.65 | 1491.69 | 1490.73 | 1490.42 | 1492.43 | 1494.44 | 1496.81 | 1499.63 |
| EXCAVATION DEPTH (m) | 1.12 | 1.01 | 0.97 | 0.93 | 0.73 | 0.88 | 0.97 | 0.94 | 1.22 | 1.41 | 1.94 | 2.36 | 2.20 | 2.00 | 1.72 | 1.20 | 1.33 | 1.25 | 1.01 | 0.95 | 0.84 | 0.94 | 1.07 | 1.07 | 1.06 | 0.99 | 0.85 | 0.86 | 0.81 | 1.23 | 1.98 |
| DESIGN FLOW ($m^3$/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 63MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -13.32% | | -5.29% | | 4.74% | | 6.66% | | | | | | | | | | -2.06% | | 1.07% | | -4.81% | | | | | | 10.07% | | | 14.11% | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

KAMUNGU WATER PIPELINE

PLAN AND PROFILE

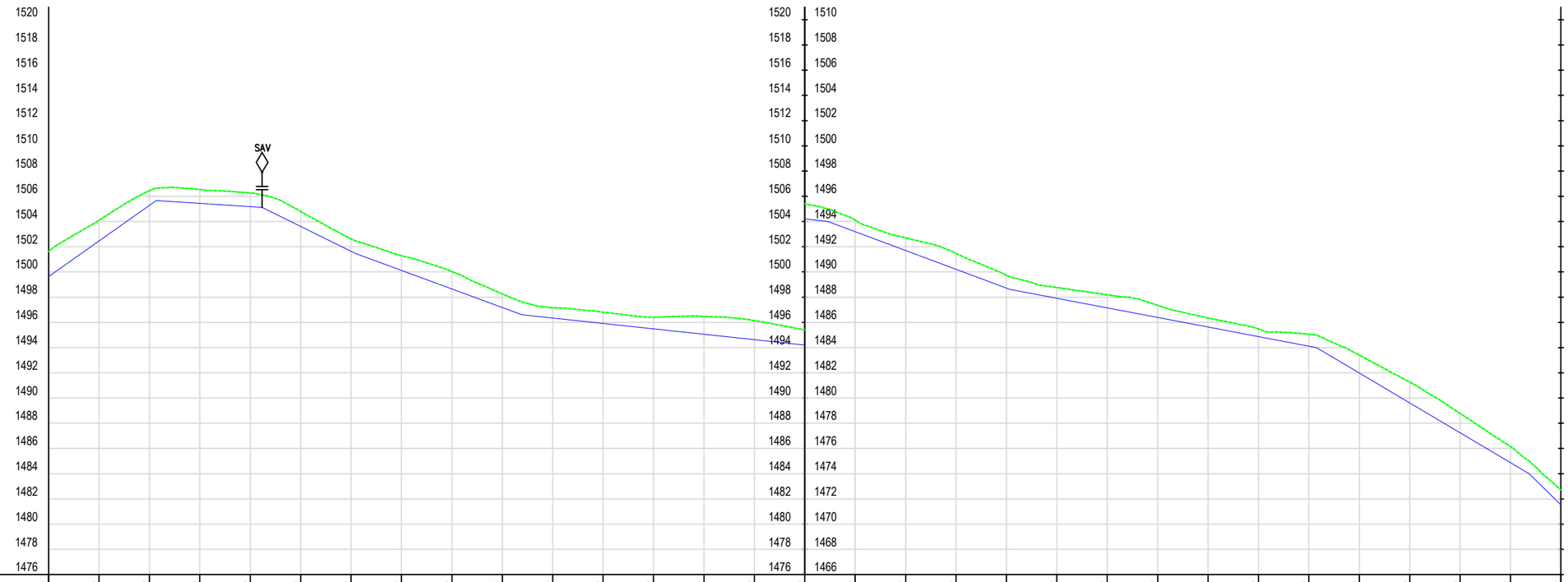
SHEET 22 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KAMUNGU LINE PROFILE




| CHAINAGE (Km+m) | 1+200 | 1+220 | 1+240 | 1+260 | 1+280 | 1+300 | 1+320 | 1+340 | 1+360 | 1+380 | 1+400 | 1+420 | 1+440 | 1+460 | 1+480 | 1+500 | 1+520 | 1+540 | 1+560 | 1+580 | 1+600 | 1+620 | 1+640 | 1+660 | 1+680 | 1+700 | 1+720 | 1+740 | 1+760 | 1+780 | 1+800 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1501.61 | 1504.10 | 1506.46 | 1506.53 | 1506.26 | 1504.80 | 1502.63 | 1501.29 | 1500.03 | 1498.26 | 1497.17 | 1496.81 | 1496.41 | 1496.47 | 1496.14 | 1495.40 | 1494.11 | 1492.71 | 1491.47 | 1489.74 | 1488.76 | 1488.19 | 1487.35 | 1486.35 | 1485.48 | 1485.05 | 1483.40 | 1481.27 | 1478.78 | 1476.15 | 1472.71 |
| INVERT LEVELS (mASL) | 1499.63 | 1502.45 | 1505.27 | 1505.43 | 1505.17 | 1503.60 | 1501.63 | 1500.12 | 1498.65 | 1497.18 | 1496.35 | 1495.92 | 1495.49 | 1495.06 | 1494.63 | 1494.20 | 1493.19 | 1491.70 | 1490.21 | 1488.71 | 1487.91 | 1487.15 | 1486.39 | 1485.63 | 1484.87 | 1484.11 | 1481.99 | 1479.62 | 1477.25 | 1474.88 | 1471.51 |
| EXCAVATION DEPTH (m) | 1.98 | 1.65 | 1.19 | 1.10 | 1.09 | 1.20 | 1.00 | 1.17 | 1.37 | 1.07 | 0.82 | 0.90 | 0.92 | 1.42 | 1.51 | 1.20 | 0.92 | 1.01 | 1.26 | 1.03 | 0.86 | 1.04 | 0.97 | 0.72 | 0.61 | 0.94 | 1.42 | 1.65 | 1.53 | 1.27 | 1.19 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 63MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 14.11% | | | -1.30% | | -9.85% | | -7.34% | | | | | | -2.15% | | | | | -7.46% | | | | | -3.79% | | | | | -11.85% | | 19.74% |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

KAMUNGU WATER PIPELINE

PLAN AND PROFILE

SHEET 23 OF 53

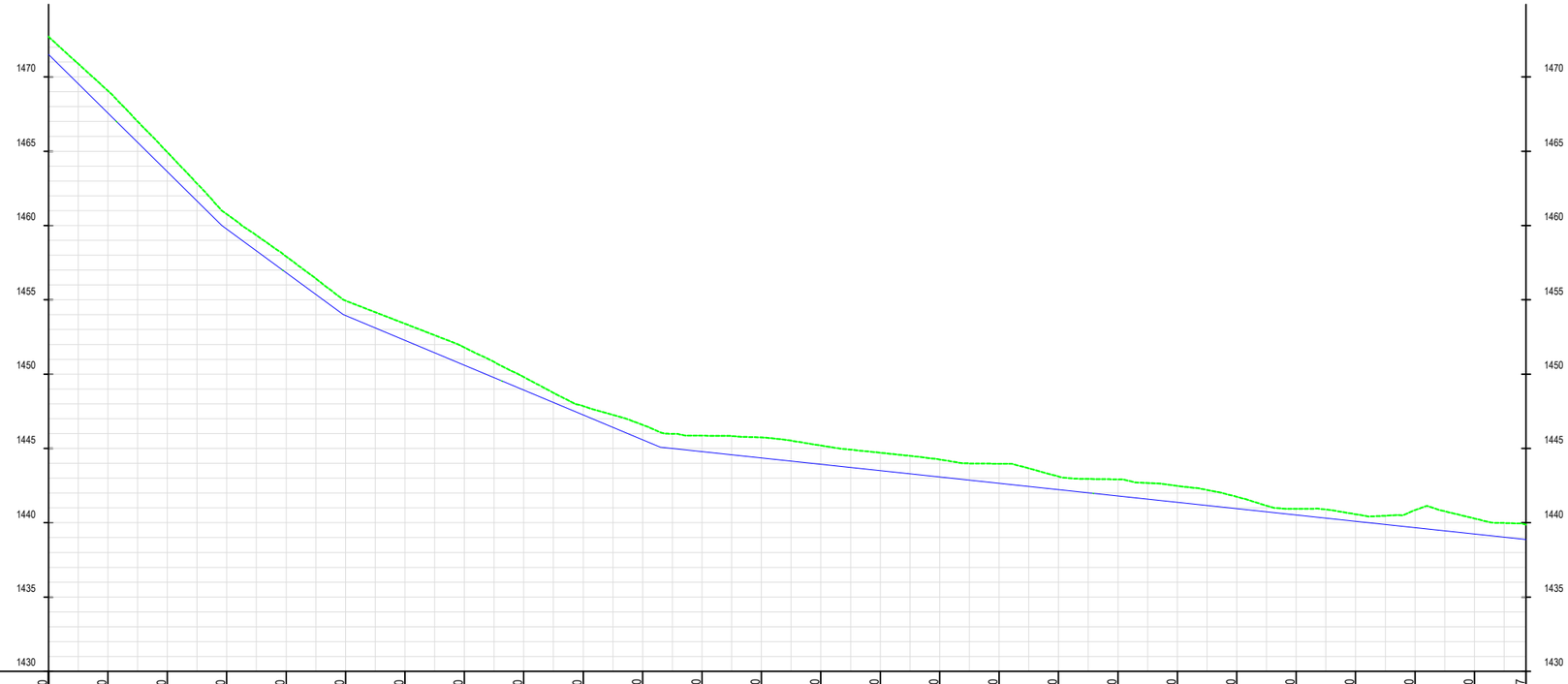
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|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |

A STATUS | DRAWING No. TA-(WSDP)/ | 0 REV




## PLAN
SCALE 1:1000

KAMUNGU LINE PROFILE




| CHAINAGE (Km+m) | 1+800 | 1+820 | 1+840 | 1+860 | 1+880 | 1+900 | 1+920 | 1+940 | 1+960 | 1+980 | 2+000 | 2+020 | 2+040 | 2+060 | 2+080 | 2+100 | 2+120 | 2+140 | 2+160 | 2+180 | 2+200 | 2+220 | 2+240 | 2+260 | 2+280 | 2+297 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1472.71 | 1469.07 | 1464.94 | 1460.76 | 1457.92 | 1454.94 | 1453.39 | 1451.79 | 1449.81 | 1447.85 | 1446.59 | 1445.86 | 1445.74 | 1445.20 | 1444.71 | 1444.26 | 1443.97 | 1443.11 | 1442.92 | 1442.49 | 1441.75 | 1440.94 | 1440.57 | 1440.85 | 1440.29 | 1439.87 |
| INVERT LEVELS (mASL) | 1471.51 | 1467.57 | 1463.62 | 1459.76 | 1456.82 | 1453.94 | 1452.27 | 1450.59 | 1448.92 | 1447.25 | 1445.58 | 1444.78 | 1444.36 | 1443.93 | 1443.50 | 1443.08 | 1442.65 | 1442.23 | 1441.80 | 1441.37 | 1440.95 | 1440.52 | 1440.09 | 1439.67 | 1439.24 | 1438.87 |
| EXCAVATION DEPTH (m) | 1.19 | 1.50 | 1.32 | 1.01 | 1.10 | 1.00 | 1.13 | 1.20 | 0.88 | 0.60 | 1.01 | 1.07 | 1.38 | 1.27 | 1.20 | 1.18 | 1.32 | 0.89 | 1.12 | 1.11 | 0.80 | 0.42 | 0.48 | 1.18 | 1.04 | 1.00 |
| DESIGN FLOW (m³/day) | | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | | HDPE OD 63MM | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | | -19.74% | | | -14.67% | | | -8.36% | | | | | | | | | | | | | -2.13% | | | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

KAMUNGU WATER PIPELINE

PLAN AND PROFILE

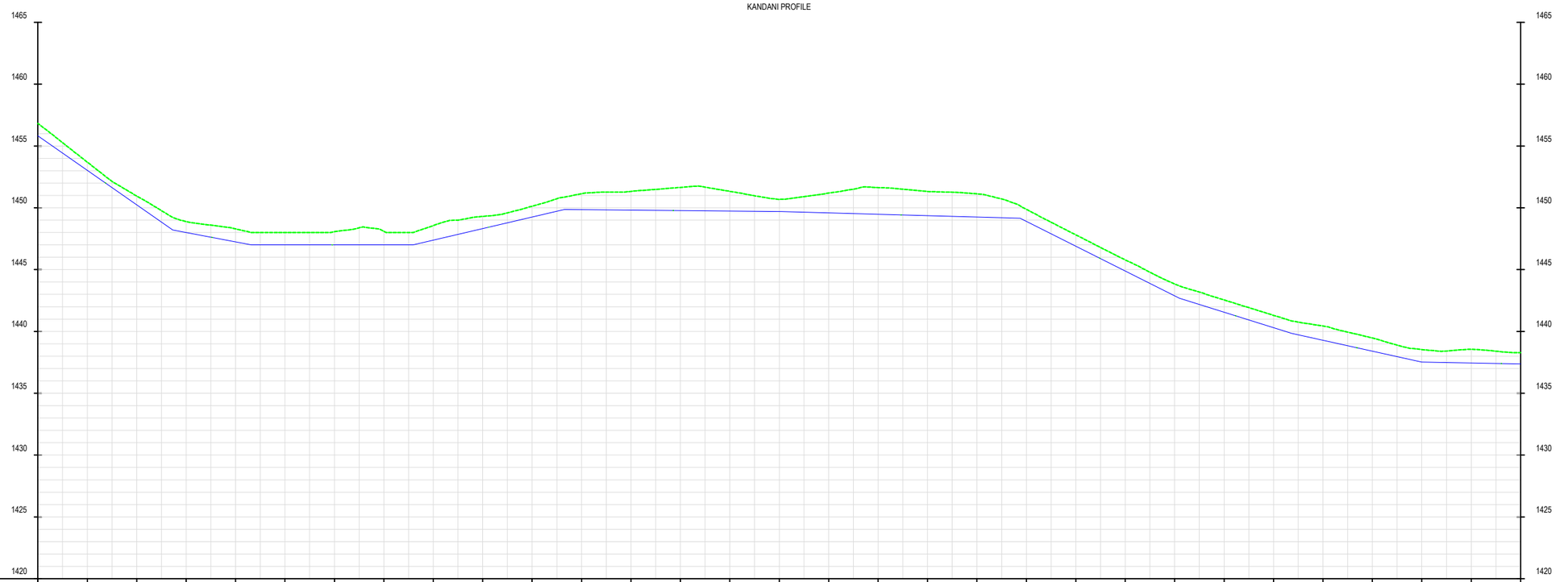
SHEET 24 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KANDANI PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1456.83 | 1453.70 | 1450.95 | 1448.89 | 1448.29 | 1448.00 | 1448.07 | 1448.10 | 1448.56 | 1449.30 | 1450.13 | 1451.14 | 1451.33 | 1451.65 | 1451.33 | 1450.68 | 1451.19 | 1451.64 | 1451.32 | 1451.13 | 1449.87 | 1447.81 | 1445.79 | 1443.84 | 1442.55 | 1441.30 | 1440.44 | 1439.47 | 1438.53 | 1438.56 | 1438.29 |
| INVERT LEVELS (mASL) | 1455.83 | 1453.04 | 1450.25 | 1448.01 | 1447.24 | 1447.00 | 1447.00 | 1447.00 | 1447.38 | 1448.32 | 1449.25 | 1449.85 | 1449.81 | 1449.77 | 1449.73 | 1449.69 | 1449.59 | 1449.47 | 1449.36 | 1449.25 | 1448.90 | 1446.89 | 1444.88 | 1442.87 | 1441.55 | 1440.31 | 1439.29 | 1438.41 | 1437.53 | 1437.45 | 1437.37 |
| EXCAVATION DEPTH (m) | 1.00 | 0.66 | 0.70 | 0.88 | 1.05 | 1.00 | 1.07 | 1.10 | 1.18 | 0.99 | 0.88 | 1.29 | 1.52 | 1.88 | 1.60 | 0.99 | 1.60 | 2.16 | 1.96 | 1.88 | 0.97 | 0.92 | 0.91 | 0.97 | 1.00 | 1.00 | 1.15 | 1.06 | 1.00 | 1.11 | 0.92 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 110 MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -13.94% | | -3.82% | | 0.00% | | 4.68% | | -0.20% | | -0.56% | | -10.05% | | -6.23% | | -4.40% | | -0.41% | | | | | | | | | | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES
1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:
- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

KANDANI WATER PIPELINE

PLAN AND PROFILE

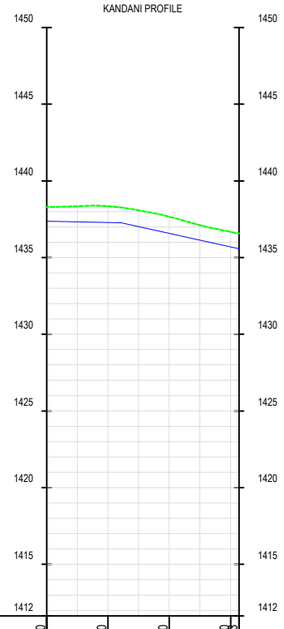
SHEET 25 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

KANDANI PROFILE




| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+663 |
|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1438.29 | 1438.35 | 1437.66 | 1436.67 | 1436.57 |
| INVERT LEVELS (mASL) | 1437.37 | 1437.29 | 1436.58 | 1435.69 | 1435.57 |
| EXCAVATION DEPTH (m) | 0.92 | 1.06 | 1.09 | 0.98 | 1.00 |
| DESIGN FLOW (m³/day) | | DESIGN FLOW | | | |
| PIPE DETAILS | | HDPE OD 110MM | | | |
| BEDDING DETAILS | | TO BE DETERMINED ON SITE | | | |
| SLOPE (%) | | -0.41% | | -4.41% | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| A | | BY | | | |
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CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

CONSULTANCY NAME:
CONTRACT No.: PROJECT NAME:
IMPLEMENTING AGENCY:
ASSIGNMENT NAME:

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

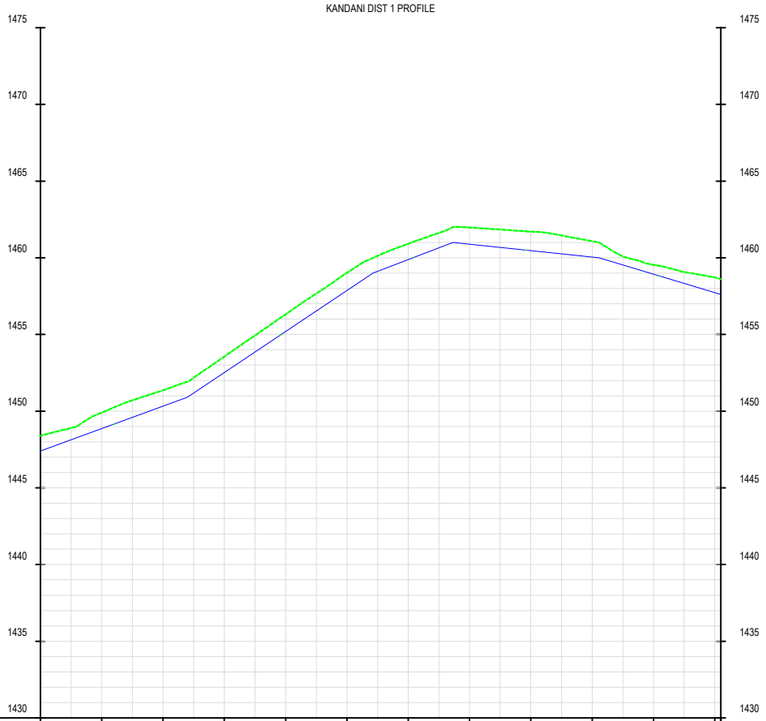
Drawing Title
KANDANI WATER PIPELINES
PLAN AND PROFILE
SHEET 26 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KANDANI DIST 1 PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1448.40 | 1449.91 | 1451.36 | 1453.56 | 1456.31 | 1459.03 | 1460.92 | 1461.97 | 1461.71 | 1461.08 | 1459.54 | 1458.74 |
| INVERT LEVELS (mASL) | 1447.40 | 1448.86 | 1450.32 | 1452.51 | 1455.19 | 1457.86 | 1459.88 | 1460.89 | 1460.47 | 1460.05 | 1458.93 | 1457.74 |
| EXCAVATION DEPTH (m) | 1.00 | 1.04 | 1.04 | 1.04 | 1.12 | 1.17 | 1.03 | 1.09 | 1.24 | 1.04 | 0.61 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 32MM | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | |
| SLOPE (%) | 7.30% | | | | 13.37% | | | 7.67% | | -2.10% | | -6.03% |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES
1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:
- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
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| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

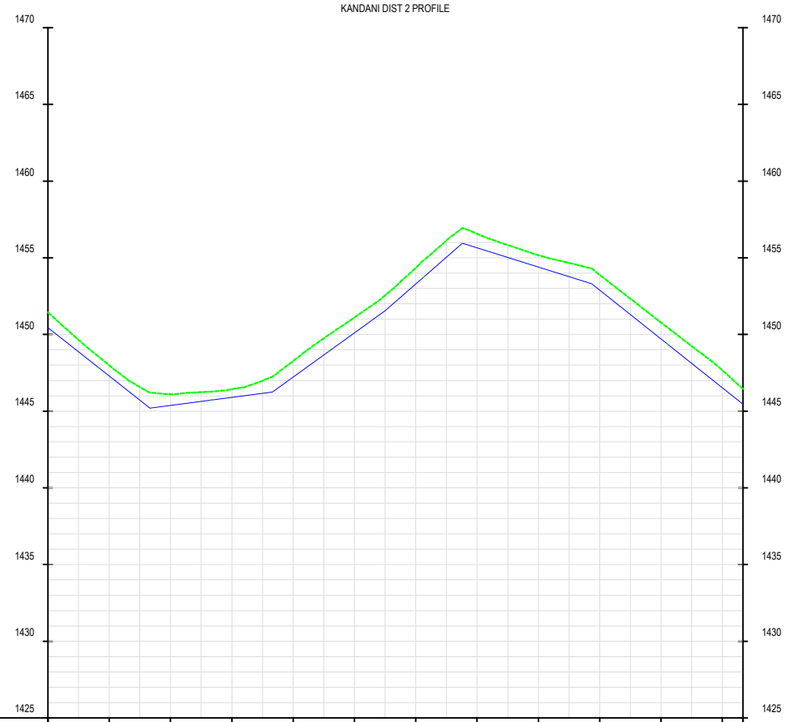
Drawing Title
KANDANI WATER DISTRIBUTION PIPELINE
PLAN AND PROFILE
SHEET 27 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KANDANI DIST 2 PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+227 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1451.44 | 1447.99 | 1446.10 | 1446.44 | 1448.27 | 1451.11 | 1454.35 | 1456.57 | 1455.17 | 1453.89 | 1450.77 | 1447.67 | 1446.45 |
| INVERT LEVELS (mASL) | 1450.44 | 1447.29 | 1445.38 | 1445.90 | 1447.23 | 1450.11 | 1453.29 | 1455.64 | 1454.39 | 1452.88 | 1449.70 | 1446.51 | 1445.45 |
| EXCAVATION DEPTH (m) | 1.00 | 0.70 | 0.72 | 0.53 | 1.04 | 1.00 | 1.06 | 0.92 | 0.79 | 1.00 | 1.07 | 1.16 | 1.00 |
| DESIGN FLOW (m³/day) | | DESIGN FLOW | | | | | | | | | | | |
| PIPE DETAILS | | HDPE OD 32MM | | | | | | | | | | | |
| BEDDING DETAILS | | TO BE DETERMINED ON SITE | | | | | | | | | | | |
| SLOPE (%) | | -15.77% | 2.62% | 14.41% | 17.41% | -6.27% | -15.92% | | | | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES
1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:
- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
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| C | | BY | | | |
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CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

KANDANI WATER DISTRIBUTION PIPELINE

PLAN AND PROFILE

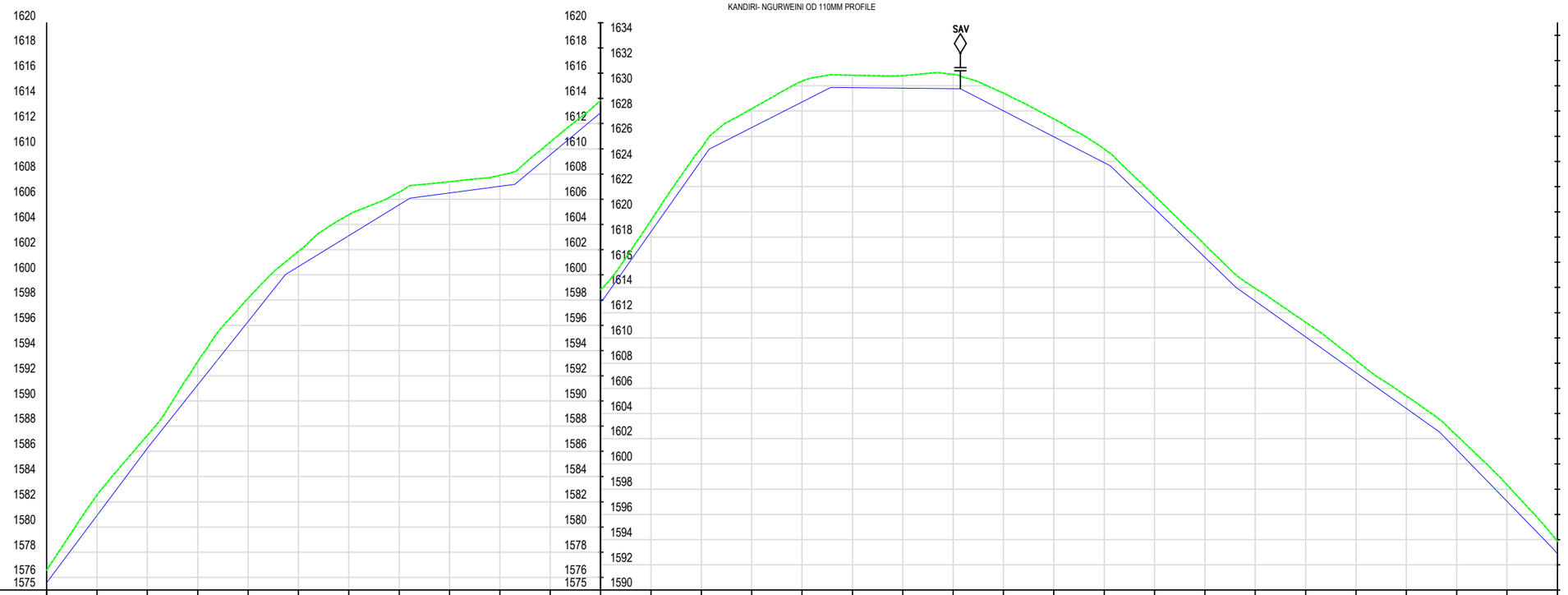
SHEET 28 OF 53

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|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KANDIRI- NGURWEINI OD 110MM PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1576.58 | 1582.54 | 1587.26 | 1593.12 | 1598.15 | 1601.86 | 1604.77 | 1606.56 | 1607.38 | 1607.90 | 1610.54 | 1613.84 | 1619.32 | 1625.06 | 1628.18 | 1630.37 | 1630.84 | 1630.81 | 1630.90 | 1629.42 | 1627.38 | 1624.99 | 1621.28 | 1617.39 | 1613.93 | 1611.24 | 1608.22 | 1605.39 | 1602.27 | 1598.34 | 1593.88 |
| INVERT LEVELS (mASL) | 1575.58 | 1580.92 | 1586.26 | 1591.28 | 1596.30 | 1600.65 | 1603.11 | 1605.56 | 1606.50 | 1607.02 | 1609.52 | 1612.85 | 1618.41 | 1624.07 | 1626.68 | 1628.72 | 1629.86 | 1629.82 | 1629.78 | 1628.01 | 1625.96 | 1623.90 | 1620.25 | 1616.38 | 1612.91 | 1610.08 | 1607.24 | 1604.40 | 1601.14 | 1597.04 | 1592.86 |
| EXCAVATION DEPTH (m) | 1.00 | 1.62 | 1.01 | 1.85 | 1.86 | 1.21 | 1.66 | 1.00 | 0.89 | 0.87 | 1.01 | 0.99 | 0.91 | 0.99 | 1.49 | 1.65 | 0.98 | 0.99 | 1.12 | 1.41 | 1.42 | 1.09 | 1.04 | 1.01 | 1.01 | 1.17 | 0.98 | 0.99 | 1.14 | 1.30 | 1.02 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 110MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 26.69% | | 25.09% | | 12.27% | | 2.63% | | 16.65% | | 28.31% | | 10.17% | | -0.20% | | -10.29% | | -19.33% | | -14.18% | | -20.49% | | -24.08% | | | | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES
1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:
- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
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CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

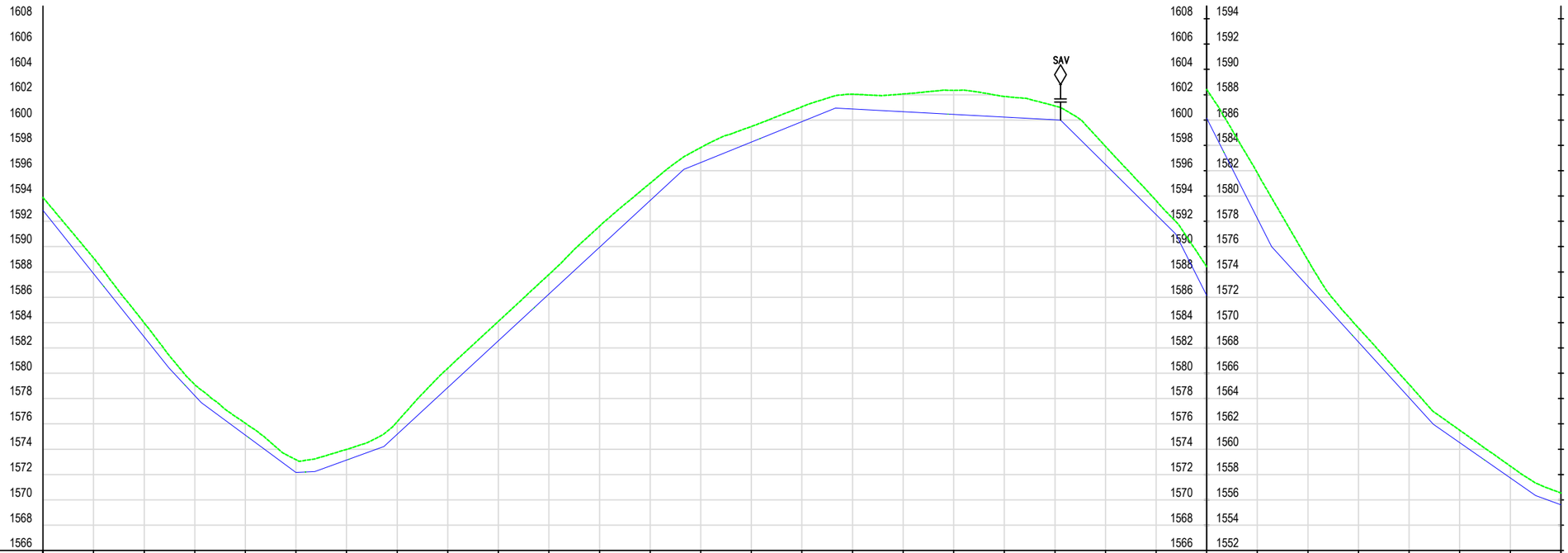
Drawing Title
KANDIRI- NGURWEINI WATER PIPELINE
PLAN AND PROFILE
SHEET 29 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

KANDIRI- NGURWEINI OD 110MM PROFILE




| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+680 | 0+700 | 0+720 | 0+740 | 0+760 | 0+780 | 0+800 | 0+820 | 0+840 | 0+860 | 0+880 | 0+900 | 0+920 | 0+940 | 0+960 | 0+980 | 1+000 | 1+020 | 1+040 | 1+060 | 1+080 | 1+100 | 1+120 | 1+140 | 1+160 | 1+180 | 1+200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1593.88 | 1589.11 | 1583.97 | 1579.10 | 1576.05 | 1573.17 | 1573.99 | 1576.17 | 1580.40 | 1584.10 | 1587.80 | 1591.63 | 1595.01 | 1597.83 | 1599.49 | 1601.05 | 1602.04 | 1602.06 | 1602.34 | 1601.86 | 1601.12 | 1597.91 | 1593.63 | 1588.42 | 1581.83 | 1574.93 | 1569.58 | 1565.12 | 1561.50 | 1558.67 | 1556.54 |
| INVERT LEVELS (mASL) | 1592.86 | 1587.87 | 1582.87 | 1578.23 | 1575.12 | 1572.17 | 1573.14 | 1575.17 | 1578.86 | 1582.56 | 1586.25 | 1589.94 | 1593.64 | 1596.64 | 1598.25 | 1599.86 | 1600.86 | 1600.65 | 1600.44 | 1600.23 | 1600.02 | 1596.48 | 1592.53 | 1586.14 | 1578.23 | 1572.85 | 1568.46 | 1564.07 | 1560.52 | 1557.73 | 1555.61 |
| EXCAVATION DEPTH (m) | 1.02 | 1.24 | 1.10 | 0.87 | 0.93 | 1.00 | 0.85 | 1.00 | 1.53 | 1.54 | 1.55 | 1.68 | 1.37 | 1.19 | 1.24 | 1.18 | 1.17 | 1.40 | 1.90 | 1.63 | 1.09 | 1.43 | 1.10 | 2.27 | 3.60 | 2.08 | 1.11 | 1.05 | 0.98 | 0.94 | 0.93 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 110MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -24.98% | -21.46% | -14.73% | 0.77% | 7.24% | 18.47% | 8.06% | -1.05% | -19.78% | -39.56% | -21.94% | -13.96% | -2.21% | | | | | | | | | | | | | | | | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

CONSULTANCY NAME:
CONTRACT No.: PROJECT NAME:
IMPLEMENTING AGENCY:
ASSIGNMENT NAME:

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
KANDIRI- NGURWEINI WATER PIPELINE
PLAN AND PROFILE
SHEET 30 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KANDIRI- NGURWEINI OD 110MM PROFILE




| CHAINAGE (Km+m) | 1+200 | 1+220 | 1+240 | 1+260 | 1+280 | 1+300 | 1+320 | 1+340 | 1+360 | 1+380 | 1+400 | 1+420 | 1+440 | 1+460 | 1+480 | 1+500 | 1+520 | 1+540 | 1+560 | 1+580 | 1+600 | 1+620 | 1+640 | 1+660 | 1+680 | 1+700 | 1+720 | 1+740 | 1+760 | 1+780 | 1+800 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1556.54 | 1555.16 | 1555.67 | 1557.92 | 1561.21 | 1566.13 | 1570.74 | 1575.73 | 1579.70 | 1581.16 | 1582.29 | 1581.87 | 1581.45 | 1581.49 | 1581.67 | 1582.24 | 1582.85 | 1583.29 | 1583.49 | 1582.78 | 1581.49 | 1580.00 | 1578.62 | 1578.57 | 1578.82 | 1580.44 | 1582.90 | 1584.47 | 1586.45 | 1585.56 | 1582.88 |
| INVERT LEVELS (mASL) | 1555.61 | 1554.17 | 1554.60 | 1557.00 | 1560.17 | 1565.03 | 1569.89 | 1574.75 | 1578.58 | 1580.09 | 1581.18 | 1580.83 | 1580.47 | 1580.60 | 1580.76 | 1581.25 | 1581.85 | 1582.22 | 1582.47 | 1581.78 | 1580.43 | 1579.08 | 1577.73 | 1577.63 | 1577.93 | 1579.46 | 1581.37 | 1583.28 | 1585.19 | 1584.02 | 1581.38 |
| EXCAVATION DEPTH (m) | 0.93 | 0.99 | 1.07 | 0.92 | 1.04 | 1.10 | 0.85 | 0.98 | 1.12 | 1.07 | 1.11 | 1.04 | 0.98 | 0.89 | 0.91 | 0.99 | 1.00 | 1.07 | 1.01 | 1.00 | 1.06 | 0.92 | 0.89 | 0.93 | 0.90 | 0.98 | 1.54 | 1.19 | 1.26 | 1.55 | 1.49 |
| DESIGN FLOW (m³/day) | | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | | HDPE OD 110MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | | -7.21% | 0.00% | 12.01% | 24.30% | 7.51% | -1.78% | 0.80% | 2.99% | 1.47% | -3.47% | -6.74% | 1.48% | 9.56% | -13.18% | | | | | | | | | | | | | | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

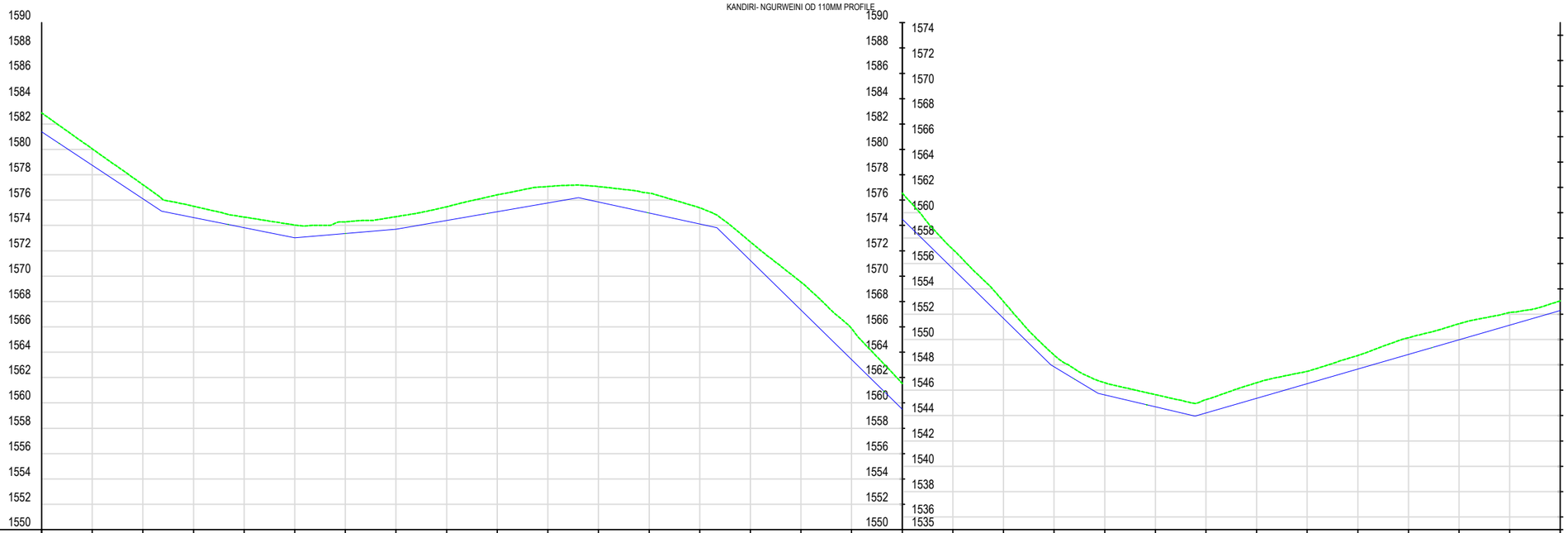
Drawing Title
KANDIRI- NGURWEINI WATER PIPELINE
PLAN AND PROFILE
SHEET 31 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

KANDIRI- NGURWEINI OD 110MM PROFILE




| CHAINAGE (Km+m) | 1+800 | 1+820 | 1+840 | 1+860 | 1+880 | 1+900 | 1+920 | 1+940 | 1+960 | 1+980 | 2+000 | 2+020 | 2+040 | 2+060 | 2+080 | 2+100 | 2+120 | 2+140 | 2+160 | 2+180 | 2+200 | 2+220 | 2+240 | 2+260 | 2+280 | 2+300 | 2+320 | 2+340 | 2+360 | 2+380 | 2+400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1582.88 | 1580.04 | 1577.21 | 1575.52 | 1574.66 | 1574.03 | 1574.28 | 1574.69 | 1575.47 | 1576.41 | 1577.07 | 1577.07 | 1576.54 | 1575.40 | 1572.70 | 1569.53 | 1565.87 | 1561.54 | 1557.11 | 1552.99 | 1548.78 | 1546.59 | 1545.65 | 1545.26 | 1546.59 | 1547.49 | 1548.74 | 1550.14 | 1551.25 | 1552.14 | 1553.05 |
| INVERT LEVELS (mASL) | 1581.38 | 1578.75 | 1576.11 | 1574.63 | 1573.83 | 1573.03 | 1573.36 | 1573.69 | 1574.38 | 1575.08 | 1575.77 | 1575.84 | 1574.98 | 1574.11 | 1571.24 | 1567.33 | 1563.41 | 1559.50 | 1555.58 | 1551.67 | 1547.85 | 1545.63 | 1544.69 | 1544.20 | 1545.35 | 1546.51 | 1547.67 | 1548.82 | 1549.98 | 1551.13 | 1552.29 |
| EXCAVATION DEPTH (m) | 1.49 | 1.30 | 1.10 | 0.89 | 0.83 | 1.00 | 0.92 | 1.00 | 1.08 | 1.33 | 1.30 | 1.22 | 1.56 | 1.28 | 1.46 | 2.21 | 2.46 | 2.04 | 1.53 | 1.33 | 0.93 | 0.96 | 0.96 | 1.07 | 1.24 | 0.98 | 1.08 | 1.32 | 1.27 | 1.01 | 0.76 |
| DESIGN FLOW (m³/day) | | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | | HDPE OD 110MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | | -13.18% | | | -3.99% | | 1.65% | | | 3.46% | | | -4.33% | | | -19.57% | | | | | | -12.01% | | -4.72% | | | | | 5.78% | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

CONSULTANCY NAME:
CONTRACT No.: PROJECT NAME:
IMPLEMENTING AGENCY:
ASSIGNMENT NAME:

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

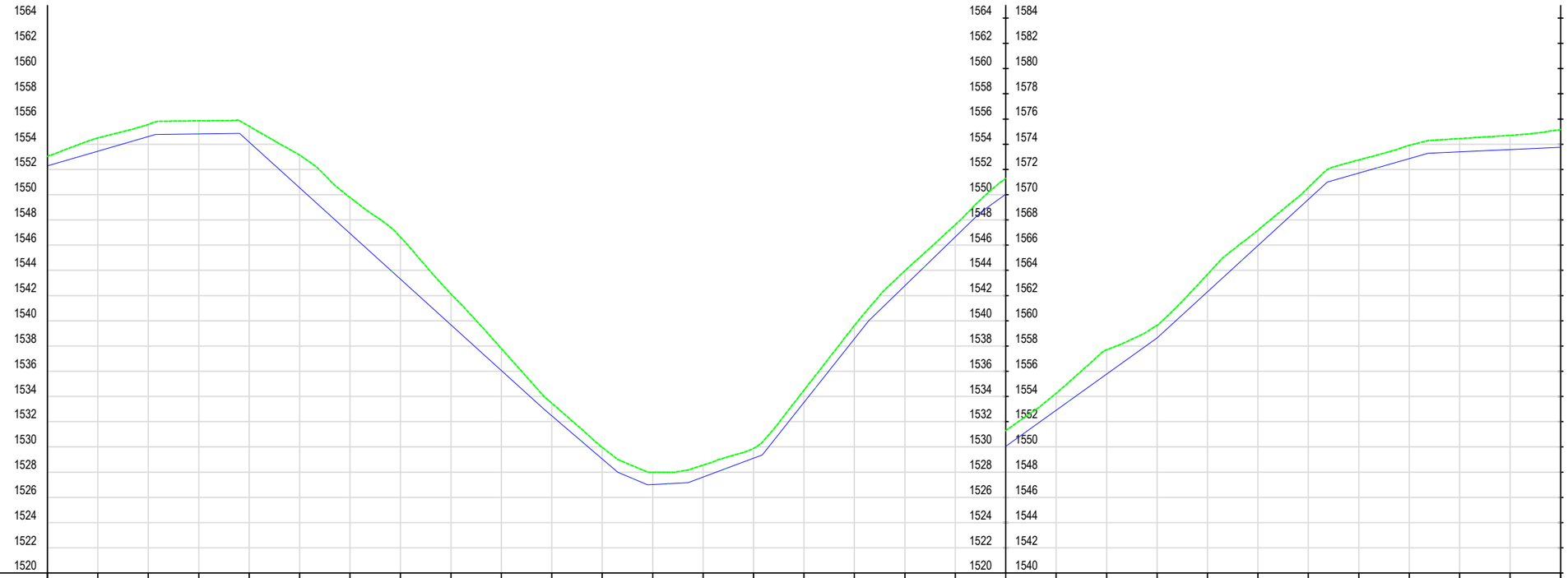
Drawing Title
KANDIRI- NGURWEINI WATER PIPELINE
PLAN AND PROFILE
SHEET 32 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

KANDIRI- NGURWEINI OD 110MM PROFILE




| CHAINAGE (Km+m) | 2+400 | 2+420 | 2+440 | 2+460 | 2+480 | 2+500 | 2+520 | 2+540 | 2+560 | 2+580 | 2+600 | 2+620 | 2+640 | 2+660 | 2+680 | 2+700 | 2+720 | 2+740 | 2+760 | 2+780 | 2+800 | 2+820 | 2+940 | 2+860 | 2+880 | 2+900 | 2+920 | 2+940 | 2+960 | 2+980 | 3+000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1553.05 | 1554.49 | 1555.57 | 1555.86 | 1555.43 | 1553.15 | 1549.78 | 1546.63 | 1542.12 | 1537.80 | 1533.47 | 1529.96 | 1528.00 | 1528.56 | 1529.88 | 1534.49 | 1539.62 | 1543.97 | 1547.62 | 1551.29 | 1554.26 | 1557.70 | 1559.64 | 1563.69 | 1567.19 | 1570.57 | 1572.76 | 1573.92 | 1574.45 | 1574.70 | 1575.17 |
| INVERT LEVELS (mASL) | 1552.29 | 1553.45 | 1554.60 | 1554.82 | 1554.17 | 1550.55 | 1546.93 | 1543.31 | 1539.69 | 1536.07 | 1532.48 | 1529.06 | 1527.02 | 1527.62 | 1529.11 | 1533.53 | 1538.57 | 1542.78 | 1546.66 | 1550.03 | 1552.90 | 1555.77 | 1558.64 | 1562.30 | 1565.97 | 1569.63 | 1571.72 | 1572.86 | 1573.40 | 1573.58 | 1573.76 |
| EXCAVATION DEPTH (m) | 0.76 | 1.05 | 0.97 | 1.04 | 1.25 | 2.60 | 2.85 | 3.32 | 2.43 | 1.73 | 0.99 | 0.90 | 0.98 | 0.94 | 0.77 | 0.96 | 1.05 | 1.18 | 0.96 | 1.26 | 1.36 | 1.93 | 1.00 | 1.38 | 1.22 | 0.94 | 1.04 | 1.05 | 1.05 | 1.13 | 1.41 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 110MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 5.78% | | 0.28% | | -18.11% | | | | | | | -17.09% | | -8.43% | 1.06% | 7.47% | 25.21% | 19.39% | 14.35% | 18.31% | 5.73% | 0.89% | | | | | | | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

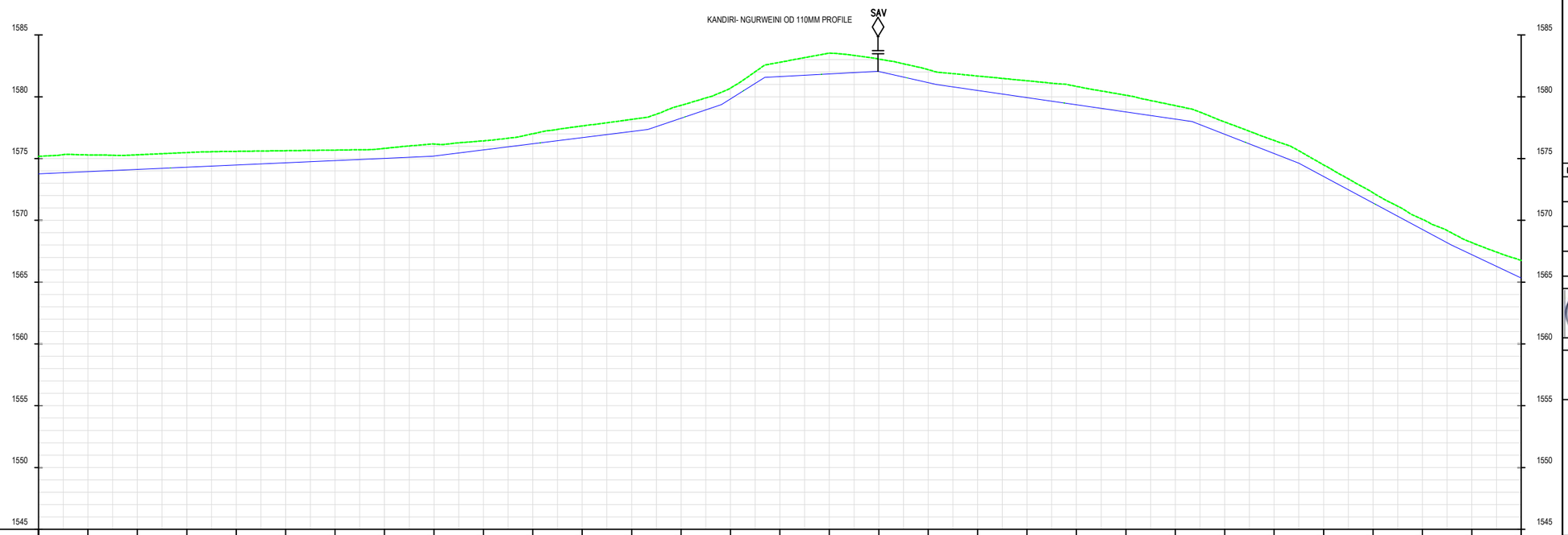
CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
KANDIRI- NGURWEINI WATER PIPELINE
PLAN AND PROFILE
SHEET 33 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000




| CHAINAGE (Km+m) | 3+000 | 3+020 | 3+040 | 3+060 | 3+080 | 3+100 | 3+120 | 3+140 | 3+160 | 3+180 | 3+200 | 3+220 | 3+240 | 3+260 | 3+280 | 3+300 | 3+320 | 3+340 | 3+360 | 3+380 | 3+400 | 3+420 | 3+440 | 3+460 | 3+480 | 3+500 | 3+520 | 3+540 | 3+560 | 3+580 | 3+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1576.17 | 1575.29 | 1575.30 | 1575.48 | 1575.58 | 1575.63 | 1575.68 | 1575.82 | 1576.17 | 1576.43 | 1577.01 | 1577.64 | 1578.17 | 1579.30 | 1580.70 | 1582.79 | 1583.53 | 1583.05 | 1582.19 | 1581.68 | 1581.29 | 1580.84 | 1580.12 | 1579.28 | 1577.96 | 1576.46 | 1574.49 | 1572.23 | 1570.09 | 1568.20 | 1566.76 |
| INVERT LEVELS (mASL) | 1573.76 | 1573.94 | 1574.11 | 1574.29 | 1574.47 | 1574.65 | 1574.83 | 1575.01 | 1575.19 | 1575.69 | 1576.19 | 1576.69 | 1577.19 | 1578.26 | 1579.82 | 1581.63 | 1581.85 | 1582.05 | 1581.15 | 1580.52 | 1579.94 | 1579.36 | 1578.78 | 1578.20 | 1576.97 | 1575.41 | 1573.55 | 1571.40 | 1569.25 | 1567.22 | 1565.34 |
| EXCAVATION DEPTH (m) | 1.41 | 1.36 | 1.19 | 1.19 | 1.11 | 0.98 | 0.86 | 0.82 | 0.98 | 0.74 | 0.82 | 0.95 | 0.98 | 1.04 | 0.88 | 1.16 | 1.68 | 1.00 | 1.04 | 1.16 | 1.36 | 1.48 | 1.35 | 1.09 | 0.99 | 1.06 | 0.94 | 0.83 | 0.83 | 0.98 | 1.42 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 110MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 0.89% | | | | | 2.50% | | | 6.76% | 12.52% | | 1.08% | -4.51% | | | -2.90% | | | | | -7.81% | | | -10.75% | | | | -9.38% | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

CONSULTANCY NAME:
CONTRACT No.: PROJECT NAME:
IMPLEMENTING AGENCY:
ASSIGNMENT NAME:

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
KANDIRI- NGURWEINI WATER PIPELINE
PLAN AND PROFILE
SHEET 34 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

KANDIRI- NGURWEINI OD 110MM PROFILE




| CHAINAGE (Km+m) | 3+600 | 3+620 | 3+640 | 3+660 | 3+680 | 3+700 | 3+720 | 3+740 | 3+760 | 3+780 | 3+800 | 3+820 | 3+840 | 3+860 | 3+880 | 3+900 | 3+920 | 3+940 | 3+960 | 3+980 | 4+000 | 4+020 | 4+040 | 4+060 | 4+080 | 4+100 | 4+120 | 4+140 | 4+160 | 4+180 | 4+200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1566.76 | 1564.97 | 1562.59 | 1559.29 | 1556.23 | 1553.78 | 1549.62 | 1548.52 | 1548.06 | 1548.17 | 1547.29 | 1547.23 | 1548.05 | 1548.23 | 1548.84 | 1549.07 | 1548.87 | 1548.28 | 1547.51 | 1546.84 | 1546.13 | 1545.27 | 1544.39 | 1543.07 | 1541.99 | 1541.08 | 1539.98 | 1539.96 | 1539.42 | 1540.22 | 1540.24 |
| INVERT LEVELS (mASL) | 1565.34 | 1563.47 | 1561.59 | 1558.35 | 1555.10 | 1551.86 | 1548.61 | 1547.61 | 1547.14 | 1546.66 | 1546.19 | 1545.97 | 1546.29 | 1546.62 | 1546.95 | 1547.28 | 1547.61 | 1547.42 | 1546.45 | 1545.48 | 1544.51 | 1543.55 | 1542.58 | 1541.61 | 1540.64 | 1539.67 | 1538.99 | 1538.96 | 1538.93 | 1538.91 | 1538.88 |
| EXCAVATION DEPTH (m) | 1.42 | 1.51 | 1.00 | 0.95 | 1.13 | 1.92 | 1.01 | 0.90 | 0.92 | 1.50 | 1.10 | 1.27 | 1.76 | 1.61 | 1.89 | 1.78 | 1.26 | 0.87 | 1.06 | 1.36 | 1.62 | 1.73 | 1.81 | 1.46 | 1.34 | 1.40 | 0.99 | 1.00 | 0.49 | 1.32 | 1.36 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 110MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -9.38% | | | -16.22% | | | | -2.38% | | | | 1.65% | | | | | | -4.84% | | | | | | | | | | -0.14% | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

SAV - SINGLE AIR VALVE

WO - WASHOUT

DAV - DOUBLE AIR VALVE

AB - ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

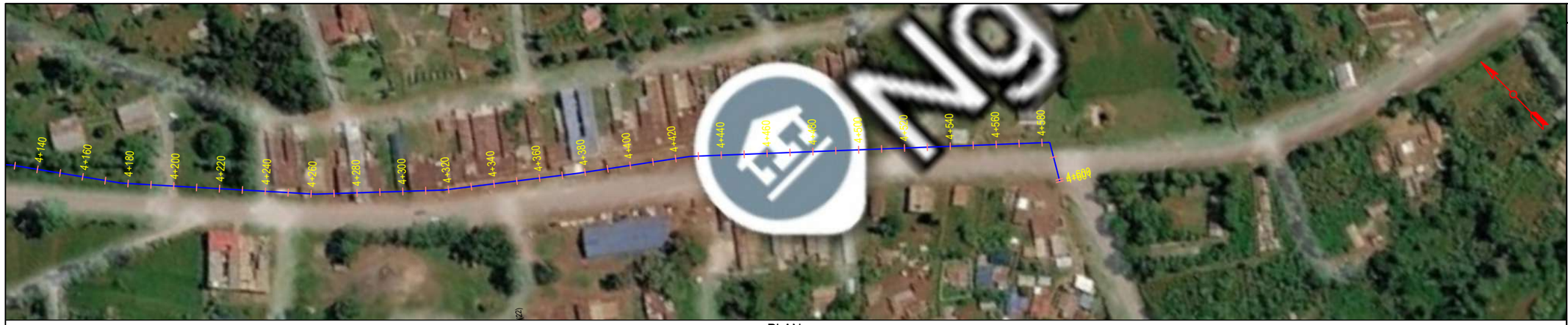
FINANCIER:

CONSULTANCY NAME:
CONTRACT No.: PROJECT NAME:
IMPLEMENTING AGENCY:
ASSIGNMENT NAME:

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

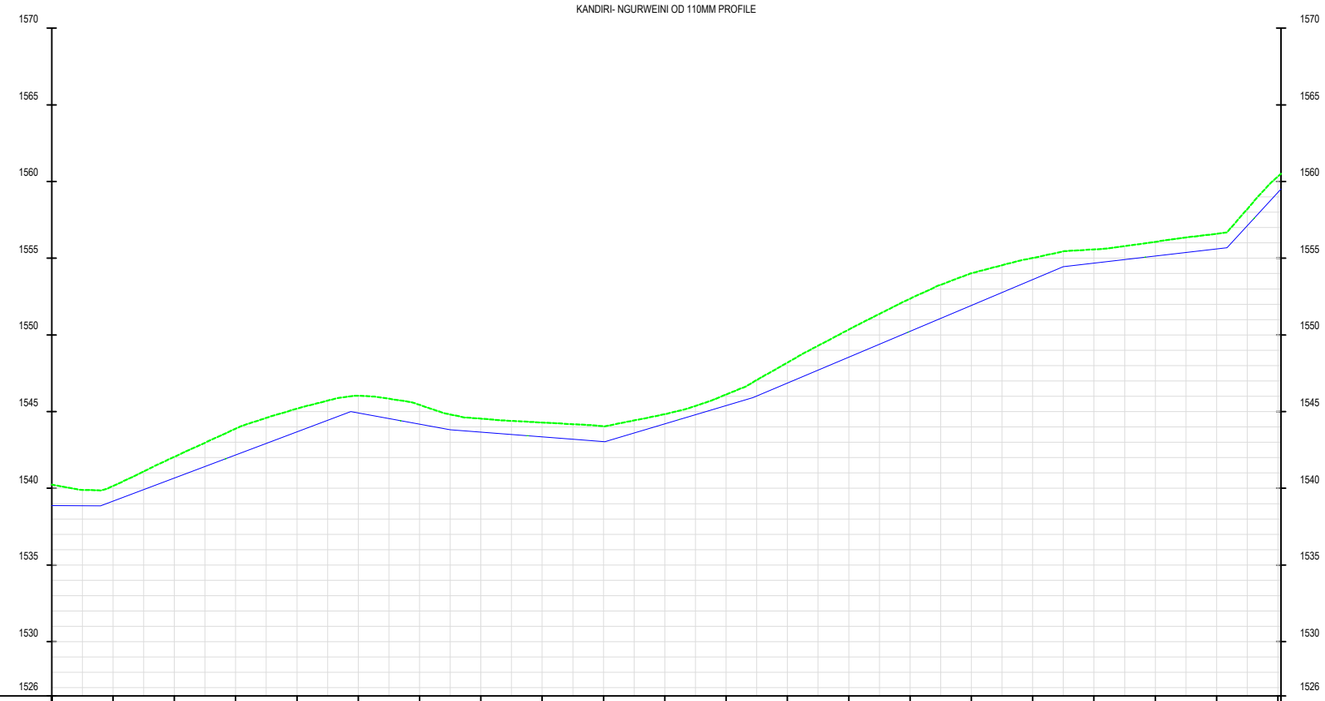
Drawing Title
KANDIRI- NGURWEINI WATER PIPELINE
PLAN AND PROFILE
SHEET 35 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KANDIRI- NGURWEINI OD 110MM PROFILE




| CHAINAGE (Km+m) | 4+200 | 4+220 | 4+240 | 4+260 | 4+280 | 4+300 | 4+320 | 4+340 | 4+360 | 4+380 | 4+400 | 4+420 | 4+440 | 4+460 | 4+480 | 4+500 | 4+520 | 4+540 | 4+560 | 4+580 | 4+609 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1540.24 | 1540.15 | 1542.05 | 1543.89 | 1545.19 | 1546.03 | 1545.44 | 1544.54 | 1544.29 | 1544.05 | 1544.83 | 1546.12 | 1548.20 | 1550.35 | 1552.36 | 1554.02 | 1555.01 | 1555.57 | 1556.07 | 1556.60 | 1560.33 |
| INVERT LEVELS (mASL) | 1538.88 | 1539.16 | 1540.67 | 1542.17 | 1543.68 | 1544.91 | 1544.18 | 1543.66 | 1543.36 | 1543.05 | 1544.21 | 1545.40 | 1546.86 | 1548.55 | 1550.23 | 1551.92 | 1553.60 | 1554.68 | 1555.14 | 1555.60 | 1559.23 |
| EXCAVATION DEPTH (m) | 1.36 | 0.99 | 1.39 | 1.72 | 1.52 | 1.12 | 1.26 | 0.88 | 0.93 | 1.00 | 0.63 | 0.72 | 1.33 | 1.80 | 2.13 | 2.10 | 1.41 | 0.90 | 0.93 | 0.99 | 1.06 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 110MM | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -0.14% | 7.52% | | -3.65% | -1.54% | 5.95% | | 8.42% | | | 2.32% | | 21.70% | | | | | | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

KANDIRI- NGURWEINI WATER PIPELINE

PLAN AND PROFILE

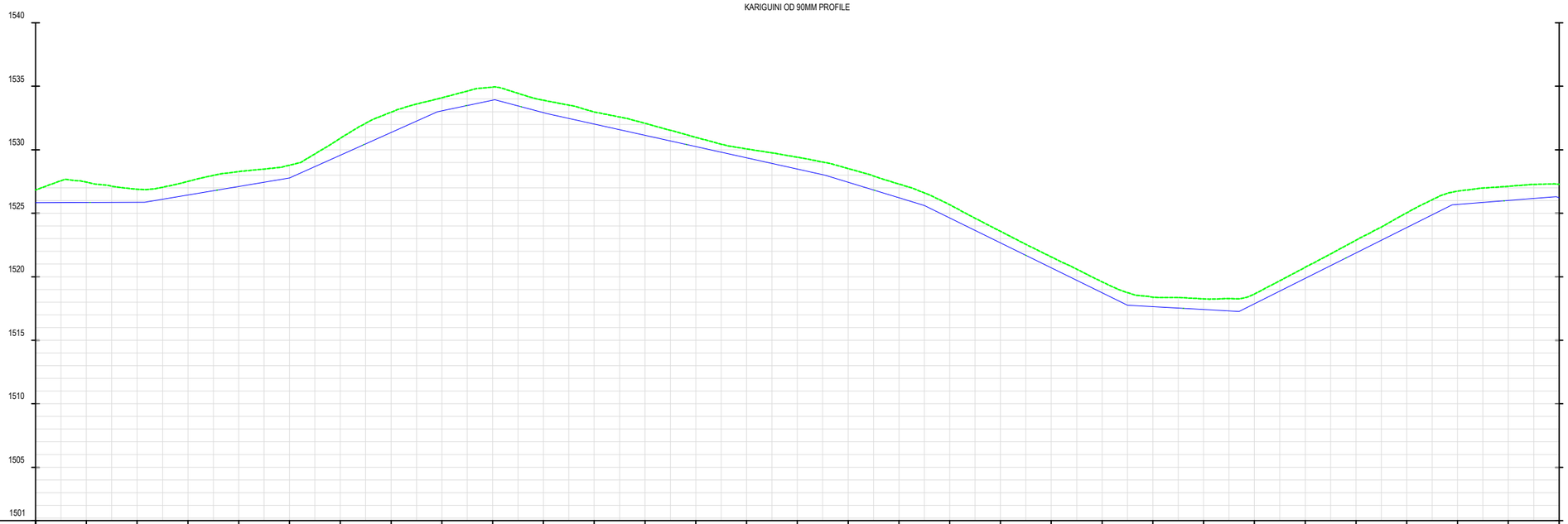
SHEET 36 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

KARIGUINI OD 90MM PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1526.83 | 1527.45 | 1526.90 | 1527.51 | 1528.29 | 1528.79 | 1530.90 | 1532.96 | 1534.09 | 1534.93 | 1533.90 | 1532.98 | 1532.08 | 1530.98 | 1530.07 | 1529.42 | 1528.52 | 1527.30 | 1525.67 | 1523.58 | 1521.56 | 1519.60 | 1518.40 | 1518.26 | 1518.64 | 1520.74 | 1522.88 | 1525.04 | 1526.74 | 1527.12 | 1527.28 |
| INVERT LEVELS (mASL) | 1525.83 | 1525.84 | 1525.86 | 1526.44 | 1527.11 | 1527.79 | 1529.58 | 1531.37 | 1533.08 | 1533.91 | 1532.92 | 1532.02 | 1531.14 | 1530.25 | 1529.37 | 1528.48 | 1527.44 | 1526.22 | 1524.63 | 1522.66 | 1520.70 | 1518.73 | 1517.64 | 1517.42 | 1517.87 | 1519.87 | 1521.87 | 1523.87 | 1525.69 | 1526.01 | 1526.23 |
| EXCAVATION DEPTH (m) | 1.00 | 1.61 | 1.03 | 1.07 | 1.18 | 1.00 | 1.33 | 1.59 | 1.02 | 1.02 | 0.98 | 0.96 | 0.94 | 0.73 | 0.71 | 0.93 | 1.08 | 1.08 | 1.05 | 0.92 | 0.87 | 0.87 | 0.76 | 0.85 | 0.77 | 0.87 | 1.01 | 1.16 | 1.04 | 1.12 | 1.05 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 90MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 0.08% | | 3.37% | | 8.96% | | 4.19% | -5.35% | | -4.43% | | | | | | | -6.12% | | -9.82% | | | -1.11% | | | 10.01% | | | 1.56% | -6.19% | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

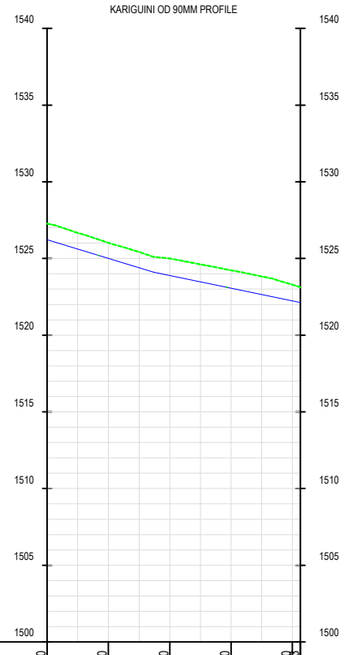
CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
KARIGUINI WATER PIPELINE
PLAN AND PROFILE
SHEET 37 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000




| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+680 | 0+683 |
|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1527.28 | 1526.02 | 1525.00 | 1524.23 | 1523.29 | 1523.19 |
| INVERT LEVELS (mASL) | 1526.23 | 1525.00 | 1523.88 | 1523.06 | 1522.24 | 1522.13 |
| EXCAVATION DEPTH (m) | 1.05 | 1.02 | 1.12 | 1.17 | 1.05 | 1.06 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | |
| PIPE DETAILS | HDPE OD 90MM | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | |
| SLOPE (%) | -6.13% | | -4.11% | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
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| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

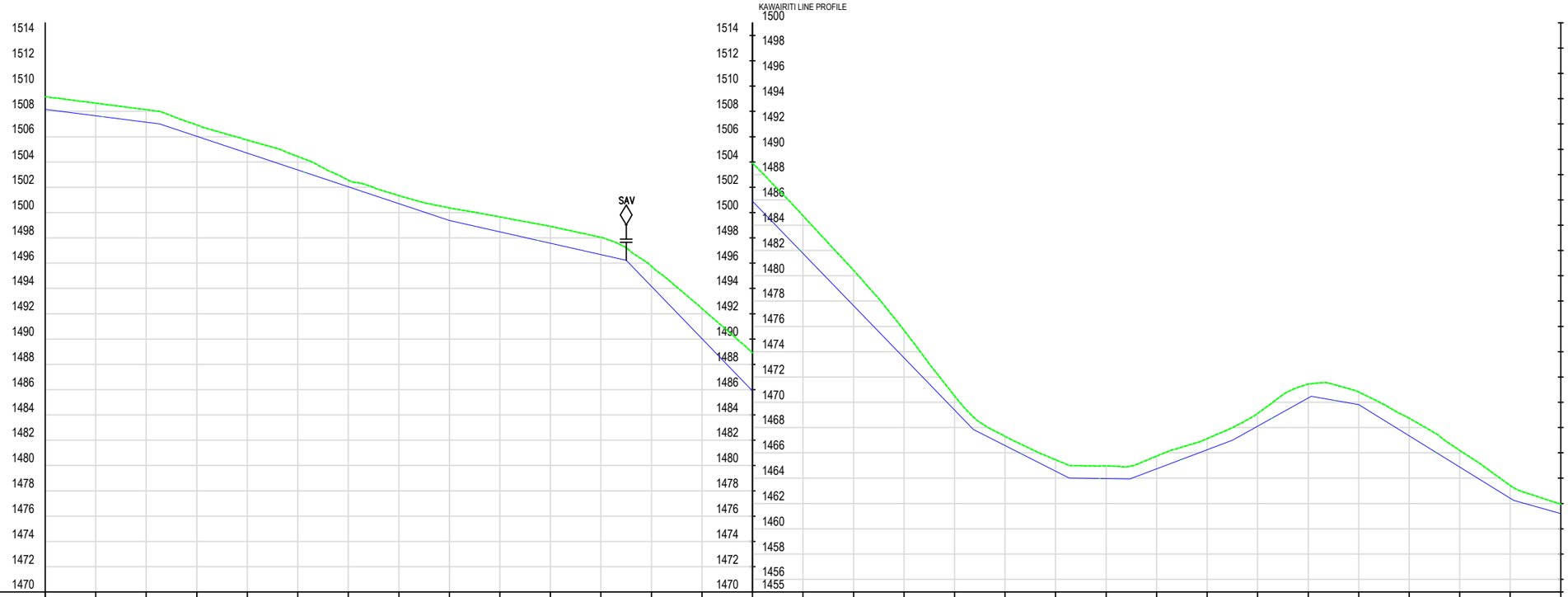
CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
KARIGUINI WATER PIPELINE
PLAN AND PROFILE
SHEET 38 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1509.16 | 1508.65 | 1508.13 | 1506.93 | 1505.73 | 1504.43 | 1502.56 | 1501.34 | 1500.37 | 1499.66 | 1498.91 | 1498.04 | 1495.76 | 1492.41 | 1488.90 | 1484.75 | 1480.43 | 1475.69 | 1470.51 | 1467.31 | 1465.46 | 1464.97 | 1465.75 | 1467.12 | 1469.12 | 1471.44 | 1470.82 | 1468.74 | 1466.20 | 1463.42 | 1461.95 |
| INVERT LEVELS (mASL) | 1508.16 | 1507.65 | 1507.14 | 1506.02 | 1504.69 | 1503.36 | 1502.03 | 1500.70 | 1499.37 | 1498.47 | 1497.58 | 1496.68 | 1494.16 | 1490.03 | 1485.90 | 1481.77 | 1477.64 | 1473.51 | 1469.38 | 1466.57 | 1464.54 | 1463.97 | 1464.74 | 1466.24 | 1468.11 | 1470.33 | 1469.82 | 1467.35 | 1464.87 | 1462.40 | 1461.19 |
| EXCAVATION DEPTH (m) | 1.00 | 1.00 | 1.00 | 0.90 | 1.04 | 1.07 | 0.53 | 0.64 | 1.00 | 1.18 | 1.34 | 1.36 | 1.60 | 2.38 | 3.00 | 2.98 | 2.79 | 2.18 | 1.13 | 0.74 | 0.91 | 1.01 | 1.01 | 0.88 | 1.01 | 1.10 | 1.00 | 1.39 | 1.32 | 1.02 | 0.76 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -2.57% | | | -6.65% | | | | | -4.49% | | | | | -20.65% | | | | | -10.14% | | -0.24% | | 7.53% | | 11.13% | | -3.49% | | -12.36% | | -5.59% |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
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| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
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**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
KAWAIRITI WATER PIPELINE
PLAN AND PROFILE
SHEET 39 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

KAWAIRITI LINE PROFILE




| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+680 | 0+700 | 0+720 | 0+740 | 0+760 | 0+780 | 0+800 | 0+820 | 0+840 | 0+860 | 0+880 | 0+900 | 0+920 | 0+940 | 0+960 | 0+980 | 1+000 | 1+020 | 1+040 | 1+060 | 1+078 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1461.95 | 1460.72 | 1459.71 | 1458.96 | 1460.10 | 1460.59 | 1462.02 | 1464.26 | 1466.29 | 1468.86 | 1471.92 | 1474.85 | 1477.82 | 1479.97 | 1479.99 | 1480.26 | 1479.56 | 1478.25 | 1475.35 | 1474.08 | 1474.19 | 1473.79 | 1473.10 | 1472.18 | 1471.63 |
| INVERT LEVELS (mASL) | 1461.19 | 1460.08 | 1458.96 | 1457.97 | 1458.70 | 1459.44 | 1461.28 | 1463.59 | 1465.91 | 1468.22 | 1470.78 | 1473.57 | 1476.36 | 1478.97 | 1479.06 | 1479.16 | 1477.92 | 1475.96 | 1473.99 | 1472.92 | 1472.45 | 1471.98 | 1471.51 | 1471.04 | 1470.63 |
| EXCAVATION DEPTH (m) | 0.76 | 0.64 | 0.75 | 0.98 | 1.39 | 1.16 | 0.75 | 0.67 | 0.38 | 0.64 | 1.15 | 1.28 | 1.46 | 1.00 | 0.92 | 1.09 | 1.64 | 2.29 | 1.36 | 1.16 | 1.74 | 1.81 | 1.58 | 1.13 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50MM | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -5.59% | | 3.66% | | 11.58% | | 13.97% | | 0.49% | | -9.81% | | -2.34% | | | | | | | | | | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

CONSULTANCY NAME:
CONTRACT No.: PROJECT NAME:
IMPLEMENTING AGENCY:
ASSIGNMENT NAME:

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

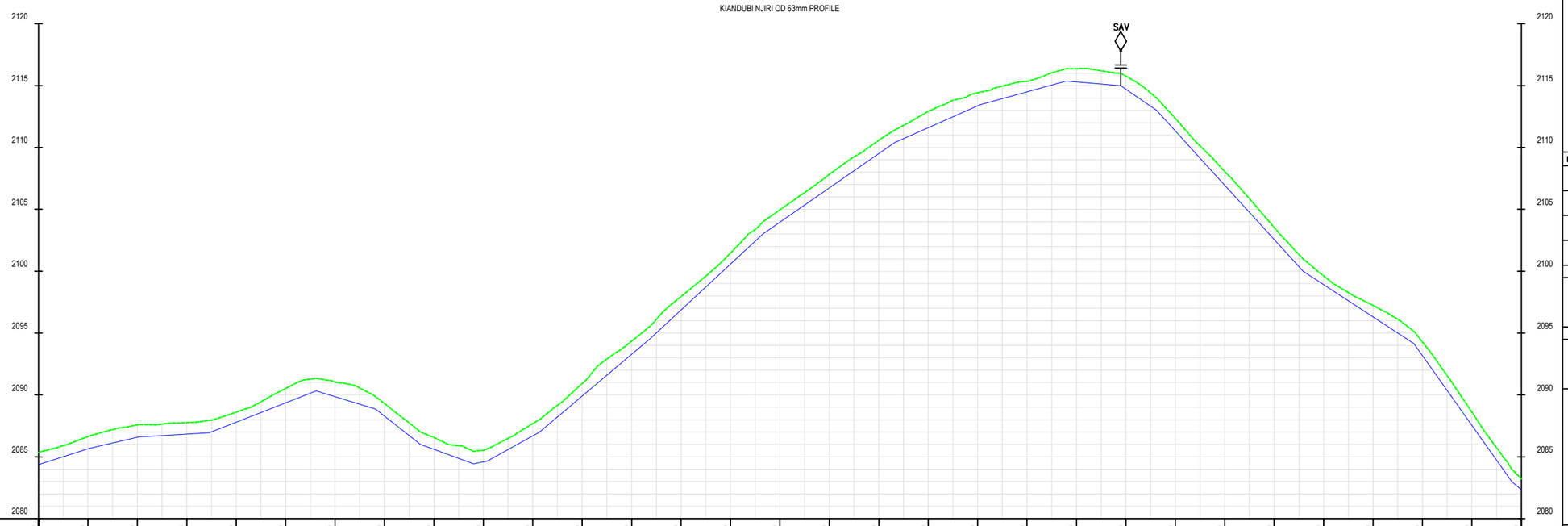
Drawing Title
KAWAIRITI WATER PIPELINE
PLAN AND PROFILE
SHEET 40 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

KIANDUBI NJIRI OD 63mm PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 2085.37 | 2086.64 | 2087.58 | 2087.76 | 2088.61 | 2090.52 | 2091.05 | 2089.30 | 2086.56 | 2085.53 | 2087.68 | 2090.91 | 2094.35 | 2097.95 | 2101.47 | 2104.96 | 2107.82 | 2110.57 | 2112.91 | 2112.42 | 2115.35 | 2116.37 | 2115.77 | 2112.35 | 2108.05 | 2103.54 | 2099.62 | 2097.24 | 2094.29 | 2088.62 | 2083.23 |
| INVERT LEVELS (mASL) | 2084.37 | 2085.64 | 2086.58 | 2086.83 | 2087.80 | 2089.36 | 2089.86 | 2088.29 | 2085.61 | 2084.59 | 2086.70 | 2089.92 | 2093.29 | 2096.87 | 2100.57 | 2103.95 | 2106.73 | 2109.51 | 2111.60 | 2113.37 | 2114.50 | 2115.30 | 2114.71 | 2111.34 | 2106.94 | 2102.57 | 2098.92 | 2096.31 | 2093.17 | 2087.55 | 2082.34 |
| EXCAVATION DEPTH (m) | 1.00 | 1.00 | 1.00 | 0.93 | 0.81 | 1.17 | 1.19 | 1.01 | 0.96 | 0.94 | 0.98 | 1.00 | 1.06 | 1.08 | 0.90 | 1.00 | 1.09 | 1.06 | 1.31 | 1.04 | 0.85 | 1.07 | 1.06 | 1.01 | 1.11 | 0.97 | 0.70 | 0.93 | 1.12 | 1.07 | 0.89 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 63MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 6.38% | 4.65% | 1.18% | 7.80% | 7.82% | -6.13% | -15.72% | -7.26% | 3.66% | 11.12% | 16.86% | 18.51% | 13.88% | 8.87% | 5.46% | -1.66% | -13.75% | -22.07% | -21.87% | -13.07% | -28.09% | -17.39% | | | | | | | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

CONSULTANCY NAME:
CONTRACT No.: PROJECT NAME:
IMPLEMENTING AGENCY:
ASSIGNMENT NAME:

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

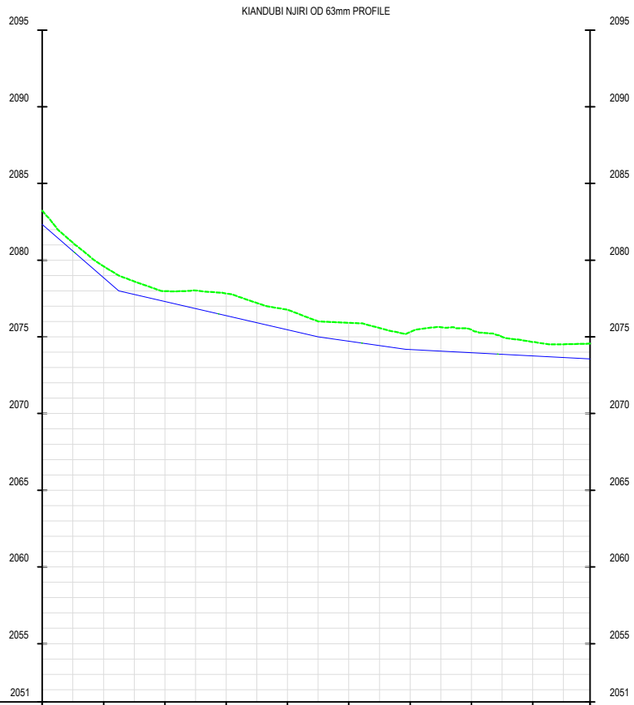
Drawing Title
KIANDUBI NJIRI WATER PIPELINE
PLAN AND PROFILE
SHEET 41 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KIANDUBI NJIRI OD 63mm PROFILE




| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+680 | 0+700 | 0+720 | 0+740 | 0+760 | 0+779 |
| GROUND LEVELS (mASL) | 2083.23 | 2079.60 | 2077.98 | 2077.83 | 2076.77 | 2075.91 | 2075.31 | 2075.47 | 2074.67 | 2074.57 |
| INVERT LEVELS (mASL) | 2082.34 | 2078.86 | 2077.31 | 2076.39 | 2075.47 | 2074.72 | 2074.17 | 2073.96 | 2073.76 | 2073.57 |
| EXCAVATION DEPTH (m) | 0.89 | 0.74 | 0.67 | 1.44 | 1.30 | 1.20 | 1.14 | 1.51 | 0.91 | 1.00 |
| DESIGN FLOW (m³/day) | | DESIGN FLOW | | | | | | | | |
| PIPE DETAILS | | HDPE OD 63MM | | | | | | | | |
| BEDDING DETAILS | | TO BE DETERMINED ON SITE | | | | | | | | |
| SLOPE (%) | | -17.39% | | -4.60% | | -2.89% | | -1.02% | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES
1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:
- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
KIANDUBI NJIRI WATER PIPELINE
PLAN AND PROFILE
SHEET 42 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1453.94 | 1453.75 | 1452.00 | 1451.00 | 1451.00 | 1451.50 | 1453.37 | 1455.78 | 1458.38 | 1460.98 | 1463.39 | 1465.60 | 1467.16 | 1469.02 | 1469.12 | 1469.19 | 1468.80 | 1468.47 | 1468.83 | 1469.65 | 1470.74 | 1471.87 | 1472.23 | 1472.50 | 1472.77 | 1472.99 | 1472.47 | 1471.72 | 1471.41 | 1472.26 | 1474.31 |
| INVERT LEVELS (mASL) | 1452.94 | 1452.60 | 1450.81 | 1450.00 | 1450.00 | 1450.60 | 1452.44 | 1454.71 | 1457.20 | 1459.70 | 1462.20 | 1464.58 | 1466.38 | 1467.98 | 1467.83 | 1467.67 | 1467.52 | 1467.51 | 1467.99 | 1468.68 | 1469.81 | 1470.82 | 1470.75 | 1470.69 | 1470.62 | 1470.56 | 1470.49 | 1470.42 | 1470.36 | 1471.37 | 1473.11 |
| EXCAVATION DEPTH (m) | 1.00 | 1.15 | 1.19 | 1.00 | 1.00 | 0.90 | 0.93 | 1.07 | 1.17 | 1.28 | 1.19 | 1.02 | 0.77 | 1.04 | 1.29 | 1.51 | 1.29 | 0.96 | 0.93 | 0.97 | 0.93 | 1.05 | 1.48 | 1.81 | 2.15 | 2.43 | 1.98 | 1.30 | 1.05 | 0.89 | 1.20 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 32MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 0.98% | -8.97% | 0.00% | 9.16% | 12.49% | 8.99% | -0.78% | 2.43% | 5.68% | -0.33% | 8.41% | 10.29% | | | | | | | | | | | | | | | | | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

KIHORWE WATER PIPELINE

PLAN AND PROFILE

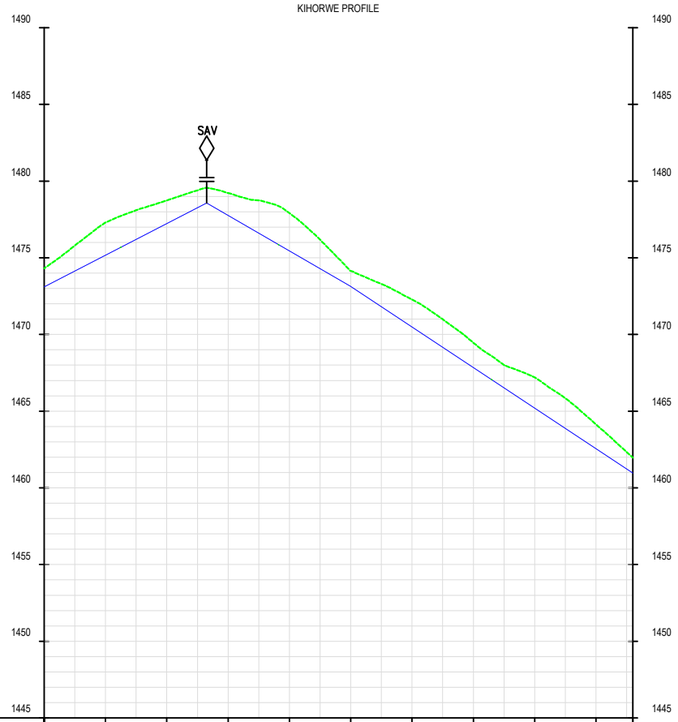
SHEET 43 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

KIHORWE PROFILE



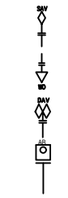

| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+680 | 0+700 | 0+720 | 0+740 | 0+760 | 0+780 | 0+792 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1474.31 | 1477.29 | 1478.74 | 1479.23 | 1477.91 | 1474.14 | 1472.28 | 1469.47 | 1467.20 | 1464.14 | 1461.97 |
| INVERT LEVELS (mASL) | 1473.11 | 1475.17 | 1477.23 | 1477.76 | 1475.45 | 1473.13 | 1470.49 | 1467.85 | 1465.21 | 1462.56 | 1460.97 |
| EXCAVATION DEPTH (m) | 1.20 | 2.13 | 1.52 | 1.47 | 2.47 | 1.01 | 1.79 | 1.62 | 1.99 | 1.58 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 32MM | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | |
| SLOPE (%) | 10.30% | | | | -11.56% | | | -13.21% | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES
1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:
- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
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| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
KIHORWE WATER PIPELINE
PLAN AND PROFILE
SHEET 44 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

MWEMA LINE PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1507.72 | 1504.99 | 1503.40 | 1502.56 | 1502.03 | 1501.49 | 1500.33 | 1499.35 | 1498.56 | 1497.53 | 1495.64 | 1493.42 | 1491.65 | 1489.71 | 1487.20 | 1483.89 | 1480.37 | 1476.65 | 1473.02 | 1470.52 | 1468.87 | 1467.54 | 1467.69 | 1468.36 | 1470.86 | 1473.00 | 1475.08 | 1474.51 | 1474.68 | 1475.17 | 1475.88 |
| INVERT LEVELS (mASL) | 1506.72 | 1504.13 | 1502.69 | 1501.41 | 1500.66 | 1499.91 | 1499.16 | 1498.41 | 1497.66 | 1496.39 | 1494.28 | 1492.17 | 1490.06 | 1487.95 | 1485.84 | 1482.85 | 1479.29 | 1475.73 | 1472.17 | 1469.55 | 1467.88 | 1466.67 | 1466.64 | 1467.61 | 1469.54 | 1471.47 | 1473.40 | 1473.91 | 1474.07 | 1474.23 | 1474.39 |
| EXCAVATION DEPTH (m) | 1.00 | 0.86 | 0.71 | 1.15 | 1.37 | 1.58 | 1.17 | 0.94 | 0.90 | 1.14 | 1.37 | 1.26 | 1.60 | 1.77 | 1.37 | 1.04 | 1.08 | 0.93 | 0.85 | 0.97 | 0.99 | 0.87 | 1.05 | 0.75 | 1.32 | 1.53 | 1.68 | 0.59 | 0.61 | 0.94 | 1.49 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -15.79% | -7.21% | -3.76% | -10.55% | -17.80% | -8.36% | -0.15% | 9.65% | 0.80% | | | | | | | | | | | | | | | | | | | | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

MWEMA WATER PIPELINE

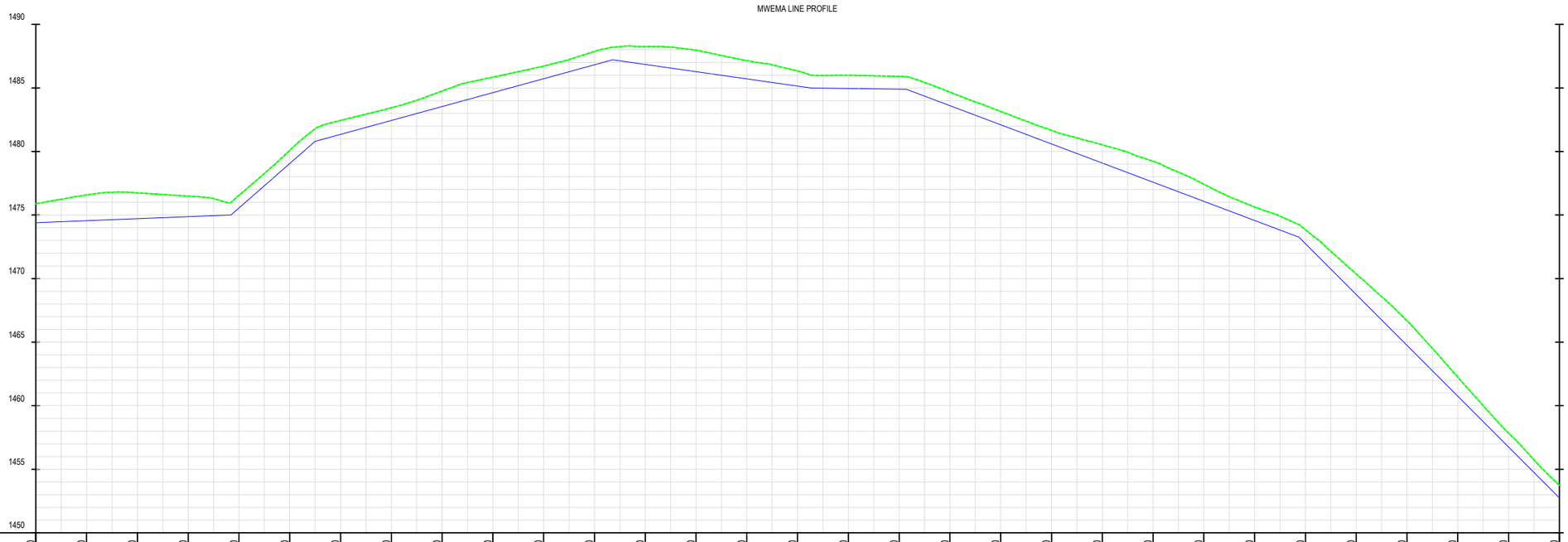
PLAN AND PROFILE

SHEET 45 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000




| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+680 | 0+700 | 0+720 | 0+740 | 0+760 | 0+780 | 0+800 | 0+820 | 0+840 | 0+860 | 0+880 | 0+900 | 0+920 | 0+940 | 0+960 | 0+980 | 1+000 | 1+020 | 1+040 | 1+060 | 1+080 | 1+100 | 1+120 | 1+140 | 1+160 | 1+180 | 1+200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1475.88 | 1476.58 | 1476.75 | 1476.49 | 1476.55 | 1480.09 | 1482.44 | 1483.44 | 1484.76 | 1485.85 | 1486.72 | 1487.87 | 1488.26 | 1487.97 | 1487.15 | 1486.34 | 1486.00 | 1485.91 | 1484.67 | 1483.14 | 1481.66 | 1480.52 | 1479.23 | 1477.42 | 1475.63 | 1473.84 | 1470.37 | 1466.68 | 1462.25 | 1457.84 | 1453.74 |
| INVERT LEVELS (mASL) | 1474.39 | 1474.55 | 1474.71 | 1474.87 | 1475.55 | 1479.05 | 1481.34 | 1482.44 | 1483.53 | 1484.62 | 1485.72 | 1486.81 | 1486.84 | 1486.28 | 1485.71 | 1485.15 | 1484.96 | 1484.90 | 1483.60 | 1482.10 | 1480.59 | 1479.08 | 1477.58 | 1476.07 | 1474.57 | 1472.74 | 1468.74 | 1464.74 | 1460.74 | 1456.74 | 1452.74 |
| EXCAVATION DEPTH (m) | 1.49 | 2.03 | 2.04 | 1.62 | 0.99 | 1.05 | 1.10 | 1.00 | 1.23 | 1.23 | 1.00 | 1.06 | 1.42 | 1.70 | 1.43 | 1.19 | 1.04 | 1.00 | 1.06 | 1.05 | 1.07 | 1.43 | 1.65 | 1.35 | 1.06 | 1.10 | 1.63 | 1.94 | 1.50 | 1.10 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 0.80% | | | 17.47% | | | | 5.47% | | | | | | -2.82% | | | -0.28% | | | | | -7.53% | | | | | | | | -20.00% | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

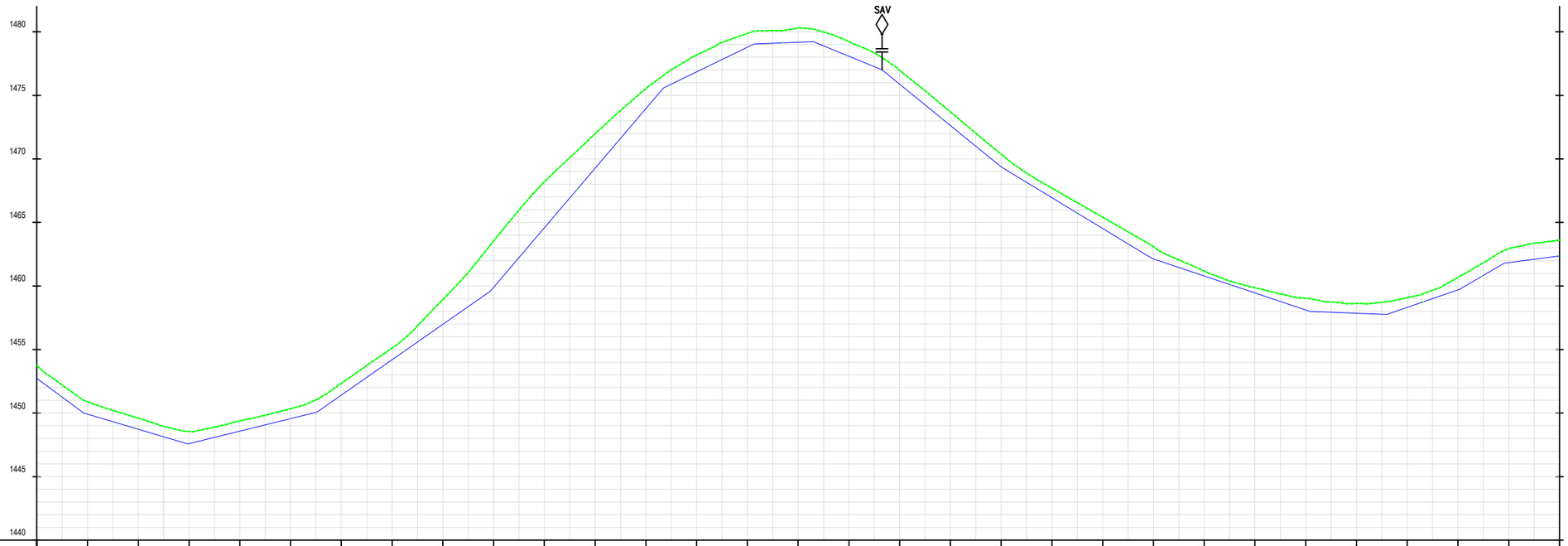
Drawing Title
MWEMA WATER PIPELINE
PLAN AND PROFILE
SHEET 46 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

MWEMA LINE PROFILE




| CHAINAGE (Km+m) | 1+200 | 1+220 | 1+240 | 1+260 | 1+280 | 1+300 | 1+320 | 1+340 | 1+360 | 1+380 | 1+400 | 1+420 | 1+440 | 1+460 | 1+480 | 1+500 | 1+520 | 1+540 | 1+560 | 1+580 | 1+600 | 1+620 | 1+640 | 1+660 | 1+680 | 1+700 | 1+720 | 1+740 | 1+760 | 1+780 | 1+800 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1453.74 | 1450.89 | 1449.60 | 1448.56 | 1449.39 | 1450.35 | 1452.34 | 1455.12 | 1458.94 | 1463.54 | 1468.19 | 1471.98 | 1475.54 | 1478.17 | 1479.87 | 1480.30 | 1479.23 | 1476.97 | 1473.70 | 1470.37 | 1467.70 | 1465.41 | 1463.09 | 1461.17 | 1459.87 | 1459.04 | 1458.62 | 1459.08 | 1460.67 | 1462.94 | 1463.60 |
| INVERT LEVELS (mASL) | 1452.74 | 1449.91 | 1448.72 | 1447.59 | 1448.57 | 1449.56 | 1451.41 | 1454.20 | 1456.98 | 1459.89 | 1464.58 | 1469.26 | 1473.94 | 1476.84 | 1478.79 | 1479.17 | 1478.07 | 1475.87 | 1472.62 | 1469.37 | 1466.95 | 1464.53 | 1462.13 | 1460.79 | 1459.45 | 1458.11 | 1457.85 | 1458.32 | 1459.69 | 1461.83 | 1462.36 |
| EXCAVATION DEPTH (m) | 1.00 | 0.98 | 0.88 | 0.97 | 0.82 | 0.79 | 0.93 | 0.92 | 1.95 | 3.65 | 3.62 | 2.72 | 1.59 | 1.33 | 1.09 | 1.12 | 1.16 | 1.10 | 1.08 | 1.00 | 0.75 | 0.88 | 0.96 | 0.38 | 0.41 | 0.93 | 0.76 | 0.76 | 0.97 | 1.10 | 1.24 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -20.00% | -14.77% | -5.93% | 4.93% | 13.94% | 23.42% | 9.70% | 0.81% | -8.21% | -16.24% | -12.11% | -6.69% | -0.79% | 6.88% | 11.66% | 2.63% | | | | | | | | | | | | | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

SAV - SINGLE AIR VALVE

WO - WASHOUT

DAV - DOUBLE AIR VALVE

AB - ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
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| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

CONSULTANCY NAME:
CONTRACT No.: PROJECT NAME:
IMPLEMENTING AGENCY:
ASSIGNMENT NAME:

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

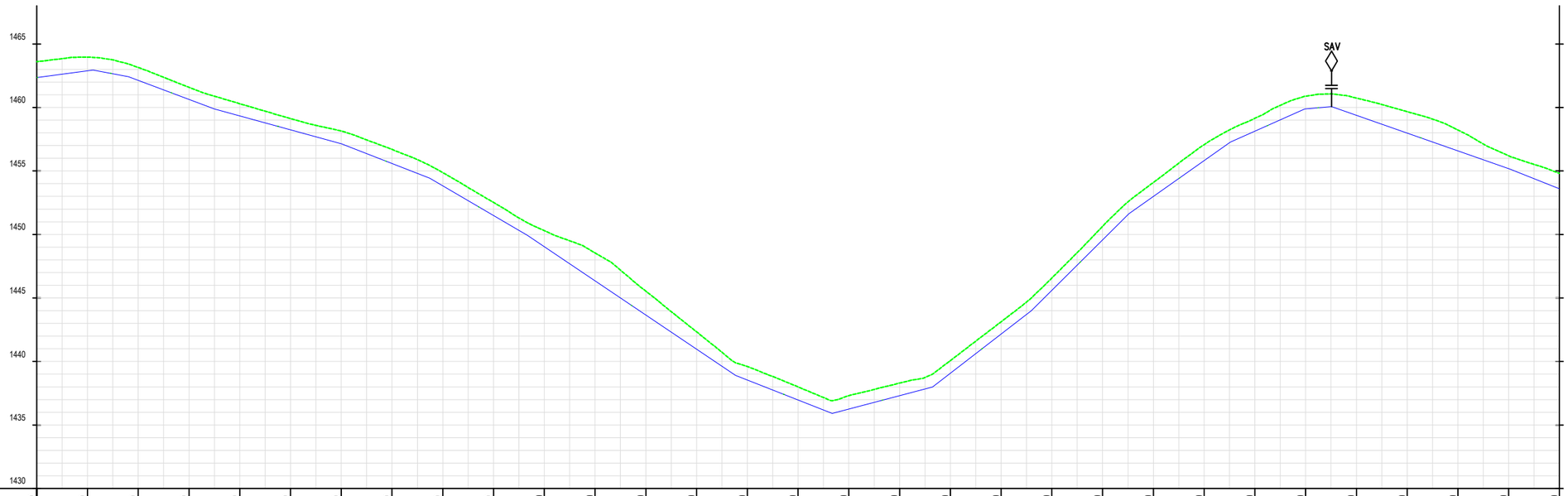
Drawing Title
MWEMA WATER PIPELINE
PLAN AND PROFILE
SHEET 47 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

MWEMA LINE PROFILE




| CHAINAGE (Km+m) | 1+800 | 1+820 | 1+840 | 1+860 | 1+880 | 1+900 | 1+920 | 1+940 | 1+960 | 1+980 | 2+000 | 2+020 | 2+040 | 2+060 | 2+080 | 2+100 | 2+120 | 2+140 | 2+160 | 2+180 | 2+200 | 2+220 | 2+240 | 2+260 | 2+280 | 2+300 | 2+320 | 2+340 | 2+360 | 2+380 | 2+400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1463.60 | 1463.97 | 1463.15 | 1461.58 | 1460.30 | 1459.12 | 1458.15 | 1456.69 | 1454.87 | 1452.52 | 1450.30 | 1448.54 | 1445.54 | 1442.33 | 1439.61 | 1438.00 | 1437.32 | 1438.30 | 1440.07 | 1443.13 | 1446.58 | 1450.64 | 1454.09 | 1457.07 | 1459.15 | 1460.89 | 1460.74 | 1459.67 | 1458.22 | 1456.19 | 1454.81 |
| INVERT LEVELS (mASL) | 1462.36 | 1462.88 | 1462.13 | 1460.64 | 1459.34 | 1458.24 | 1457.15 | 1455.59 | 1453.83 | 1451.49 | 1449.03 | 1446.34 | 1443.65 | 1440.97 | 1438.54 | 1436.97 | 1436.26 | 1437.31 | 1439.08 | 1442.16 | 1445.60 | 1449.57 | 1452.99 | 1455.81 | 1458.13 | 1459.89 | 1459.38 | 1457.98 | 1456.58 | 1455.18 | 1453.60 |
| EXCAVATION DEPTH (m) | 1.24 | 1.08 | 1.01 | 0.95 | 0.96 | 0.88 | 1.00 | 1.10 | 1.04 | 1.04 | 1.27 | 2.20 | 1.89 | 1.37 | 1.07 | 1.03 | 1.06 | 0.98 | 0.99 | 0.96 | 0.97 | 1.07 | 1.10 | 1.26 | 1.02 | 1.00 | 1.36 | 1.69 | 1.65 | 1.01 | 1.22 |
| DESIGN FLOW (m³/day) | | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | | HDPE OD 50MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | | 2.63% | 3.75% | -7.48% | -5.48% | -7.81% | -11.71% | -13.44% | -7.85% | 5.27% | 15.42% | 19.85% | 14.09% | 8.91% | 1.81% | -7.01% | -7.92% | | | | | | | | | | | | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

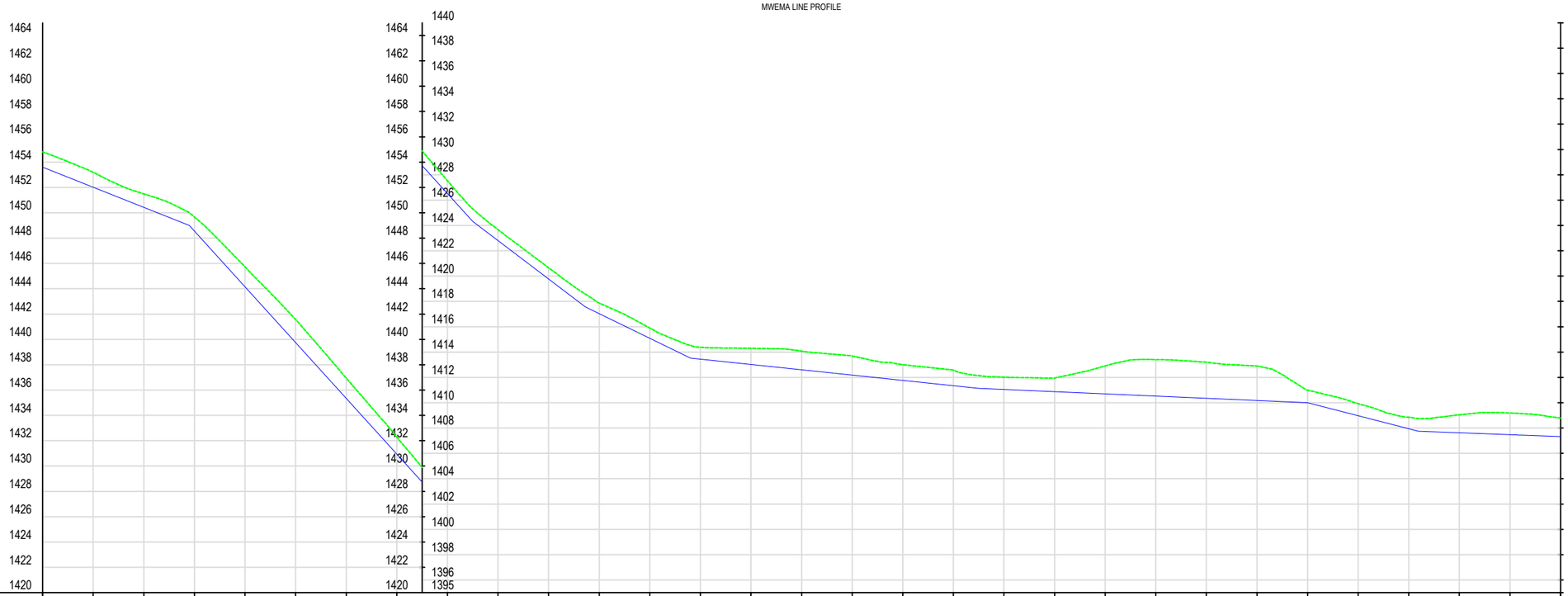
Drawing Title
MWEMA WATER PIPELINE
PLAN AND PROFILE
SHEET 48 OF 53

| | | | |
|---|---|---|---|
| Designed by JMM | | Drawn by ENN | |
| Checked by JMM | | Approved by | |
| Scale AS SHOWN (AT A1) | | Date OCTOBER 2026 | |
| Job No. TA-(WSDP) | | ACAD File: TA-(WSDP)/CAD/ | |
| A STATUS | DRAWING No. TA-(WSDP)/ | | 0 REV |




## PLAN
SCALE 1:1000

MWEMA LINE PROFILE




| CHAINAGE (Km+m) | 2+400 | 2+420 | 2+440 | 2+460 | 2+480 | 2+500 | 2+520 | 2+540 | 2+560 | 2+580 | 2+600 | 2+620 | 2+640 | 2+660 | 2+680 | 2+700 | 2+720 | 2+740 | 2+760 | 2+780 | 2+800 | 2+820 | 2+840 | 2+860 | 2+880 | 2+900 | 2+920 | 2+940 | 2+960 | 2+980 | 3+000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1454.81 | 1453.19 | 1451.49 | 1449.67 | 1445.73 | 1441.57 | 1436.94 | 1432.29 | 1427.53 | 1423.67 | 1420.66 | 1417.87 | 1415.90 | 1414.38 | 1414.29 | 1414.07 | 1413.69 | 1413.00 | 1412.58 | 1412.01 | 1411.95 | 1412.91 | 1413.41 | 1413.20 | 1412.90 | 1410.99 | 1409.92 | 1408.86 | 1409.05 | 1409.19 | 1408.78 |
| INVERT LEVELS (mASL) | 1453.60 | 1452.01 | 1450.43 | 1448.56 | 1444.15 | 1439.75 | 1435.34 | 1430.93 | 1426.53 | 1422.81 | 1419.78 | 1417.04 | 1415.09 | 1413.44 | 1413.02 | 1412.60 | 1412.18 | 1411.77 | 1411.35 | 1411.05 | 1410.88 | 1410.70 | 1410.52 | 1410.35 | 1410.17 | 1409.99 | 1408.97 | 1407.94 | 1407.62 | 1407.47 | 1407.32 |
| EXCAVATION DEPTH (m) | 1.22 | 1.18 | 1.07 | 1.10 | 1.57 | 1.83 | 1.60 | 1.35 | 1.01 | 0.87 | 0.88 | 0.83 | 0.81 | 0.94 | 1.28 | 1.47 | 1.51 | 1.24 | 1.23 | 0.96 | 1.07 | 2.21 | 2.88 | 2.85 | 2.73 | 1.00 | 0.95 | 0.91 | 1.42 | 1.72 | 1.46 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -7.92% | | | -22.04% | | | | -15.15% | | -9.76% | | | | -2.09% | | | | | | | -0.88% | | | | | -5.13% | | | -0.76% | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

MWEMA WATER PIPELINE

PLAN AND PROFILE

SHEET 49 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




## PLAN
SCALE 1:1000

MWEMA LINE PROFILE




| CHAINAGE (Km+m) | 3+000 | 3+020 | 3+040 | 3+060 | 3+080 | 3+100 | 3+120 | 3+140 | 3+160 | 3+180 | 3+200 | 3+220 | 3+240 | 3+260 | 3+280 | 3+300 | 3+320 | 3+340 | 3+360 | 3+380 | 3+400 | 3+420 | 3+440 | 3+460 | 3+480 | 3+500 | 3+520 | 3+540 | 3+560 | 3+580 | 3+587 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1408.78 | 1408.24 | 1407.15 | 1406.44 | 1405.99 | 1407.37 | 1408.76 | 1410.22 | 1411.31 | 1412.90 | 1415.24 | 1417.70 | 1421.42 | 1425.33 | 1428.61 | 1431.22 | 1433.13 | 1433.69 | 1434.09 | 1433.84 | 1432.81 | 1431.50 | 1430.09 | 1429.92 | 1429.46 | 1428.92 | 1426.98 | 1423.44 | 1419.67 | 1415.89 | 1414.45 |
| INVERT LEVELS (mASL) | 1407.32 | 1407.16 | 1406.26 | 1405.49 | 1405.01 | 1406.29 | 1407.61 | 1408.93 | 1410.24 | 1412.19 | 1414.41 | 1416.69 | 1420.45 | 1424.21 | 1427.37 | 1429.98 | 1431.91 | 1432.58 | 1432.95 | 1432.80 | 1431.59 | 1430.33 | 1429.07 | 1428.45 | 1427.96 | 1427.47 | 1425.55 | 1421.95 | 1418.34 | 1414.74 | 1413.45 |
| EXCAVATION DEPTH (m) | 1.46 | 1.08 | 0.89 | 0.96 | 0.98 | 1.08 | 1.15 | 1.29 | 1.07 | 0.71 | 0.83 | 1.00 | 0.97 | 1.12 | 1.25 | 1.24 | 1.22 | 1.11 | 1.13 | 1.04 | 1.21 | 1.17 | 1.02 | 1.46 | 1.50 | 1.45 | 1.42 | 1.49 | 1.33 | 1.15 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | -0.76% | -5.39% | -2.38% | 6.59% | 11.06% | 18.79% | 13.06% | 3.35% | -0.79% | -6.31% | -2.46% | -18.03% | | | | | | | | | | | | | | | | | | | |

## PROFILE
SCALES HOR 1:1000 AND VERT 1:100

### NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

### LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

MWEMA WATER PIPELINE

PLAN AND PROFILE

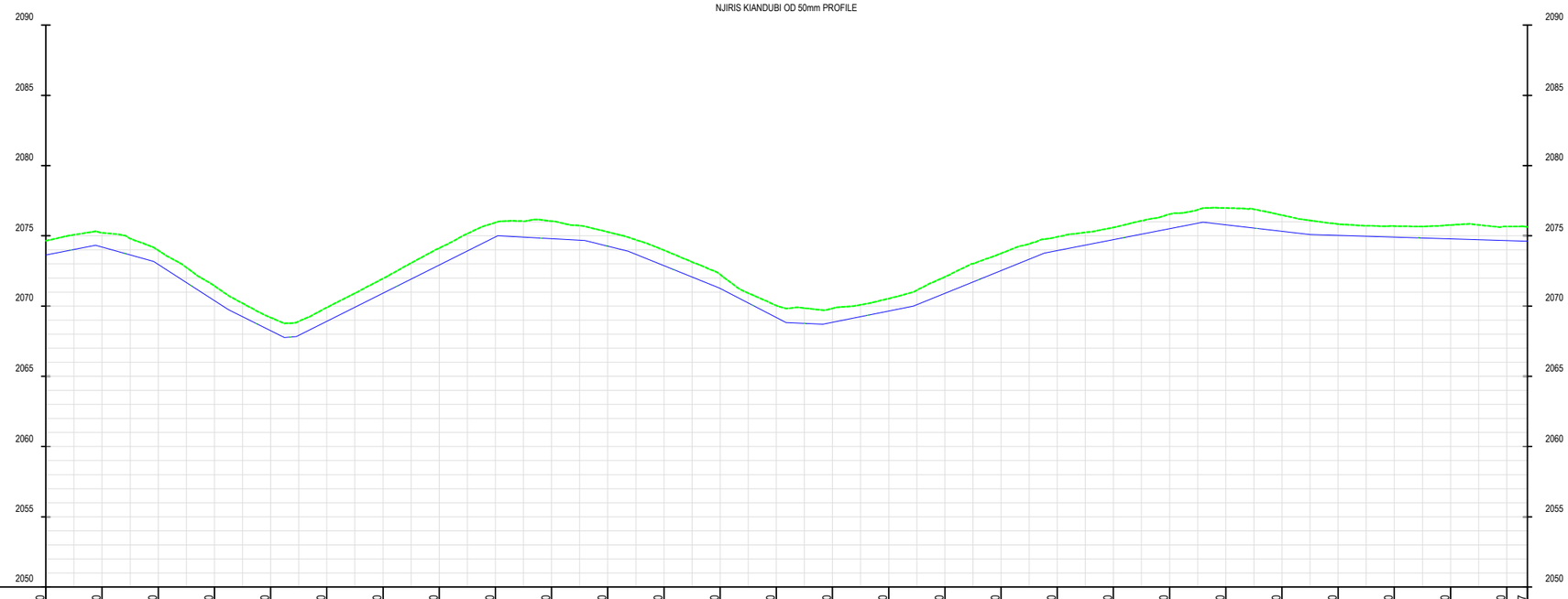
SHEET 50 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

NJIRIS KIANDUBI OD 50mm PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+527 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 2074.64 | 2075.22 | 2073.96 | 2071.43 | 2069.18 | 2069.90 | 2071.96 | 2074.13 | 2075.95 | 2076.04 | 2075.27 | 2073.97 | 2072.25 | 2070.04 | 2069.84 | 2070.53 | 2072.08 | 2073.75 | 2074.92 | 2075.59 | 2076.53 | 2076.98 | 2076.47 | 2075.84 | 2075.69 | 2075.77 | 2075.66 | 2075.62 |
| INVERT LEVELS (mASL) | 2073.64 | 2074.19 | 2072.96 | 2070.39 | 2068.25 | 2068.91 | 2070.91 | 2072.91 | 2074.92 | 2074.79 | 2074.26 | 2072.87 | 2071.26 | 2069.19 | 2068.84 | 2069.65 | 2070.91 | 2072.52 | 2073.94 | 2074.72 | 2075.51 | 2075.78 | 2075.32 | 2075.03 | 2074.91 | 2074.79 | 2074.67 | 2074.62 |
| EXCAVATION DEPTH (m) | 1.00 | 1.03 | 1.00 | 1.04 | 0.94 | 0.99 | 1.05 | 1.21 | 1.03 | 1.25 | 1.02 | 1.10 | 0.99 | 0.86 | 1.00 | 0.89 | 1.18 | 1.23 | 0.98 | 0.87 | 1.03 | 1.19 | 1.15 | 0.81 | 0.78 | 0.98 | 1.00 | 1.00 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 50MM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 3.84% | -5.54% | -12.88% | -9.96% | 1.47% | 10.01% | -1.07% | 5.00% | -8.04% | -10.37% | -0.95% | 4.05% | 8.06% | 3.91% | -2.32% | -0.60% | | | | | | | | | | | | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
2. PIPES ARE TO BE LAID TO EVEN GRADIENTS WITH A MINIMUM COVER OF 1.0m AND 1.2m FOR TRAFFICKED AREAS. WHERE COVER IS LESS THAN THIS, PIPE TO BE SURROUNDED WITH CONCRETE.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELATED DRAWINGS. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.
4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

SAV - SINGLE AIR VALVE

WO - WASHOUT

DAV - DOUBLE AIR VALVE

AB - ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

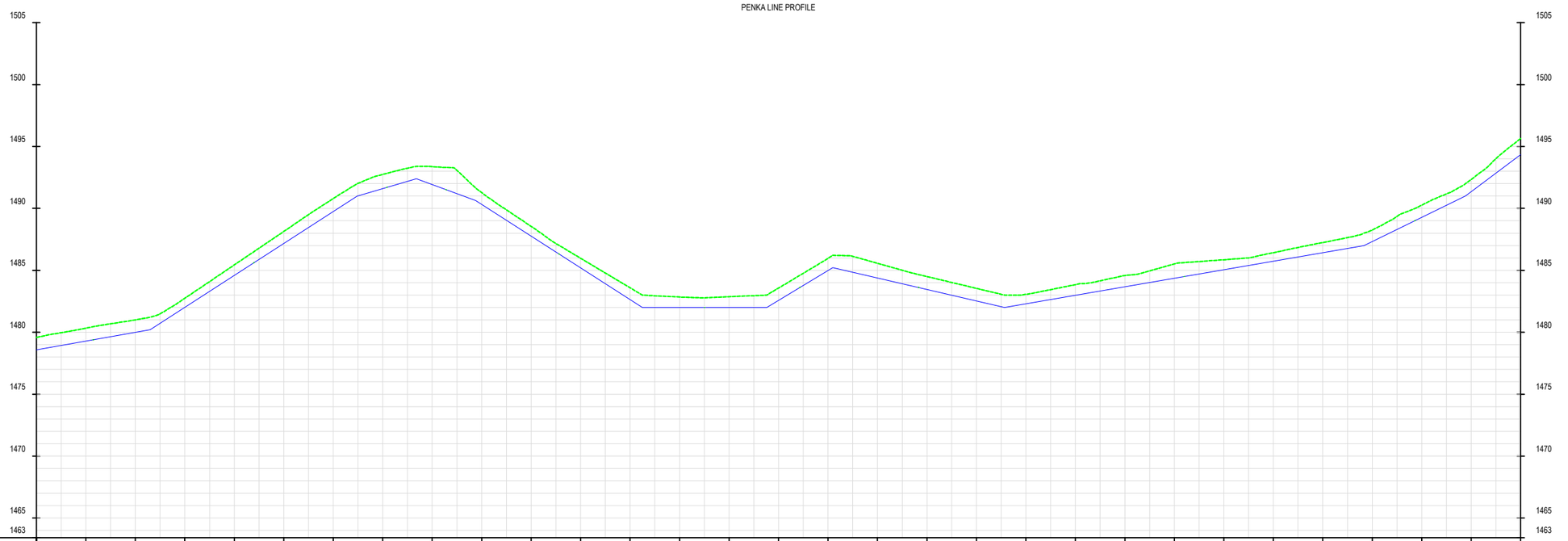
Drawing Title
NJIRIS KIANDUBI WATER PIPELINE
PLAN AND PROFILE
SHEET 51 OF 53

| | |
|---|---|
| Designed by JMM | Drawn by ENN |
| Checked by JMM | Approved by |
| Scale AS SHOWN (AT A1) | Date OCTOBER 2026 |
| Job No. TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ |
| A STATUS | DRAWING No. TA-(WSDP)/ 0 REV |




PLAN
SCALE 1:1000

PENKA LINE PROFILE




| CHAINAGE (Km+m) | 0+000 | 0+020 | 0+040 | 0+060 | 0+080 | 0+100 | 0+120 | 0+140 | 0+160 | 0+180 | 0+200 | 0+220 | 0+240 | 0+260 | 0+280 | 0+300 | 0+320 | 0+340 | 0+360 | 0+380 | 0+400 | 0+420 | 0+440 | 0+460 | 0+480 | 0+500 | 0+520 | 0+540 | 0+560 | 0+580 | 0+600 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1479.57 | 1480.33 | 1481.00 | 1482.75 | 1485.44 | 1488.14 | 1490.79 | 1492.74 | 1493.37 | 1491.27 | 1488.55 | 1485.97 | 1483.59 | 1482.84 | 1482.87 | 1483.57 | 1485.97 | 1485.57 | 1484.50 | 1483.54 | 1483.06 | 1483.85 | 1484.58 | 1485.52 | 1486.85 | 1486.42 | 1487.24 | 1488.26 | 1490.27 | 1492.34 | 1495.64 |
| INVERT LEVELS (mASL) | 1478.57 | 1479.29 | 1480.00 | 1482.02 | 1484.59 | 1487.17 | 1489.75 | 1491.60 | 1491.93 | 1490.33 | 1487.76 | 1485.20 | 1482.63 | 1482.00 | 1482.00 | 1482.58 | 1484.99 | 1484.38 | 1483.46 | 1482.53 | 1482.30 | 1482.99 | 1483.67 | 1484.36 | 1485.05 | 1485.74 | 1486.43 | 1487.33 | 1489.27 | 1491.34 | 1494.33 |
| EXCAVATION DEPTH (m) | 1.00 | 1.04 | 1.00 | 0.73 | 0.84 | 0.97 | 1.04 | 1.14 | 1.44 | 0.95 | 0.78 | 0.78 | 0.96 | 0.84 | 0.87 | 0.99 | 0.98 | 1.18 | 1.04 | 1.01 | 0.77 | 0.86 | 0.91 | 1.16 | 0.80 | 0.68 | 0.82 | 0.93 | 0.99 | 1.00 | 1.31 |
| DESIGN FLOW (m³/day) | DESIGN FLOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPE DETAILS | HDPE OD 63MM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEDDING DETAILS | TO BE DETERMINED ON SITE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SLOPE (%) | 3.56% | | | 12.89% | | | | 5.87% | -7.35% | | -12.82% | | | 0.00% | | 12.06% | -4.64% | | | 3.44% | | | | | | | | 9.73% | | 14.98% | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
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4. PRECISE ROUTES TO BE DETERMINED ON SITE.

LEGEND:

- EXISTING GROUND PROFILE
- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK




- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
|---|---|---|---|---|---|
| D | | BY | | | |
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| C | | BY | | | |
| | | CHECKED | | | |
| B | | BY | | | |
| | | CHECKED | | | |
| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:

MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:

JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title

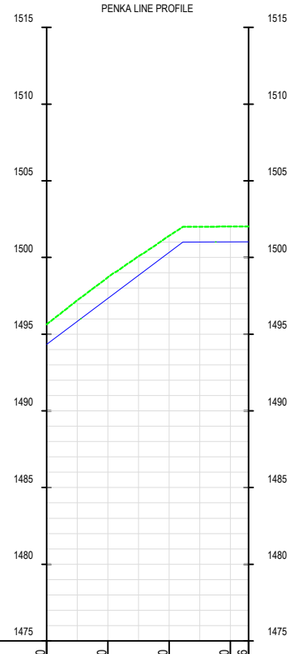
DAKIM- LAINI GRAVITY WATER LINE
PLAN AND PROFILE
SHEET 52 OF 53

| | | | |
|---|---|---|---|
| Designed by JMM | | Drawn by ENN | |
| Checked by JMM | | Approved by | |
| Scale AS SHOWN (AT A1) | | Date OCTOBER 2026 | |
| Job No. | TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ | |
| A STATUS | DRAWING No. TA-(WSDP)/ | | 0 REV |




PLAN
SCALE 1:1000

PENKA LINE PROFILE




| CHAINAGE (Km+m) | 0+600 | 0+620 | 0+640 | 0+660 | 0+686 |
|---|---|---|---|---|---|
| GROUND LEVELS (mASL) | 1495.64 | 1498.70 | 1501.41 | 1502.01 | 1502.02 |
| INVERT LEVELS (mASL) | 1494.33 | 1497.33 | 1500.33 | 1501.01 | 1501.02 |
| EXCAVATION DEPTH (m) | 1.31 | 1.37 | 1.09 | 1.00 | 1.00 |
| DESIGN FLOW (m³/day) | | DESIGN FLOW | | | |
| PIPE DETAILS | | HDPE OD 63MM | | | |
| BEDDING DETAILS | | TO BE DETERMINED ON SITE | | | |
| SLOPE (%) | | 14.98% | | 0.08% | |

PROFILE
SCALES HOR 1:1000 AND VERT 1:100

NOTES

1. ALL DIMENSIONS/LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
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- WATER LINES (EXISTING)
- WATER LINES (PROPOSED)
- RIVER/STREAM

TH-B -THRUST BLOCK

- SINGLE AIR VALVE
- WASHOUT
- DOUBLE AIR VALVE
- ANCHOR BLOCK

PRELIMINARY ISSUE

Signed: Team Leader .....

| REV | REVISIONS | | SIGN | DATE | APPROVED |
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| D | | BY | | | |
| | | CHECKED | | | |
| C | | BY | | | |
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| B | | BY | | | |
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| A | | BY | | | |
| | | CHECKED | | | |

CLIENT:
MURANG'A SOUTH WATER AND SANITATION COMPANY LIMITED

FINANCIER:

**CONSULTANCY NAME:**
**CONTRACT No.: PROJECT NAME:**
**IMPLEMENTING AGENCY:**
**ASSIGNMENT NAME:**

CONSULTANTS:
JOEDANIELS DESIGNS AND CONSTRUCTION LTD.

Drawing Title
PENKA WATER PIPELINE
PLAN AND PROFILE
SHEET 53 OF 53

| | | | |
|---|---|---|---|
| Designed by JMM | | Drawn by ENN | |
| Checked by JMM | | Approved by | |
| Scale AS SHOWN (AT A1) | | Date OCTOBER 2026 | |
| Job No. | TA-(WSDP) | ACAD File: TA-(WSDP)/CAD/ | |
| A STATUS | DRAWING No. TA-(WSDP)/ | | 0 REV |